CHAPTER TWO
DESCRIPTION OF ALTERNATIVES

2.1 Introduction

The purpose of this chapter is to describe the various exploration/development scenarios, potential levels of development and mitigation alternatives for continuing exploration for and development of the natural gas resources in the PAPA. This includes seismic surveys, design considerations, construction techniques, operating practices, and abandonment and reclamation procedures. As was shown on Figure 1-1, 3 exploration/development scenarios are addressed in this EIS. They include:

- Project Wide Exploration/Development Scenario (exploration and development activities spread generally across all portions of the PAPA);
- Anticline Crest Exploration/Development Scenario (exploration and development confined to the crest of the anticline and a few hot spots); and
- No Action Exploration/Development Scenario (no further exploration or development allowed in the PAPA).

Several other exploration/development scenarios were considered but were not analyzed in detail - Federal No Action and 40-, 320- or 640-acre well pad spacing. The rationale for excluding these exploration and development scenarios from detailed analysis can be found in Section 2.3 of this chapter.

Also considered are 2 potential levels of development - 500 and 700 well pads[1] developed in the PAPA over the next 10 to 15 years. The impact of each of these potential levels of development is evaluated for each of the exploration/development scenarios listed above (see Figure 1-1).

Two mitigation alternatives are also addressed - the Standard Stipulations (SS) and Resource Protection (RP) alternatives. The SS Alternative describes the impacts associated with imposing mitigation measures and practices common to oil and gas development elsewhere on Federal lands and minerals in Wyoming. The RP Alternatives make recommendations that exceed the standard mitigation measures currently used in the state and was designed to specifically address the manner and pace of development in the PAPA. In some portions of the PAPA, the RP Alternatives recommend reduced surface disturbance and human presence to minimize impacts to sensitive environmental resources. This chapter identifies 2 options for achieving a reduced surface disturbance and human presence - pad drilling and centralized production facilities. The RP Alternatives consider the relative impacts associated with adopting these mitigation alternatives on just Federal lands and minerals as well as on all lands and minerals in the PAPA.

In addition to gas exploration and development activities within the PAPA, this chapter also describes construction and operation of sales pipelines proposed by Jonah Gas and Western Gas. These pipelines would transport gas from the project area to existing pipeline hubs in southwestern Wyoming. Because existing pipeline capacity from the project area is insufficient to transport the quantities of gas which may be produced from the PAPA, these sales pipelines and their associated compression are considered connected actions to continued exploration and development. A field office, proposed by BP Amoco in the southern portion of the PAPA, is also addressed.

This EIS does not evaluate the typical "proposed action"[2] found in many of BLM's previous southwest Wyoming NEPA documents. At this point in time, insufficient information is available to understand exactly how the Pinedale Anticline should ultimately be developed (i.e., it is not currently possible to predict where the actual productive zones are located and what well density will be necessary to drain the reservoir(s) or adequately estimate ultimate production). However, the operators believe that at least 8 and as many as 16 bottomholes per section may be required to adequately drain productive zones which may be discovered in the future.

To date, most wells in the PAPA have been drilled on the crest of the anticline where the highest concentrations of gas are expected to be found. Because so little of the PAPA has been explored and

[1] The term "well pad" is used consistently in this EIS to identify the surface location from which single or multiple bottomholes or wells may be drilled. Wells refer to well bores, several of which may be drilled from a single well pad.

[2] The proposed action is typically defined as what the project proponents propose to do. For oil and gas projects this typically includes drilling of a specific number of wells during a specific time frame based on a well-defined understanding of the area's geology.

much remains to be understood about the ability of the anticline to economically produce natural gas, the operators have been unable to develop a detailed proposed action that specifies locations of wells and associated facilities (e.g., roads, gathering pipelines, etc.). The lack of available information to quantify development potential requires this EIS to consider a wide range of exploration/development scenarios and potential levels of development. This range includes considering the impacts from wide spread development across the full extent of the PAPA to no further additional exploration or development.

Both levels of potential development evaluated in this EIS (500 and 700 producing well pads over the next 10 to 15 years) are considered to be optimistic by some of the operators, the State of Wyoming (WOGCC and Office of State Lands and Investments) and BLM. They believe that drilling results to date suggest a more likely level of development in the PAPA of 300 to 350 producing well pads. Nevertheless, the 500 and 700 producing well pad levels of development are being analyzed in this EIS to ensure appropriate analysis coverage and disclosure of impacts.

It is possible that development within the PAPA could go beyond the levels of development considered in this EIS, although few would consider such a level of development as reasonably foreseeable. Any consideration for development beyond the levels analyzed in this EIS would require additional environmental analysis.

Regardless of the development uncertainties, the BLM initiated early preparation of this EIS because the PAPA contains a number of sensitive environmental resources (see Chapter 3) that need to be identified and protected (to the extent allowed by law) before further exploration or extensive development can proceed. In addition, NEPA requires early and continued public participation. Finally, exploration and development in the PAPA has raised concerns among the public and a number of regulatory agencies.

All but about 7 square miles of the PAPA's Federal minerals (approximately 256 square miles) have been leased. BLM cannot deny the operators the right to drill on these leased lands. Once the land is leased the BLM no longer has the authority to preclude surface disturbing activity even if the environmental impact of such activity is significant. By leasing, the government has made an irrevocable commitment to allow some surface disturbing activities, including drilling and road building.

However, BLM does have authority to regulate the manner and pace of development of a lease so long as there is no "taking" of the rights granted in the lease. In regulating the development of these leases, BLM is directed to allow no undue or unnecessary impacts to the resources that occur on the leased lands. As such, BLM strives to maintain a balance between the rights granted to the operators and an adequate level of environmental protection. To not identify and implement mitigation opportunities that eliminate undue or unnecessary impacts would conflict with BLM's regulations. Conversely, to develop protective measures that are so stringent that they effectively preclude development of the leases would contradict the terms of the lease.

2.2 Exploration/Development Scenarios

The location of future development in the PAPA will be dictated by where recoverable gas reserves are discovered. In other words, the BLM cannot choose one of the exploration/development scenarios identified in this EIS over another. Essentially, the government has sold to the operators the right to develop the minerals contained in the PAPA. Unless a lease contains a No Surface Occupancy stipulation or development would clearly violate an existing law (e.g., Endangered Species Act), BLM must allow development of any lease that has recoverable gas reserves regardless of what conflicts may occur with sensitive environmental resources (see discussion in Section 2.2.3).

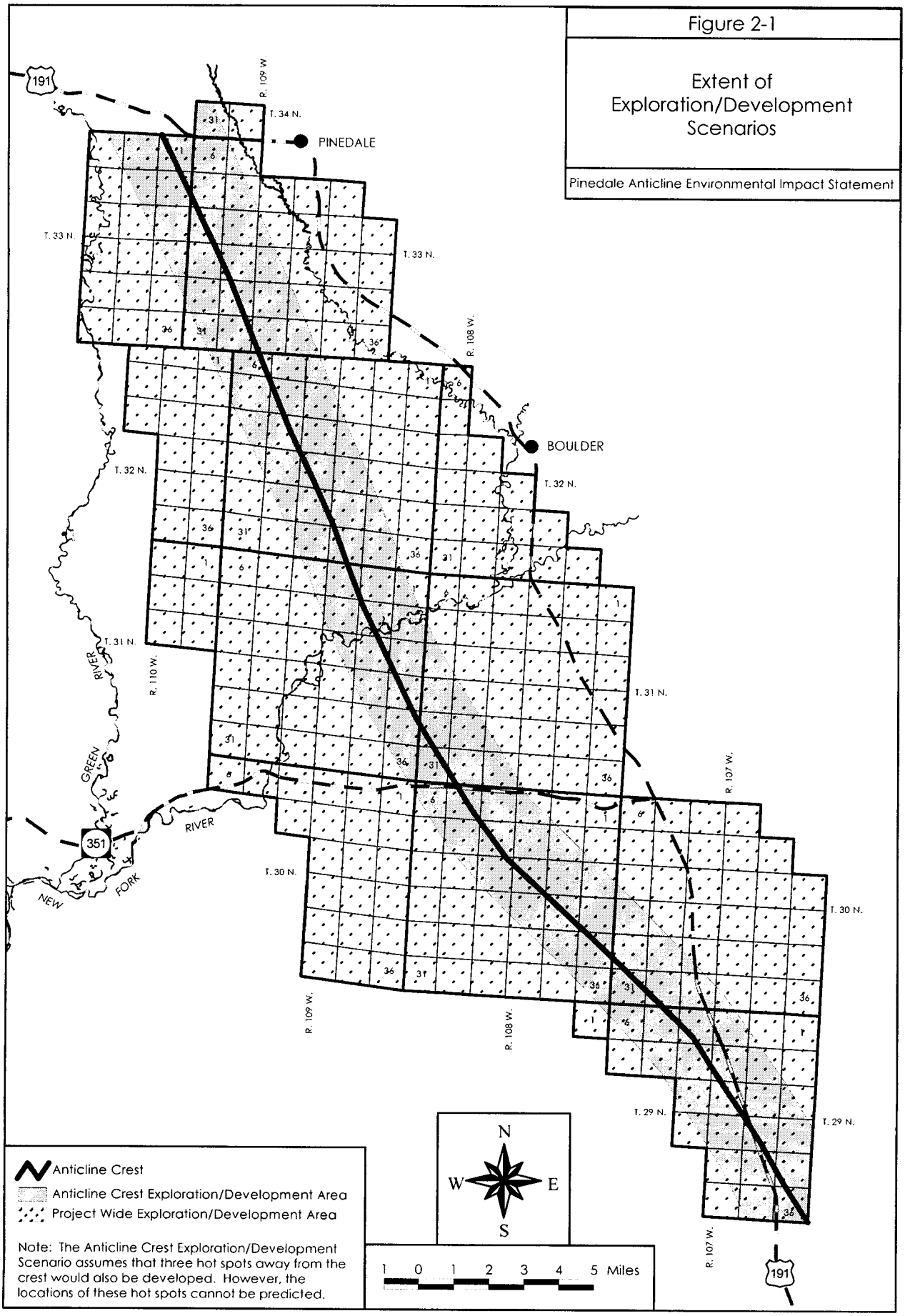
Where development will occur cannot be accurately predicted at this time because too little exploration has been conducted in the PAPA. Many of the operators and the BLM believe that the highest potential for the discovery of recoverable gas reserves is associated with a relatively narrow area on both sides of the anticline crest. Other operators believe that development potential throughout the PAPA is high.

2.2.1 Project Wide Exploration/Development Scenario. Figure 2-1 shows the location of the PAPA. The Project Wide Exploration/Development Scenario assumes that development would generally occur throughout the entire project area.

Figure 2-1

Extent of Exploration/Development Scenarios

Pinedale Anticline Environmental Impact Statement



2.2.2 Anticline Crest Exploration/Development Scenario. This scenario assumes that recoverable gas reserves will occur in isolated areas rather than throughout the PAPA. It assumes that most of the development will occur approximately within 1 mile of either side of the anticline crest shown on Figure 2-1 and that 3 hot spots would be discovered and developed away from the anticline crest. Because the location of these hot spots is not known, they are not shown on the figure. For purposes of analysis, it was assumed that approximately 70 percent of the well pads associated with the Anticline Crest Exploration/Development Scenario would be located within 1 mile of the anticline and 30 percent of the well pads would be located in 3 hot spots away from the crest. It was further assumed that an equal number of well pads would be developed in each hot spot.

2.2.3 No Action Exploration/Development Scenario. In accordance with CEQ regulations (which requires consideration of a No Action Alternative), the No Action Exploration/Development Scenario is evaluated to provide a base from which to compare incremental impacts associated with the Project Wide and Anticline Crest Exploration/Development scenarios. However, existing leases preclude the BLM from prohibiting future exploration or development on Federal lands or minerals in the PAPA. Leases on private and state lands are binding on the operators and the mineral/surface owners and enforceable under Wyoming state law.

On Federal lands, the Tenth Circuit Court of Appeals in *Sierra Club vs. Peterson* (717 F. 2d 1409, 1983) found that "*on land leased without a No Surface Occupancy stipulation, the Department* (Interior) *cannot deny the permit to drill...once the land is leased the Department no longer has the authority to preclude surface disturbing activity even if the environmental impact of such activity is significant. The Department can only impose mitigation measures upon a lessee who pursues surface disturbing exploration and/or drilling activities.*" The court goes on to say "*notwithstanding the assurance that a later site-specific environmental analysis will be made, in issuing these leases the Department has made an irrevocable commitment to allow some surface disturbing activities, including drilling and road building.*" By issuing the leases, BLM has accepted the possibility of significant impacts to the environment.

2.3 Exploration/Development Scenarios Considered but not Analyzed in Detail

During scoping and the public workshops, it was suggested that other exploration/development scenarios be analyzed in the EIS. For the reasons listed below, BLM has determined that these other scenarios are not reasonable and they are not analyzed further in this EIS.

2.3.1 Federal No Action Exploration/ Development Scenario. During scoping for this project, it was suggested that a development scenario be considered that would evaluate impacts of a prohibition of further development or exploration on Federal lands and minerals. Under this scenario, exploration and development would continue only on private and state lands and minerals. After review of the leases that have been issued to the operators for Federal minerals and for the reasons discussed in Section 2.2.3, the BLM determined that this alternative was not reasonable.

2.3.2 40-Acre Well Pad Exploration/Development Scenario. The operators believe that in parts of the PAPA it may be necessary to locate well pads on 40-acre centers. In these areas, 16 well pads per section would be necessary to efficiently and economically drain the reservoir. One way to evaluate potential impacts from development would be to apply this 40-acre well pad scenario to the entire PAPA. However, such a "worst-case" approach would result in the installation of nearly 5,000 well pads in the project area. Drilling of this number of wells would never happen for a number of reasons. First, the geology of the PAPA and the results of wells drilled by the operators to date indicates that gas development may be concentrated on a relatively narrow band centered on the crest of the anticline. Although it is anticipated that well pad density may reach 16 per section on portions of the crest of the anticline, well pad density is generally expected to decrease with distance away from the anticline crest. Off the anticline it is generally believed that less wells are likely. BLM believes a few hot spots may occur on the flanks of the anticline but that overall well densities off the anticline will remain relatively low. Based on these facts, the BLM determined that this alternative would grossly overstate potential impacts from the project and the alternative was dropped from further consideration. Not conducting worst-case analysis is consistent with CEQ regulations. CEQ

withdrew all reference to worst-case analysis from their regulations several years ago.

2.3.3 320 or 640-Acre Well Pad Exploration/ Development Scenario. Based on comments received during scoping and at the workshops, BLM also evaluated the possibility of restricting the operators to only 1 or 2 well pads per section. Some have termed this restricted well pad density the "Conservation Alternative." However, such a restriction would exceed the ability of the operators to drill and complete successful wells with adequately spaced bottomholes sufficient for complete drainage of the tight sands found in the PAPA. BLM has concluded that limiting the number of well pads to less than 4 per section, based on what is currently known about the technical limitations of directionally drilling wells, may result in a taking of the lease rights granted to the operators. The only place in the PAPA where mitigating opportunities in Chapter 4 recommend limiting well pads to less than 4 per section is in the sensitive viewshed area near Pinedale. Because this area is small, likely unproductive (uneconomical), and potential impacts were judged to be particularly severe, BLM was compelled to analyze well pad density at less than 4 per section.

Much of the controversy surrounding this project is based on what BLM can do to limit surface disturbance and the associated impacts in the project area. It is clear that one of the fundamental goals of NEPA is to explore alternatives that reduce impacts. CEQ has provided guidance on analysis of alternatives[3]. In that guidance, CEQ addresses the question *"if an EIS is prepared in connection with an application for a permit or other federal activity, must the EIS rigorously analyze and discuss alternatives that are outside the capability of the applicant or can it be limited to reasonable alternatives that can be carried out by the applicant?"* In response, CEQ stated *"...the emphasis is on what is 'reasonable' rather than on whether the proponent or applicant likes or is itself capable of carrying out a particular alternative. Reasonable alternatives include those that are practical and feasible from a technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant."*

[3] 46 Federal Register 18026. March 16, 1981.

In determining the scope of this analysis, BLM evaluated whether limiting the operators to 1 or 2 well pads in each section was practical and reasonable from a technical and economic standpoint. An overriding concern that had to be addressed was the fact that the Federal leases give the operators the right to remove all of the leased resources in a leasehold. Restrictions that can be imposed on an operator are addressed in 43 CFR 3101.2. Reasonable measures may be required to minimize adverse impacts to other resource values, land uses or users.

The BLM must also require *"that all operations be conducted in a manner which protects other natural resources and the environmental quality...and results in the maximum ultimate recovery of oil and gas"* (43 CFR 3161.2). BLM interprets these seemingly inconsistent directions to mean that the agency must provide effective mitigation to prevent unnecessary and undue degradation, but cannot unreasonably infringe on the lessee's existing rights. Further, BLM considers the economic removal of all of the leased resources in the leasehold a right conveyed to the lessee. In summary, BLM has concluded that mitigation of impacts in the PAPA must be reasonable and not restrict the operator's ability to place wells in each of the 40-acre spaced bottomhole locations.

Requiring the operators to develop the mineral leases with just 1 or 2 surface locations per section would leave much of the leased resources in the leasehold unrecovered. Placing a single well pad in the center of a section would require directionally drilling offset wells which deviate approximately 2,800 feet. Two well pads per section would require 2,100 foot deviations. The risk of mechanical failure would increase as would the cost of drilling the wells. Therefore, BLM has concluded that it is not practicable nor feasible to expect the operators to develop the natural gas resource in the PAPA from 1 or 2 well pads per section.

2.4 Potential Levels of Development

Because it is not known where recoverable gas reserves will be discovered in the PAPA, it is equally impossible to predict the number of wells which will ultimately be necessary to recover gas reserves that may be discovered in the future. In fact, determining what represents a reasonable range of potential levels of development for consideration in this EIS has been a very arduous task and has been the

subject of much discussion between the operators and the cooperating agencies. Some of the operators believe it will ultimately be necessary to drill 2,000 or more wells to adequately drain the productive zones in the PAPA while others believe that only 300 to 350 wells will eventually be drilled because productive zones are likely restricted to the anticline crest. Based on results of limited drilling in the project area to date, BLM believes that the lower estimate is probably most realistic.

However, to avoid underestimating impacts, BLM has evaluated 2 relatively high potential levels of development over the next 10 to 15 years - 500 and 700 productive well pads. Assumptions used to determine productive and dry hole well pad numbers for each of the exploration/development scenarios are provided on Table 2-1.

For purposes of analysis, it was assumed that approximately 70 to 80 percent of the wells drilled in the PAPA would be productive (not dry holes). For example, to develop 700 productive well pads in the PAPA, it was assumed that 900 well pads would be constructed and drilled and that 200 of the well pads would be abandoned and reclaimed because the wells would be dry holes. For the Anticline Crest Exploration/Development Scenario, additional assumptions were made regarding the distribution of productive well pads within approximately 1 mile of the anticline crest and in the hot spots. These assumptions are documented in the footnotes on Table 2-1.

It has been suggested that the potential levels of development analyzed in this EIS are "caps" or "upper limits" on the number of well pads BLM would allow to be constructed in the PAPA. This is not true. The potential levels of development are used for analysis purposes only and are based on rather optimistic assumptions regarding how development in the PAPA could proceed. As was discussed above, BLM is obligated to allow development of the leases. Ultimately, the number of well pads necessary to recover gas reserves that may be discovered in the PAPA will be dictated by reservoir characteristics such as permeability of the reservoir rock and the extent of recoverable reserves. Consequently, BLM cannot impose a limit on the number of well pads in the PAPA without precluding development of some of the leases in the PAPA. BLM can, however, establish an upper limit of well pads beyond which additional development activities would trigger supplemental analysis of impacts. The need for such an "analytical" upper limit will be addressed in the BLM's ROD for this project.

2.5 Project Components

The following describes activities as they would be conducted by the operators on Federal lands and minerals. For purposes of this EIS, it is assumed that activities conducted on private and state lands would be similar to those described for Federal lands. Ultimately, however, how development activities are conducted on private and state lands is determined by the operator in consultation with the landowner and in compliance with WOGCC regulations.

2.5.1 Well Development Time Frames. Although variable, a typical well on the Pinedale Anticline takes 30 to 35 days to drill and another 45 days to complete. The typical sequence of events is as follows: access road and well pad construction (including drilling of a water well); drilling; fracturing; installing production equipment and the gas gathering pipeline; well completion and testing; and reclamation of the well pad. Depending on the season in which the well is completed, it may take up to a year between the time production begins and the pit is sufficiently dry to allow the production location to be reclaimed.

2.5.2 Work Force Requirements. Average work force necessary to develop a single well in the PAPA is presented on Table 2-2. As is shown in the table, peak work force occurs during drilling and fracturing when an average of 26 and 40 workers, respectively, may be present on the well pad. Construction workers, rig crews, and support personnel would be housed in Rock Springs, Pinedale, Boulder, Big Piney, Marbleton, LaBarge, and Eden/Farson areas. The operators do not intend to provide a worker camp or temporary housing in the project area. Other support crews (e.g., cementing, fracturing, and perforating) would likely be based out of Rock Springs and would commute to the work sites.

2.5.3 Transportation Requirements. Transportation requirements for development of a single well are provided on Table 2-3. Workers, material, and equipment would be transported to the project area over U.S. Highways 191 and 189, State Highway 351, and county and BLM roads located within the PAPA. Peak light-vehicle (i.e., passenger vehicles and pickup trucks) traffic would occur during drilling and

Table 2-1
Summary of Assumptions Regarding Numbers and Locations of Well Pads for Each Exploration/Development Scenario Evaluated in the EIS

Exploration/ Development Scenario	Total Number of Well Pads Developed in the Next 10 to 15 Years	Number of Dry Holes (1)	Number of Productive Well Pads Developed (2)	Number of Productive Well Pads Within Approximately 1 Mile of Either Side of the Anticline	Number of Productive Well Pads in Hot Spots Away from the Anticline Crest	Number of Productive Well Pads in Each Hot Spot
No Action	0	0	0	0	0	0
Project Wide	900	200	700	Not Applicable (3)	Not Applicable (3)	Not Applicable (3)
Project Wide	650	150	500	Not Applicable (3)	Not Applicable (3)	Not Applicable (3)
Anticline Crest	900	200	700	490(4)	210(4)	70 (5)
Anticline Crest	650	150	500	350 (4)	150 (4)	50 (5)

1 = Assumes a 70 to 80 percent success rate.
2 = The number of total well pads developed minus dry holes.
3 = For the Project Wide Scenario, it was assumed that productive well pads would be generally developed throughout the PAPA.
4 = Assumes that 70 percent of the productive well pads associated with the Anticline Crest Scenario would be located approximately within 1 mile of either side of the anticline crest and 30 percent would be located in 3 hot spots away from the anticline crest.
5 = Assumes that an equal number of productive well pads would be developed in each hot spot.

Table 2-2
Average Work Force Requirements Necessary to Develop a Single Well in the Project Area

Category	Average Number of Workers	Average Number of Days
1. Location Work	4	7
1a. Drilling Water Well	2	3
2. Rig Set-Up	12	1
3. Drilling	26	35
4. Fracturing (assumes 6 fracs/well)		
4a. Preparation (2 days/frac)	9	12
4b. Fracturing	40	6
4c. Follow-Up (2 days/frac)	3	12
4d. Testing (2 days/frac)	2	12
5. Set-Up Production Equipment and Install Gathering Pipeline	8	13
6. Well Completion	8	7
7. Production Site Reclamation	4	5

fracturing when each well being drilled would contribute 34 vehicles daily on area roads. Peak heavy vehicle traffic would be associated with fracturing when an average of 50 heavy vehicles per well would travel on area roads daily.

2.5.4 Access Roads and Transportation Plan. A transportation committee would be formed to address planning issues associated with development of a transportation plan for the PAPA (see Appendix B, Section B-6.0). The first transportation meeting to discuss the concept of the committee was held during the August, 1999 workshop in Pinedale. The committee would be open to participation by all interested parties, including the BLM, operators, State of Wyoming, Sublette County, Mesa users, environmental groups, general public, etc. The purpose of the transportation committee is to develop a framework that will allow the design, construction and operation of a transportation network in the PAPA that provides reasonable access to areas with recoverable reserves and that protects existing uses and minimizes, to the extent practicable, impacts to the environment. The framework which will be used

Table 2-3
Average Transportation Requirements Necessary to Develop a Single Well in the Project Area

Category	Heavy Vehicles Daily One-Way Trips	Light Vehicles Daily One-Way Trips
1. Location Work	0 (1)	10
1a. Drilling Water Well	0 (1)	6
Gravel Hauling	5	10
2. Rig Set-Up	0 (1)	26
3. Drilling	0	34
4. Fracturing (assumes 6 fracs/well)		
4a. Preparation (2 days/frac)	6.5	8
4b. Fracturing	50	34
4c. Follow-Up (2 days/frac)	24	12
4d. Testing (2 days/frac)	0	6
5. Set-Up Production Equipment and Install Gathering Pipeline	8	18
6. Well Completion	8	22
7. Production Site Reclamation (2)	1.6	10

1 = It is assumed that the heavy vehicles associated with these activities are already in the PAPA and would not travel outside the project area on a daily basis.
2 = Reclamation of the production site may occur as late as 1 year after the well is completed because of the time required to dry the pit.

to develop the transportation plan for the PAPA is contained in Appendix B. Figure 2-2 shows the location of existing access to the PAPA. Currently, primary access to the PAPA consists of the following roads:

- Luman Road which connects the Jonah II Field with U.S. Highway 191 and crosses through the southeastern portion of the PAPA;
- Jonah North Road which connects the Jonah II Field with State Highway 351 and extends to the south side of the New Fork River;
- Burma Road which crosses through the southwestern portion of the PAPA;
- Boulder South Road which connects U.S. Highway 191 and State Highway 351 and runs along the south side of the New Fork River;
- Paradise Road which also connects U.S. Highway 191 and State Highway 351 but runs along the north side of the New Fork River; and
- Mesa Road which runs across the Mesa between the Green River Road, State Highway 351 and the Town of Pinedale.

During the August, 1999 transportation workshop a number of problems were pointed out regarding current access to the PAPA. These included dust at residences adjacent to the Paradise Road and Green River Road, excessive speeds, washboarding, safety, traffic on Twin Bridges Road through the Town of Pinedale (it was suggested a traffic study be conducted to determine future conflicts with accessing the project area through Pinedale), conflicts with big game winter ranges adjacent to the Mesa Road, and the need for adequate and safe turnouts from U.S. Highway 191 and State Highway 351 to intersecting BLM and county roads. The locations where these turnouts are needed are shown on Figure 2-2.

To address these issues, it was suggested that a new road be constructed along the crest of the anticline. For purposes of this EIS, this proposed road is called the Anticline Crest Road. The location of the new road is shown on Figure 2-2. In essence, this road would follow an existing pipeline corridor that runs between the Mesa Road on the northern part of the PAPA and the north end of the Jonah North Road which currently terminates south of the New Fork River. To access State Highway 351 from the Mesa, a new bridge would need to be installed across the New Fork River. The crossing would occur on private lands so an easement, obtained by the operator(s), would be required from the landowner. It was also suggested that a new road be installed to allow access from U.S. Highway 191 on the west side of Pinedale to the northern portion of the project area and the area southwest of Pinedale. For purposes of

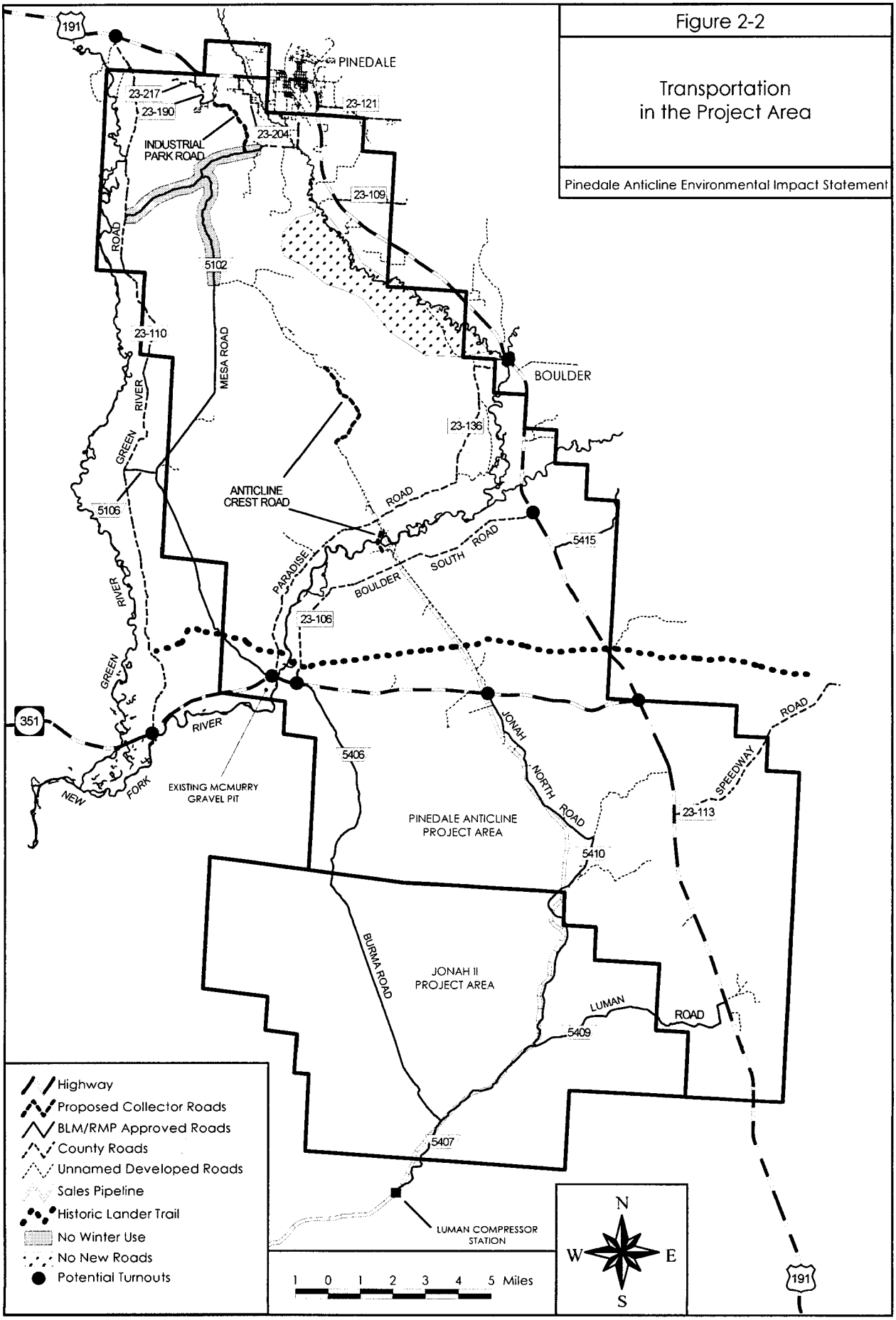


Figure 2-2
Transportation
in the Project Area
Pinedale Anticline Environmental Impact Statement
191
PINEDALE
23-217
23-190
23-121
23-204
INDUSTRIAL
PARK ROAD
23-109
ROAD
5102
23-110
MESA ROAD
RIVER
GREEN
BOULDER
23-136
ANTICLINE
CREST ROAD
ROAD
5106
5415
PARADISE
BOULDER
SOUTH
ROAD
RIVER
23-106
GREEN
351
RIVER
NEW
FORK
EXISTING MCMURRY
GRAVEL PIT
5406
JONAH
NORTH
ROAD
ROAD
SPEEDWAY
23-113
PINEDALE ANTICLINE
PROJECT AREA
5410
BURMA ROAD
JONAH II
PROJECT AREA
LUMAN
ROAD
5409
5407
LUMAN COMPRESSOR
STATION
Highway
Proposed Collector Roads
BLM/RMP Approved Roads
County Roads
Unnamed Developed Roads
Sales Pipeline
Historic Lander Trail
No Winter Use
No New Roads
Potential Turnouts
1 0 1 2 3 4 5 Miles
N
W
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S
191

this EIS, this new road is called the Industrial Park Road. The location of this road is shown on Figure 2-2. The Project Wide and Anticline Crest Exploration/Development scenarios addressed in this EIS assume the Anticline Crest Road and Industrial Park Road would be constructed at some point in the future.

The Anticline Crest Road may solve a number of problems. It is anticipated that development of this road would reduce traffic on the Green River Road and Paradise Road, thereby reducing safety and dust concerns. The road would also provide access to the Mesa from the south which would allow access in the winter while minimizing crossing of deer winter ranges. The Industrial Park Road would allow access to the northern part of the Mesa without the need for traffic to travel through residential portions of Pinedale on the Twin Bridges Road. Currently, traffic avoids Twin Bridges Road by traveling on U.S. Highway 191 through Pinedale, turning south on the Green River Road and traveling back to the east on the Mesa Road. However, in the winter the Mesa Road is closed to protect deer winter range and all access would be routed on the Twin Bridges Road through town.

BLM's current road classification system provides for the following types of roads. Disturbance associated with each of these road types is summarized on Table 2-4.

Table 2-4
Disturbance Associated with Road Types Which Would be Constructed in the Project Area

Road Type	Minimum Subgrade Width (feet)	Minimum Surfaced Travelway Width (feet)	Average Disturbance Width (feet)
Collector	28	24	52
Local	24	20	48
Resource	16	12	40

Collector Roads. These roads normally provide access to large blocks of land and connect with or are extensions of a public road system. Collector roads usually require application of the highest standards used by the BLM. The design speed is 30 to 50 miles per hour (mph) and subgrade width is a minimum of 28 feet (24-foot full surfaced travelway).

Local Roads. These minimum volume roads usually provide the internal access network within an oil and gas field. The design speed is 20 to 50 mph and subgrade width is normally 24 feet (20-foot full surfaced travelway). Low volume local roads in broken terrain may be single lane roads with turnouts.

Resource Roads. These are normally spur roads that provide point access. Roads servicing individual well pads usually fall within this classification. These roads have a design speed of 15 to 30 mph and are constructed to a minimum subgrade of 16 feet (12-foot minimum full surfaced travelway) with intervisible turnouts. The subgrade width of resource roads is 16 to 18 feet, depending on the depth of surfacing materials and travel surface. Resource roads within the PAPA would be a minimum of 12-foot wide when surfaced.

Access Road Construction. Standard cut and fill construction methods and construction equipment such as crawler tractors, graders and motor scrapers would be used during construction of the new roads. Average disturbance associated with construction of roads and the adjacent gathering pipelines in the PAPA would range from 4.8 and 8.5 acres/mile. After reclamation of the road ditches and the pipeline right-of-way, approximately 2.9 acres/mile would remain disturbed for the life of the project. For purposes of this EIS it is assumed that all local and resource roads would have adjacent gathering pipelines.

All access road construction would be in accordance with the transportation plan and a road design plan approved by the BLM. The road design plan would include BLM road construction standards. Following approval of the road design plan and APD, the road right-of-way would be staked in accordance with the design plan. Construction staking consists of determining finished site elevations, cut and fill slopes and their respective catch points, drainage, balanced earthwork and other necessary construction features.

The first step in road construction would be right-of-way clearing. This would consist of grubbing, trimming and removal of vegetation. This work would include preservation of vegetation and objects designated to remain free from injury or defacement. All debris, trees, stumps, roots and other protruding vegetative material within the clearing limits would be removed. Between 40 and 52 feet of width would be cleared to allow construction of the 12- to 24-foot wide travelway, adjacent ditches and drainage structures. Width of the construction right-of-way would be

modified during field inspection as necessary to conform to site characteristics.

On Federal lands, up to 6 inches of topsoil (where available) would be stripped from all areas disturbed during road construction and deposited in a windrow apart from other excavated material. After the necessary amount of material has been removed, and the resulting slopes and ditches have been shaped and smoothed, the stored topsoil would be evenly spread over exposed subsoil (except for the travelway).

Once road construction is complete, the area would be reclaimed. During reclamation, damage from erosion or other causes would be repaired after the completion of grading and before revegetation. Repair activities would include filling gullies, smoothing irregularities and repairing other incidental damage. Immediately in advance of seeding, any crusted surface would be scarified at right angles to the slope plane. All areas disturbed in the course of construction, reconstruction or heavy maintenance would be revegetated with a seed mix approved by the BLM. Other existing roads and two tracks in the vicinity of new roads not needed for field operations or other resource uses (e.g., grazing, recreation) may be reclaimed and/or fenced or signed to discourage access.

Access Road Gravel. In areas of weak soils not conducive to supporting the loads associated with the proposed construction traffic, a portion of the new roads would need to be graveled. Soil sampling may be necessary to determine the locations where gravel would be necessary and the amount of gravel required.

Where gravel is required for new access roads or well pads in the PAPA, the operators may purchase it from existing gravel pits. The location of one existing gravel pit is shown on Figure 2-2. Gravel from this source can be easily transported throughout the PAPA using the network of existing and proposed access roads described above. This gravel pit currently supplies the gravel needs for the Jonah II Field. Other existing gravel sources exist in the vicinity of the project area but are not shown on the figure.

Access Road Maintenance. Roads would be maintained by the operators throughout the life of the project. This would include but not be limited to maintenance of culverts, side slopes, road and pad surfaces, and the local portions of channels affected by the drainage of the roads or pads.

Abandonment. Roads abandoned following termination of the project or during reclamation of a dry hole would be ripped and recontoured back to approximate pre-construction contours and topsoil would be spread evenly over the disturbed surfaces. Ripping would be accomplished to 2 feet deep on 1.5 foot centers to eliminate compaction. Barriers or signs would be installed to discourage vehicular use of the abandoned road. The road surface would be seeded. All culverts used for cross drains would be removed. Monitoring of disturbed areas would continue until an acceptable level of revegetation, as determined by the BLM, is achieved.

Unless it can be demonstrated that a need exists that cannot be achieved using other roads, all resource, local and collector roads installed on Federal lands from this point forward would be reclaimed upon abandonment of the project. Legal access to Federal lands present in the PAPA at the beginning of the project would be retained for public access. This would be limited to portions of the Mesa Road on the northern and western portion of the PAPA and Burma Road on the southern portion of the PAPA. In addition, all county roads on Federal lands would remain open after abandonment of the project.

2.5.5 Well Pads. This EIS considers 3 types of well drilling - conventional, directional and pad drilling (see Figure 2-3). It is anticipated that further exploration and development of Federal lands and minerals in the PAPA may use all 3 types of well drilling. For conventional and directional drilling, 1 surface well pad is required for each well drilled. The conventional well is a straight, vertical hole drilled to the bottomhole target directly or nearly directly beneath the surface well pad. Directional drilling refers to a single bottomhole drilled from a well pad surface location that was moved from directly above the bottomhole to avoid some sort of surface restriction (i.e., residence, wetland, steep slope, etc.). The operators have used directional drilling in the PAPA with mixed results.

Pad drilling is one of the options considered in the RP Alternatives for reducing surface disturbance and human presence. This technique is based on a number of wells with different bottomholes being directionally drilled from a single surface well pad. In

Figure 2-3

Schematic Drawing of the Three Types of Well Drilling Techniques That May be Used in the Project Area

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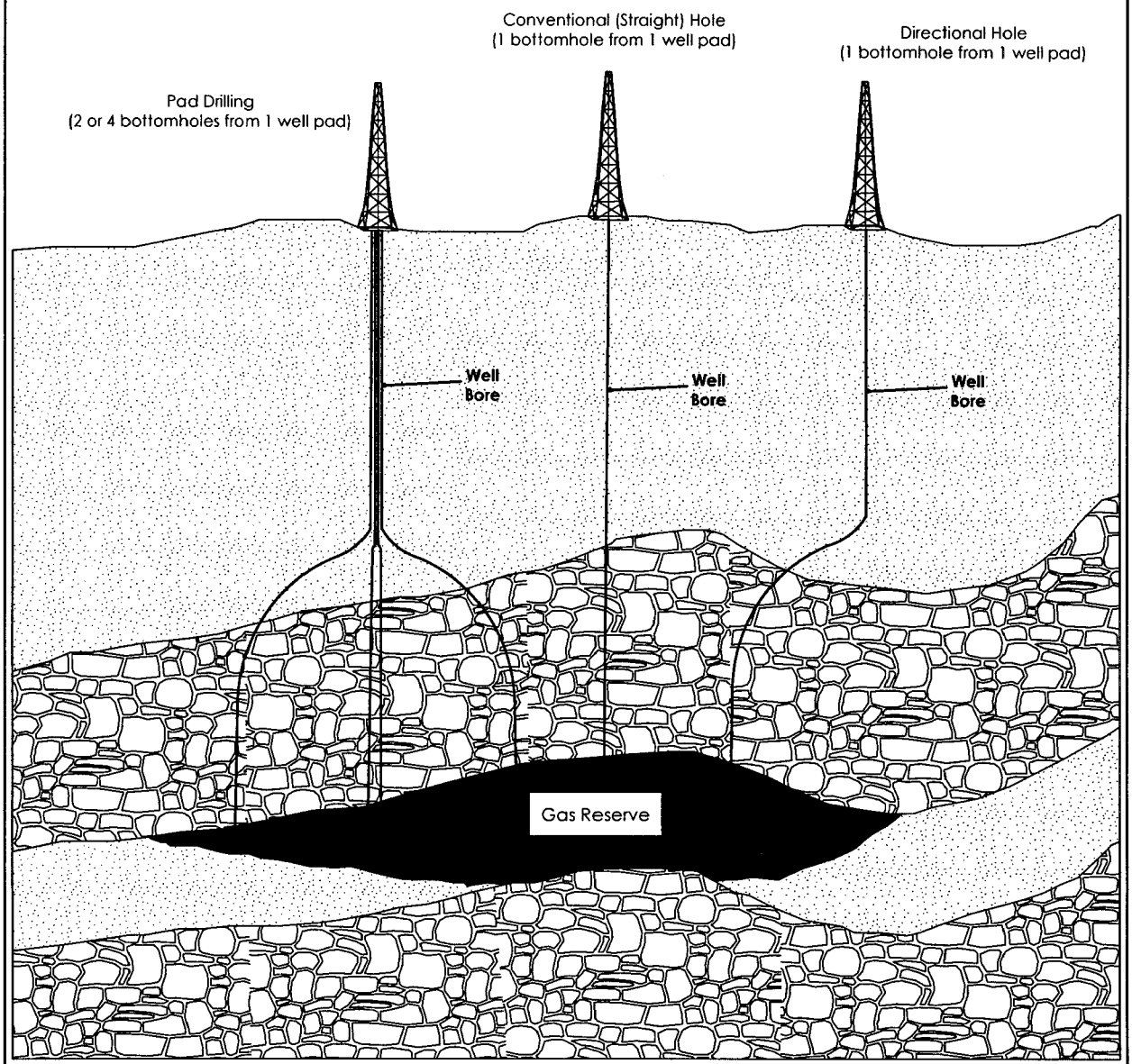

theory, pad drilling would allow full recovery of the gas resource while reducing the number of surface disturbing well pads (e.g., reducing the number of well pad locations from 16 to 8 or 4 per section). Pad drilling has not been attempted by the operators in the PAPA to date. Considering present economic conditions and technical factors, Ultra proposes to use pad drilling only under "rather narrow" circumstances, such as to expand reservoir drainage ability when surface locations are restricted or when economies of scale merit use of this drilling technique (such as centralized production facilities, reduced roads, reduced time and expense of moving a rig, expanding drilling/completion time to year-round operations). None of the other operators propose to use pad drilling under any circumstances. However, BLM has the authority to require the operators to use pad drilling to reduce impacts if it can be demonstrated that pad drilling is technically and economically feasible.

Potential Well Pad Locations. This EIS analyzes the impacts of developing 500 and 700 productive well pads in the PAPA over the next 10 to 15 years. However, insufficient information is currently available to determine where those well pads would be located. The well pads may be installed throughout the PAPA or they may be restricted to the vicinity of the crest of the anticline and in a few hot spots. Additional exploration and development would be required before the development potential of the entire project area can be fully understood.

The most dense bottomhole well spacing which the WOGCC would currently allow within the PAPA is 40-acre spacing. WOGCC rule [Chapter 3, Section 2(a)] states "*in the absence of special orders of the Commission establishing drilling units or authorizing different well density or location patterns for particular pools or parts thereof, each oil and gas well shall be located in the center of a forty (40) acre governmental quarter-quarter section or lot or tract or combination of lots or tracts substantially equivalent thereto*". In theory, this 40-acre spacing could result in 16 wells being drilled in each section where recoverable reserves are discovered.

According to the operators, this level of well density could be necessary in places in the PAPA (i.e., on the crest of the anticline or over areas where, because of geologic characteristics, a denser well spacing is necessary to efficiently drain the reservoir). In fact, it has been suggested that it may be necessary to increase the well density in parts of the Jonah II Field to 40-acre spacing to achieve complete drainage of that field. Jonah is currently being developed with 80-acre spacing (i.e., 8 wells/section).

To determine where well pads could be placed on the surface of the land, it is necessary to divide each section of land into a quarter-quarter section grid. In simple terms, if a section of land was to be developed on 40-acre spacing, a grid would be established with each quarter-quarter equating to approximately 40 acres. Generally, the centers of these quarter-quarter sections are termed "spots". For a 40-acre spacing scenario, there would be sixteen 40-acre spots for each section of land. Spots are numbered starting in the northeast quarter of the northeast quarter of the section. As an example, the corresponding well number can be a combination of the spot number and the section the well is being drilled in. For example, a well pad located in the northwest quarter of the northwest quarter of Section 17 would be drilled in spot 4 and the well would be named the 4-17 (see Figure 2-4 for an example).

The BLM imposes a number of standard restrictions on surface disturbing activities. In some cases, these restrictions can require the relocation of a potential well pad away from the center of each spot on Federal lands and minerals (see Figure 2-4). Most of these restrictions are listed in the Wyoming BLM Mitigation Guidelines and Practices for Surface Disturbing and Disruptive Activities (hereafter BLM Mitigation Guidelines - see Appendix A). These guidelines are utilized to mitigate adverse impacts caused by surface disturbing activities on Federal lands and minerals. BLM's Mitigation Guidelines emphasize the agency's responsibility to ensure that good construction practices are used on Federal lands and they generally apply to all surface disturbing activities. If the mitigation guidelines are not contained in lease stipulations (the case with many of the PAPA leases) they are added as conditions of approval during the APD review process, where appropriate.

To prepare this EIS, BLM's Mitigation Guidelines were used to determine the suitability of each potential 40-acre spaced well pad spot or location on Federal lands and minerals in the PAPA. It is important to keep in mind that even though the analysis evaluated the suitability of nearly 5,000 potential spots or locations for well pads, only 500 or 700 are assumed to be developed during the next 10

Figure 2-4

Schematic Representation of Well Pad Surface Locations Under Various Surface Spacing Scenarios

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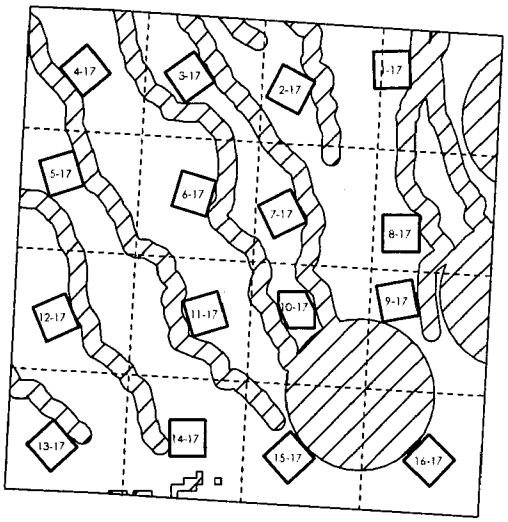
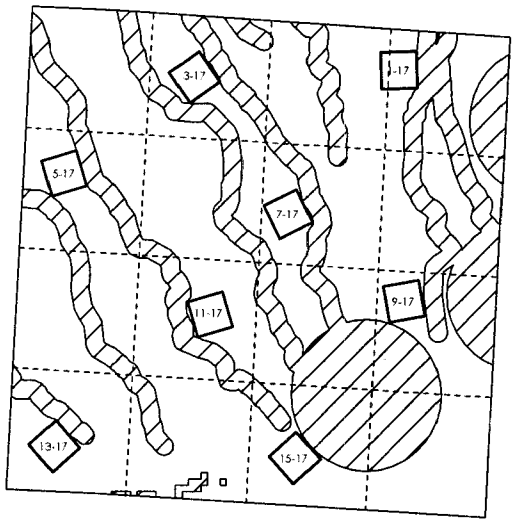
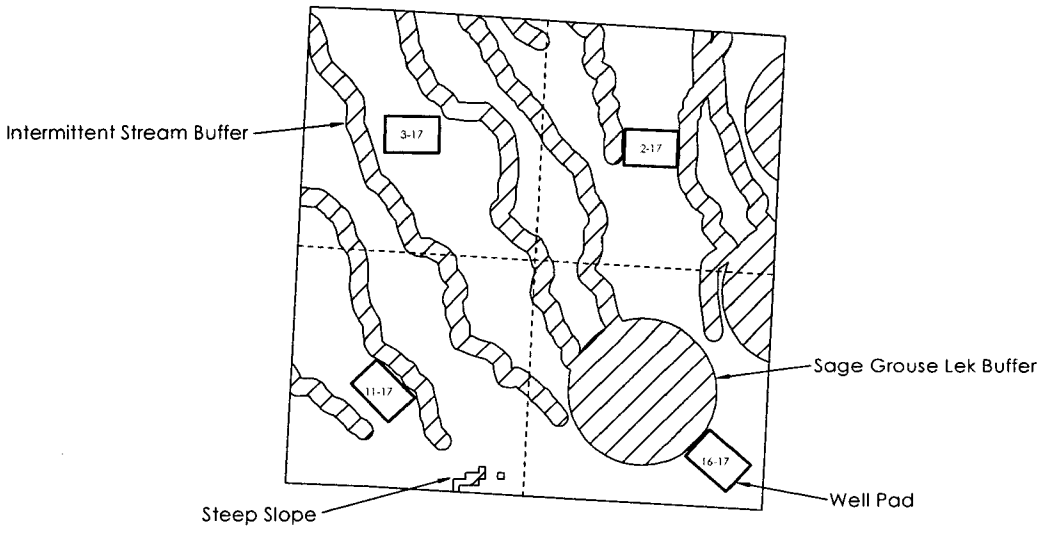


40-ACRE SURFACE SPACING
(16 Well Pads/Section)



80-ACRE SURFACE SPACING
(8 Well Pads/Section)



160-ACRE SURFACE SPACING
(4 Well Pads/Section)

to 15 years. In part, BLM's Mitigation Guidelines indicate where placement of well pads would not be allowed on Federal lands and minerals. The intent of these guidelines is to avoid surface disturbing activities unless or until the operator and BLM arrive at an acceptable plan for mitigation of anticipated impacts. Specific threshold criteria (e.g., 500 feet from riparian areas) have been established based on the best information available. These mitigation guidelines are discussed in detail in Appendix A and include:

Surface Disturbance Mitigation Guidelines. BLM's current standard lease stipulations require surface disturbance avoidance on Federal lands and minerals for the following:

- slopes in excess of 25 percent;
- within 500 feet of surface water and/or wetland and riparian areas (100 feet from ephemeral streams and those intermittent streams not exhibiting riparian characteristics);
- within 500 feet of 100-year flood plains;
- within a quarter mile or visual horizon (whichever is closer) of an historic trail (if a trail crosses the parcel of interest);
- construction during periods when the soil material is saturated, frozen, or when watershed damage is likely to occur;
- within 200 feet of Federal and state highways and other existing rights-of-way;
- within 0.25 miles of occupied dwellings; and
- material sites (gravel pits).

Wildlife Mitigation Guidelines.[4] The wildlife guidelines are intended to provide 2 basic types of protection - seasonal restrictions and no surface occupancy. They include:

- to protect important big game winter habitat, drilling and other surface disturbing activity would not be allowed during the period from November 15 to April 30 within certain areas. This limitation does not apply to maintenance or operation of producing wells;
- to protect important raptor and/or sage grouse nesting habitat, drilling and other surface disturbing activity would not be allowed during the period from February 1 through July 31 within certain areas. This guideline applies to a 2 mile radius around sage grouse leks and 0.5 to 1 mile radius around raptor nests. This limitation does not apply to maintenance or operation of producing wells[5]; and
- no surface occupancy would be allowed within 0.25 miles of sage grouse leks or within 825 feet of raptor nests, 1,000 feet of ferruginous hawk nests and 2,000 feet of bald eagle nests.[6]

Special Resource Mitigation Guidelines. In order to protect other resource values, the BLM reserves the right to prohibit surface disturbance within the specified distance of the following special resources:

- within 0.25 miles of recreation areas;
- Native American sacred sites;[7]
- within 0.25 miles of occupied dwellings; and
- within 100-year flood plains.

BLM would require a detailed plan addressing mitigation and special restrictions prior to development in these areas.

All of these restrictions have been mapped and are shown (except for seasonal restrictions and Native American sensitive sites) for Federal lands and minerals on Figure 2-5. In many cases, the surface disturbance restrictions overlap. Total acreage on Federal lands and minerals encumbered by these restrictions is 41,106 acres or roughly 21 percent of the PAPA. By ownership, this includes 36,721acres of Federal lands and Federal minerals, 75 acres of Federal lands with state minerals, and 4,310 acres of private lands with Federal minerals. Application of the restrictions would leave 4,833 potential well pad "spots".

The last step in determining the suitability of potential well pad locations on Federal lands and minerals was to compare these surface restrictions with each of the 4,833 potential well pad spots or locations identified by dividing up the entire PAPA into 40-acre spacing. The results of this comparison are provided in the Pinedale Anticline EIS Technical

[4] BLM can change these limitations in any year to address site-specific conditions (see Appendix A).

[5] This limitation has caused considerable confusion in the past. As written, the limitation applies a single seasonal constraint to both raptors and sage grouse. In fact, different species-specific dates have been developed in consultation with the WGFD and USFWS. For instance, the BLM's Pinedale Field Office applies the sage grouse seasonal constraint from March 1 through June 30.

[6] These buffers were developed by BLM in consultation with the WGFD and USFWS.

[7] BLM would consult with affected tribes to determine appropriate avoidance distance for any disturbance that would occur within 1 mile of any Native American-identified sacred site.

Figure 2-5

Areas With Surface Restrictions Which Would be Avoided by Well Pads on Federal Lands and Minerals in the Project Area

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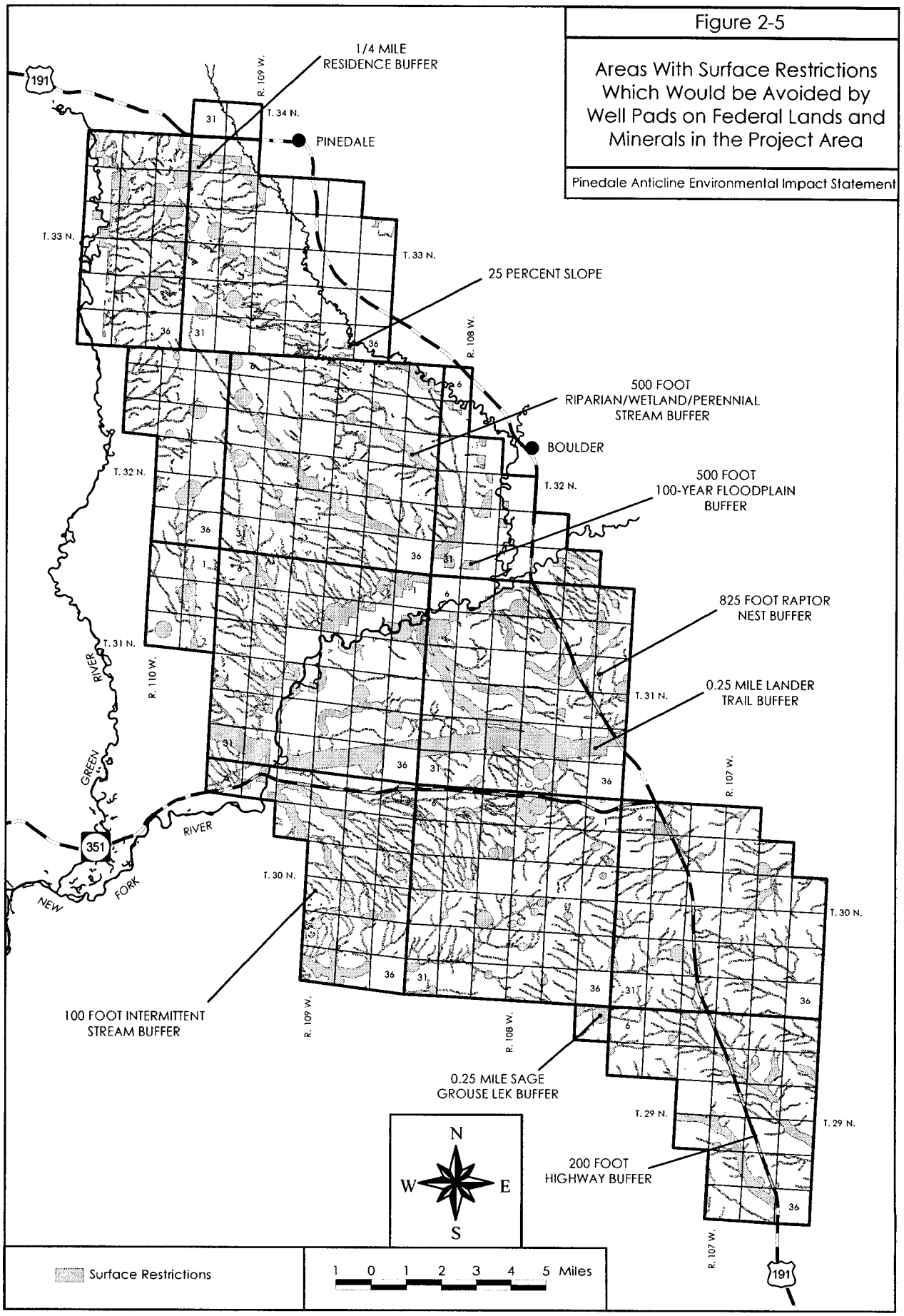

Report, Attachment A. It is important to note that no adjustments were made for potential well pads or spots located on non-Federal lands and minerals. Of the 4,833 potential well pad spots or locations, 1,550 (32 percent of the potential locations) were relocated to avoid restrictions and 313 were eliminated because their locations could not be adjusted to avoid the standard surface restrictions described above. For purposes of analysis, any potential well pad spot or location which had to be moved more than 600 feet to avoid a surface restriction was eliminated. Potential well pad locations which would not be allowed to be developed without an exception from BLM are identified as "ELIMINATE WELL PAD" in Attachment A of the technical report. If the operators intend to develop the reserves under these spots, directional drilling would have to be used because surface disturbance within the restricted area would not be allowed. After the 313 (6 percent of the potential locations) potential well pad spots or locations identified as "ELIMINATE WELL PAD" in the technical report were eliminated, 4,520 potential well pads or spots remained. The remaining potential well pads are distributed by land and mineral ownership as shown on Table 2-5. Actual well spot locations would be determined during the APD process based on field surveys to determine if any site-specific resource conflicts occur (i.e., cultural, biological, topographic, hydrologic, etc.). Analysis provided in the technical report is based on the best data currently available.

Table 2-5
Potential Well Pad Spots or Locations by Surface and Mineral Ownership

Land/Mineral Owner	Acres	Potential Well Pad Spots
Federal/Federal	156,444	3,547
Federal/State	1,275	32
Private/Federal	7,701	141
Private/State	338	8
Private/Private	21,821	547
State/State	9,766	245
Total	197,345	4,520

In addition to the restrictions on well pad placement described above, the WOGCC has adopted restrictions that apply to the locations of well pads on private and state lands and minerals. Generally, WOGCC rules prohibit the placement of production tanks and associated production equipment within 350 feet of residences, schools, hospitals, or other places where people are known to congregate.

WOGCC also issues approvals to construct reserve pits. WOGCC rules require special precautions, including but not limited to, an impermeable liner and/or membrane, monitoring systems, or closed drilling systems to prevent contamination of streams and potable water. This also provides additional protection to human health and safety in instances where drilling operations are conducted in close proximity to water supplies, residences, schools, hospitals, or other structures where people are known to congregate. Pits cannot be located closer than 350 feet from any of the aforementioned items. The Supervisor of the WOGCC may impose greater distances for good cause and likewise grant exceptions to the 350-foot rule.

Well Pad Construction. Standard industry practices and mitigation guidelines adopted by the BLM for the construction of well pads would be applied by the operators for wells on Federal lands and minerals (see Appendix A). On-site inspections of each drilling location by the BLM may result in additional conditions of approval. On-site inspections would be attended by the operator, their contractor, and affected parties.

Once the location for an individual well pad is determined following site-specific NEPA analysis, the location would be surveyed and staked. Well pad construction would take approximately 1 week. Construction of each well pad would disturb an area about 400 x 400 feet (approximately 3.7 acres). Compared to other fields in the Green River Basin, the well pads associated with the Pinedale Anticline are relatively large. However, during fracturing the entire well pad is occupied by trucks, tanks and other essential equipment. Although layout for a well pad varies depending on characteristics of the location (i.e., slope), a typical well pad layout for a single well is provided on Figure 2-6. If pad drilling is used, it would be necessary to increase the size of the well pad. If 4 wells were drilled from a single pad, Ultra and McMurry estimate that the disturbance would increase to about 5 acres. However, this increased size is still considerably less than the nearly 15 acres necessary to drill 4 wells from individual well pads.

Construction of a well pad typically begins with stripping topsoil from the top of the location and

Figure 2-6

Schematic of a Typical Single Well Pad Layout

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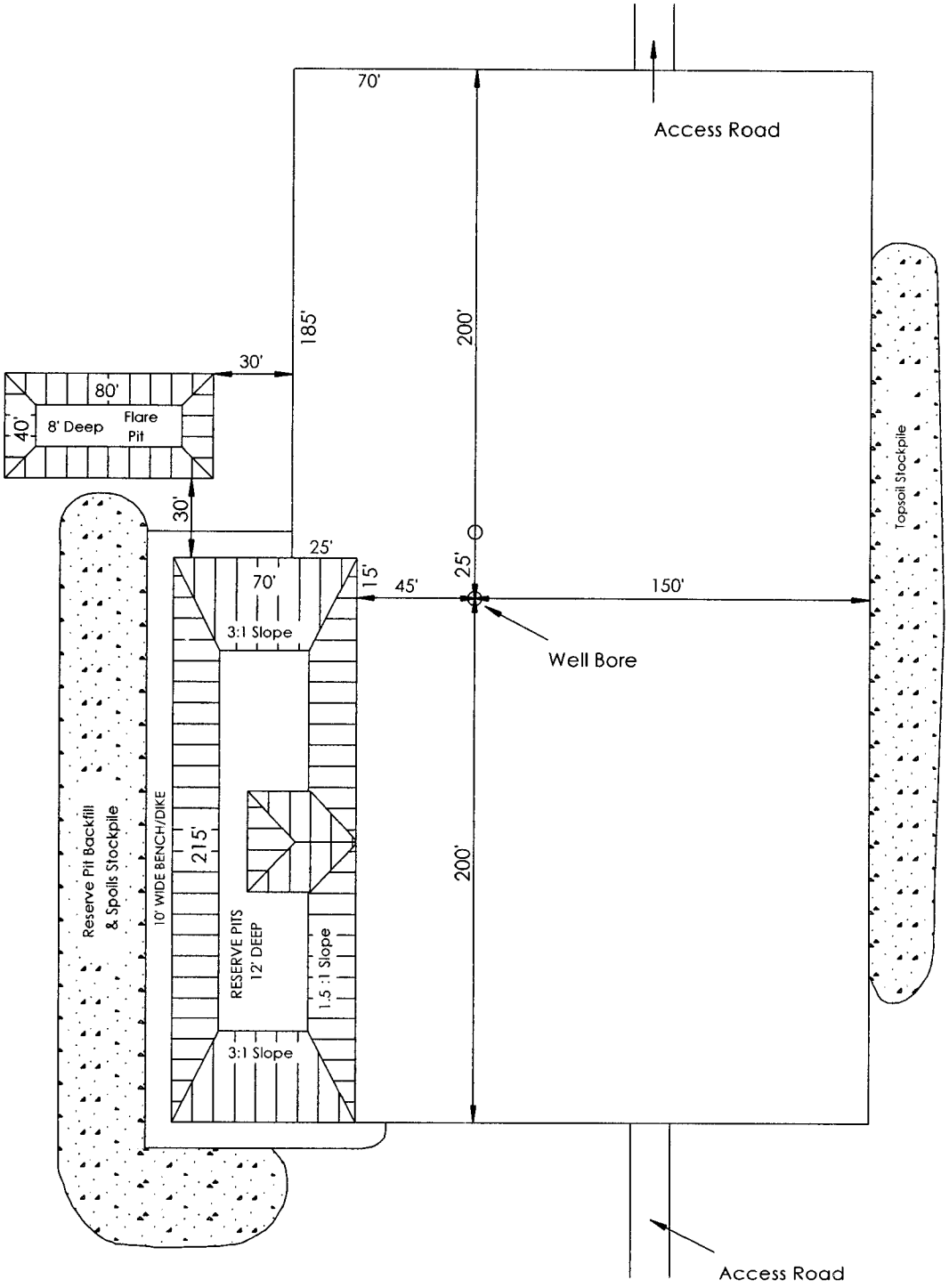

stockpiling the topsoil to one side of the well pad. On Federal lands and minerals, up to 6 inches of topsoil, where available, would be removed from the well pad during construction and would be stockpiled adjacent to the well site for later use in reclamation. Areas for stockpiling topsoil would not typically be bladed or graded. Once the topsoil is stripped, the pad would be leveled using bulldozers, scrapers, belly loaders and other equipment.

One reserve pit (typically 70 x 215 feet) would be constructed on each well pad prior to start of drilling operations (see Figure 2-6). This pit would be used to store fluids and cuttings returned to the surface from the hole during the drilling process. All reserve pits on Federal lands and minerals in the PAPA would be lined unless it is determined that the base soils are clay or that no groundwater would be affected (see Appendix A). The need for lining pits on private and state lands and minerals would be determined by regulations established by the WOGCC which requires lining of pits under special circumstances including, but not limited to, sandy soils, shallow groundwater, groundwater recharge areas, drilling or production locations immediately adjacent to the Green River or the Colorado River drainage and other sensitive environments or circumstances identified by the WOGCC. Pits constructed in fill or those used to retain oil-base drilling muds, high density brines, and/or completion or treatment fluids must also be lined.

The WOGCC has developed minimum standards for pit design (WOGCC rules, Chapter 4, Section 1(x)). Those standards include:

- Soil mixture liners, recompacted clay liners, and manufactured liners must be compatible with the waste contained. The WOGCC can require operators to provide evidence of the chemical resistance of the liner selected for use;
- Liners constructed of synthetic materials must meet the following specifications: a 9 to 12 mil thickness, greater than 20 percent elongation at failure, puncture strength of 60 pounds, tear strength of 50 pounds, and permeability less than 10^{-7} cm/sec.;
- Joints must be overlapped a minimum of 2 inches and seams sealed as recommended by the manufacturer. Blemishes, holes, or scars must be repaired per manufacturer's recommendation. Breaches in the liner for siphons or other equipment must be reinforced;
- Slopes for soil mixture liners or recompacted liners must not exceed 3:1. Slopes for manufactured liners must not exceed 1:1;
- Reasonable provisions for protection of liners during filling and emptying activities must be included in the construction plans;
- Manufactured liners must be installed over smooth fill subgrade which is free of pockets, loose rocks, or other materials which could damage the liner. Sand, sifted dirt, or bentonite are suggested. At no time will straw or any other organic material except synthetic cushion fabric designed for that purpose be used for a liner cushion. Installation of synthetic or soil mixture liners must be in accordance with accepted engineering practice;
- Liner edges must be secured. The WOGCC prefers that liner edges be placed in a trench which is deep enough to receive approximately 1 foot of compacted soil which will anchor the material;
- Monitoring systems may be required for pits constructed in sensitive areas. Such pits must be operated in a manner that avoids damage to liner integrity. Periodic inspections, weekly at a minimum, of pits must be made by the operator and documentation of such inspections may be required to be submitted to the WOGCC when requested; and
- Liquids must be kept at a level that takes into account extreme precipitation events and prevents overtopping and unpermitted discharges.

When the pit is no longer needed and fluids evaporated or removed, the pit liner would be buried in the pit during reclamation.

A 40 x 80 foot (typical size) excavated flare pit would also be constructed on each well pad. The flare pit would be used for the safe containment and combustion of flammable gases produced during drilling, completion and testing of the well. The flare pit would be bermed to prevent non-combusted fluids from drifting outside the flare pit. Although not a standard practice, the flare pit may be used for evaporation as long as no fluid is allowed to accumulate in the flare pit.

BLM and WOGCC stipulations prohibit disposal of trash in a pit and the pits would be fenced on 3 sides during drilling. After drilling is completed and the rig dismantled, the fourth side of the pit would be

fenced. All 4 corners would be braced with an H-type brace. Fence construction would be on cut or undisturbed surface.

If oil or other harmful substances are present, WOGCC regulations require pits to be netted or otherwise secured at the time the rig substructure has been moved from the location in a manner that avoids the loss of wildlife, domestic animals, or migratory birds. The WOGCC recommends netting as the preferred means of securing pits.

If a well pad is constructed but the well is not drilled, the well pad and access road would be reclaimed in accordance with standard BLM or WOGCC stipulations/conditions. On Federal lands and minerals the operator would be required to implement erosion control measures in compliance with BLM operating standards.

Water Wells. Drilling of a well in the PAPA requires an average of 3.2 acre-feet (1,050,000 gallons) of water. The single largest use of water during drilling is for mixing with clay and a number of other materials to create the weighted drilling fluids. These weighted drilling fluids increase the density of the drilling mud to help overcome high-pressure flows of gas. Water would also be used for dust abatement. Water would be supplied from a water well drilled on the well pad or from a nearby well pad. These wells would be permitted through the Wyoming State Engineer's Office. After drilling is complete, the water wells would be capped but not plugged. Ultra has initiated a monitoring program in the Mesa to evaluate the effects of drawdown of surface water used by livestock.

In general, operator water wells are drilled deeper (400 to 800 foot range) than stock wells (100 to 350 foot range). Also, operator water wells tap higher yield aquifers (up to 100 gallons/minute), usually in the Wasatch sandstone beds located below the base level of the New Fork and Green River drainages. Newly drilled water wells need to be tested when first drilled for water quality and pH level and periodically thereafter to detect any pH change. Water wells located in the Jonah area have a high pH and are therefore unfit to supply water for cement. If operators drill a new well having a neutral pH (about 7.0) that later becomes alkaline (pH of 8.0 to 10.0), then drilling and completion techniques may need to be changed in order to find the source of the alkalinity and isolate that unit. Currently, the operators in Jonah have a state permit to haul surface water from the New Fork River at the State Highway 351 bridge. This water meets the quality needed for cement.

Well Drilling. Drilling and completion of a well involves many steps including assembling the equipment and crews, drilling, casing (installing pipe), cementing, perforation, stimulation and installation of the production tubing. Once well pad construction is complete, the drilling rig would be brought to the well pad. The drilling rigs would be powered by diesel engines and the diesel fuel would be supplied by tanker truck and temporarily stored in tanks at each drilling location. Each operator and contractor is responsible for supplementing and updating Spill Prevention, Countermeasure and Control (SPCC) Plans to address emergency procedures should a spill occur on or off the well pad or during transportation of fuels if a spill from these facilities or portable units has a reasonable chance of entering waters of the United States. Other equipment, racks, pumps and air compressors, would be required to drill the wells. Portable dumpsters would be provided for trash at each drilling location and the trash would be hauled off-site for proper disposal. No burning of trash would occur. On-site treatment, portable chemical toilets or holding tanks would be provided for sewage. All untreated sewage would be disposed of off of Federal land and in accordance with county and state requirements.

Drilling and casing of most wells (approximately 12,000 feet) would be accomplished in approximately 30 to 35 days. After drilling is complete, the drilling rig would be moved to a new location and other equipment would be brought in for fracturing operations.

Tops of important geological formations vary depending on location within the PAPA. For a typical anticline well, the following estimated formation tops were reported:

Formation	Depth	Contents Expected
Wasatch	Surface	Mostly fresh water to base
Fort Union	4,200	Mostly saline water; coal beds and gas possible in lower part
Lance	8,500	Over pressured gas
Mesa Verde	12,000	Over pressured gas

Drilling techniques vary by operator and conditions encountered, however, drilling technique would comply with BLM Onshore Order #2 and WOGCC regulations. The first step in the drilling

process for a straight hole would be to drill a surface casing hole. Typically, this 12 ¼-inch diameter hole would be drilled to a depth of approximately 2,500 feet. The next step would be to set 8 ⅝- to 9 ⅝-inch surface casing (minimum wall thickness ½ inch) in the hole and cement it to the surface. The surface casing prevents washout of surface formations during drilling, provides protection of shallow aquifers, provides support for the casing-head and subsequent casing strings and provides a method for controlling subsurface pressure. Once the surface casing is cemented in place, drilling of the 7 ⅞- to 8 ¾-inch production hole would begin. The production hole would be drilled through the target formation. If the well is economic, the operators would set 4 ½- or 5 ½-inch production casing and cement to a minimum of 400 feet above all hydrocarbon bearing zones. A typical directional well would employ the use of intermediate casing. The surface casing (typically 10 ¾- inch) would be set at approximately 1,500 feet. The intermediate hole would be drilled to the over-pressured zone in the Lance formation at approximately 9,200 feet. The intermediate casing (typically 7 ⅝- inch) would be set to this depth with cement brought to about 2,500 feet to cover the brine water bearing aquifers in the Fort Union Formation (see Figure 2-7). The production hole would be drilled to a total depth of about 13,000 feet. The 4-½ to 5 ½ -inch casing string would be set at total depth and cement would be circulated back into the intermediate casing string.

During the drilling process, one of the most important tasks is to maintain a balance between the formation pressure and drilling fluid pressure inside the hole to prevent blowout (possibly sending uncontrolled fluids, including natural gas to the surface). To accomplish this task, proper selection of drilling fluids and the use of a blowout preventer (BOP) are essential. As the well is drilled, the rock formation exerts inward pressure on the wellbore. The column of drilling fluid in the wellbore exerts an outward pressure on the formation. The pressure that is exerted on the formation by the fluid column is carefully controlled at the surface by the density of the drilling fluid to prevent the well from blowing out. BOPs provide a means of shutting the well in at the surface if formation pressures exceed fluid column pressures. With the BOP closed, the formation and drilling fluids can be circulated through a choke which provides additional back pressure against the formation until the drilling fluid density can be increased to sufficiently control the formation pressure. BOPs would be inspected and operated daily to insure good mechanical working order.

Once the hole has been drilled to the target depth, the hole would be cleaned to remove any remaining rock chips and casing would be installed. Running casing involves inserting a thread-jointed pipe into the hole from the surface of the hole to the bottom. The operators would use standard American Petroleum Institute (API) casing to insure that the casing can safely withstand the forces of tension, collapse and burst. Selection of the proper casing grade and weight involves estimating the forces that would be applied to the casing to insure that the casing could withstand the forces. Production casing would be purchased in 30 to 40 foot lengths and brought to the site using trucks. The casing would be stored on pipe racks until each joint is needed.

Once the entire length of casing is placed in the hole, it would be cemented by a well cementing service company crew. The crews use highly specialized equipment to mix dry cement and water into a slurry. The slurry would be pumped through the casing string and forced up the annular space between the casing and the formation where it would be allowed to harden. This cementing method ensures that the annular space between the casing and formation in the productive zones is isolated with cement. The purposes of cementing the casing are to: 1) restore the original formation isolation between formations that existed prior to the drilling of the well; 2) to provide support for the casing by preventing formation pressures from acting directly on the casing; and 3) to retard corrosion by minimizing contact between the casing and corrosive formation fluids. This allows further protection against contamination of shallow aquifers. After the casing string has been cemented and the cement allowed to harden, the producing zone would be perforated. Perforating the producing zone involves piercing the casing and the cement sheath behind the casing. The primary purpose of perforating a well is to establish a direct link between the wellbore and the producing zone. The piercing of the wellbore would be accomplished using a perforation assembly, which fires shaped charges. The holes created in the casing and cement sheath would allow formation fluids to enter the wellbore and move up the production tubing to the surface.

Fracturing. After the well has been perforated to allow communication between the cased well and the

Figure 2-7

Typical Completed and Abandoned Well Bore Diagram

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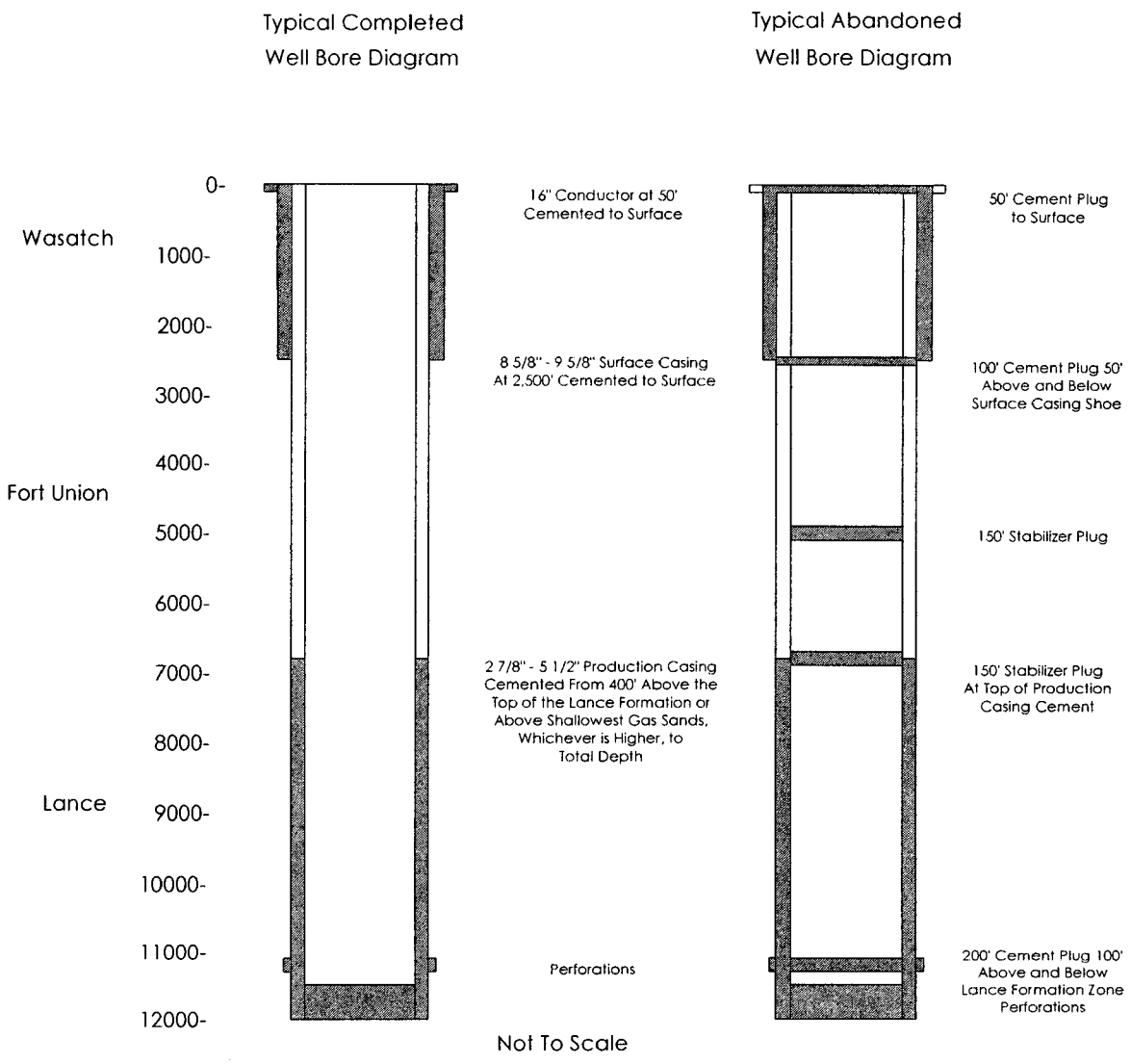

Casing, cementing, and plug depths will vary depending upon location

formation, the well would likely have to be hydraulically fractured. Numerous "fracs" may be performed on each well with up to a week or more between fracs. A large part of the recent interest in exploration in the PAPA is associated with new fracturing techniques that greatly improve production from the wells. This new fracturing technique makes for profitable wells that would not have been profitable otherwise.

Four basic types of equipment are used to fracture a formation: pumpers, blenders, sand transports and fluid transports. To fracture the formation, oil, water, nitrogen or carbon dioxide are mixed with sand or other propping material and is pumped into the formation at a high rate, which causes fractures in the formation. The sand moving with the water through these fractures actually props them open. This can significantly increase the drainage radius of the wellbore and thus the productivity of the well.

Once the frac job is complete (up to 45 days), the well is flowed back to the surface for 2 to 3 days in an attempt to recover as much of the frac fluid as possible and to clean excess proppant out of the perforations. All frac fluid additives would meet BLM Onshore Order #7 requirements for disposal of oil field wastes. All fluids utilized in completion procedures would be contained on the well location in pits or tanks and disposed of in compliance with state and Federal regulations. Gases produced in association with completion and testing would be combusted in the flare pit. Flow-back fluids may contain condensate, thus flow-back occurs into containment tanks to separate the condensate from water. These hydrocarbons are then put into production tanks and sold.

Fracturing is a very noisy operation on a productive well. The noise produced during flow-back is similar to the noise generated by a jet engine.

Interim Well Pad Reclamation. The BLM would require the operator to provide notice of the date of rig release. The drilling rig would be removed from the location within 30 days of completion of drilling unless prior approval is granted by the BLM. Once drilling and completion is finalized, the well pad area would be reclaimed as soon as possible with only the immediate production area left unreclaimed (about 1.5 acres). After all drilling and completion equipment has been removed from the pad, site rehabilitation and reclamation would commence - typically the first appropriate season (fall or spring) after well completion. The first step would be to dewater the pit or to allow fluids to evaporate. Fluids removed from the pit would either be reused or trucked to a WDEQ-approved disposal facility.

After it has dried, the pit would be backfilled. Generally, BLM would require that pit backfilling and site recontouring begin as soon as the pit is dry and be completed within 3 months. Under normal weather conditions approximately 1 month would be allowed for backfill to settle after which final recontouring, topsoil spreading and seeding could take place. However, if the well is completed late in the year, erosion control measures would be implemented following completion of the well and final reclamation would be completed the following spring.

Seeding, using native species only, would be accomplished during the first appropriate season following well completion as directed by the BLM. Specifications for seed mixtures to be used in reclamation would be determined on a case-by-case basis. The mixture would be certified to be weed-free and a copy of the certification would be supplied to the BLM prior to planting.

If a well is a dry hole, the entire drilling location would be reclaimed as soon as seasonally appropriate. The hole would be plugged in accordance with WOGCC and BLM abandonment procedures.

Well Operation and Maintenance. Production facilities would be installed on producing well pads. All of the well pad, except for an area approximately 1.5 acres, would be reclaimed (see Figure 2-8). Aboveground production facilities at each location would include a production unit, dehydration unit, tanks and possibly a flare stack (combustion chamber). The production facilities would be designed and laid out to maximize interim well pad rehabilitation. However, in compliance with WOGCC regulations, permanent ignition sources (heaters, etc.) would be located no closer than 100 feet from the wellhead. The wellhead production equipment is necessary for metering and removing liquids (condensate and water) from the produced "wet" gas. The wet gas would be produced to the surface through the wellbore and flow in a pipeline through a sand trap where solids are removed from the gas stream. Sand is sometimes produced with the well

Figure 2-8

Schematic of a Typical Single Well Production Facility

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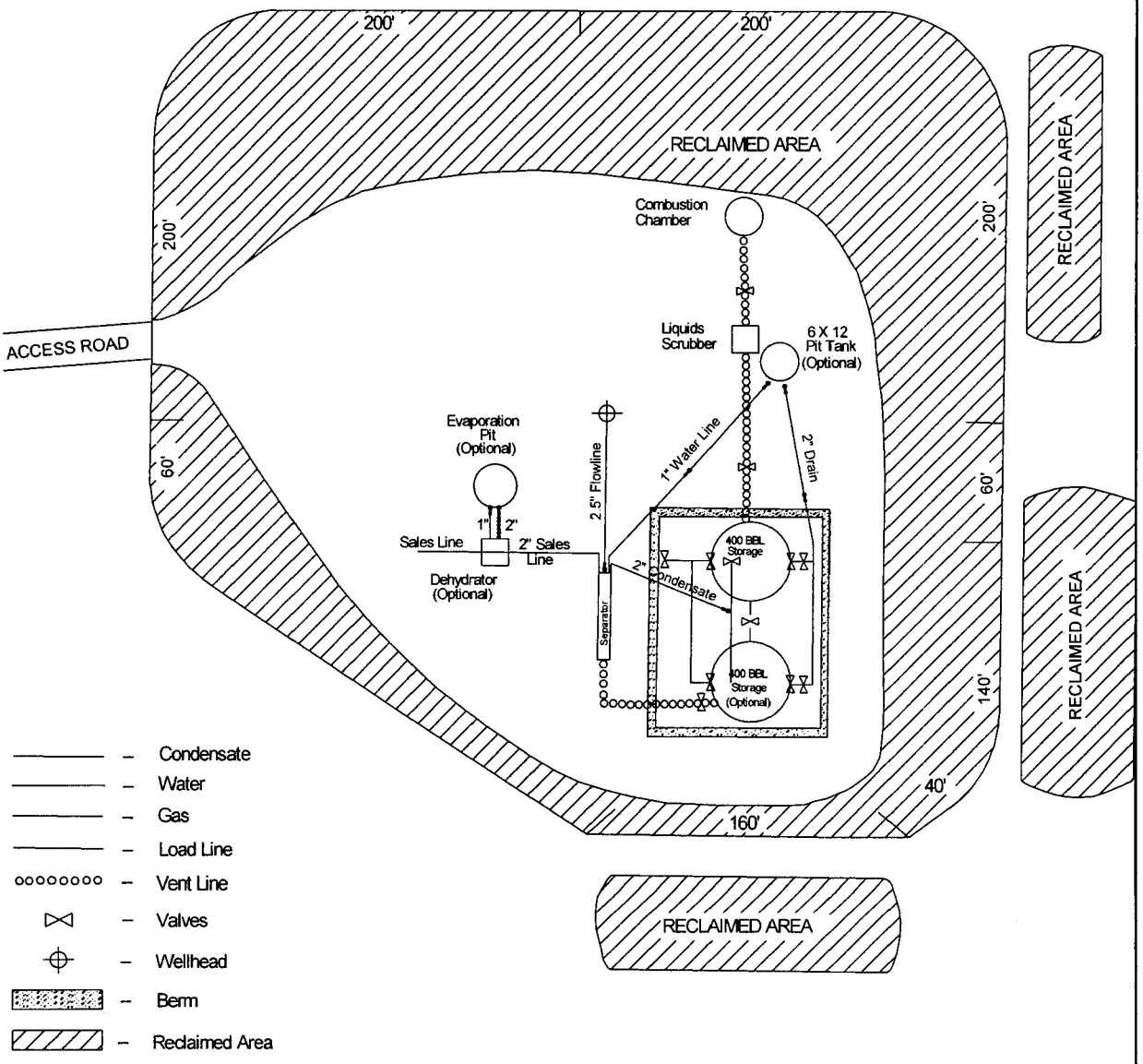

fluids and the abrasive fine particles can damage equipment. Wet gas flows from the sand trap to a production unit. The production unit contains a separator which is used to separate gas from free liquids in the wet gas stream. Gas leaving the separator no longer contains free liquids but the gas still contains significant amounts of water vapor. Water vapor is removed in a glycol dehydrator which consists of a pressure vessel (a glycol absorber) that allows the glycol to flow downward as the gas flows upward. The gas would then be metered and flow into a gathering pipeline. From the production facilities at each well site, gas would be delivered for sale via pipelines. Water and condensate would be stored on-site in tanks. According to Ultra, their tanks (low profile) are typically 9 feet tall and about 16 feet in diameter. However, other operators use tanks as tall as 20 feet.

Tanks would be emptied by trucks. Produced water would be disposed of at a WDEQ approved facility. The frequency of the need to empty the tanks would depend on production from each well. Ultra used information from the Mesa 15-8 for September, 1998 to estimate average truck traffic. According to Ultra's estimates, they anticipate that water would need to be removed from tanks on-site 46 times annually. Condensate would need to be removed 29 times annually.

On Federal lands, all above-ground production facilities would be painted an earth tone color, Carlsbad Canyon or other specified environmental color (Munsell Soil Color), in accordance with BLM requirements. No outdoor area lighting fixtures would be installed at production locations.

According to Ultra, in the summer it would be necessary to visit each well pad at least 3 times weekly. However, initially in the winter each well pad would need to be visited daily. After 2 or 3 years of production, visits in the winter may be reduced to 3 times weekly. According to the operators, remote sensing equipment will not replace the need for daily visits. The equipment is, however, proving effective in relaying immediate notification of problems.

One issue that has been raised is the amount of volatile organic compounds (VOCs) emitted from production equipment. The primary sources of VOC emissions include the dehydration unit and the condensate tank (flashing). The amount of VOCs produced and ultimately emitted are proportional to the overall gas production rate. As production declines, so will production of VOCs.

Ultra provided data on VOC emissions for the Mesa 15-8 from September, 1998. The well was producing 3.8 MMCFD and had VOC emissions of 80 tons per year (tpy). Hazardous air pollutants (HAPs) were estimated to be about 12 tpy. WDEQ/AQD has new oil and gas presumptive BACT emissions that allow oil and gas operators to place a new well online and submit a Notice of Installation within 30 days of first production. They can use the production from the first 30 days and then multiply it by 0.6 which represents an 80 percent decline during the first year. If this value is less than 40 tpy of VOCs, no controls would be required. For the Mesa 15-8, for example, VOC emissions using the decline would still be 48 tpy and controls would be required. The operators would still be required to submit a Section 21 permit application within180 days of first production.

Flare stacks or combustion chambers to control (burn) VOCs can be up to 30 feet in height. The flare or combustion chamber would be fired by an automatic pilot and is designed to achieve at least 98 percent combustion efficiency. Pursuant to WDEQ/AQD guidance, the opacity limits for flares or combustion chambers installed in the PAPA would be evaluated during the New Source Review permitting process.

Abandonment. The operators would follow the procedures of the WOGCC and BLM for plugging and abandonment of each well. Reclamation plans that are provided in the approved APD would be used for final abandonment procedures. All surface production equipment would be removed from the site and the well pad area and roads would be recontoured as soon as weather permits. The well pad and access road would be seeded during the fall, as directed by the BLM.

2.5.6 Gas Gathering System. The gas gathering system would typically consist of a series of 3- to 12-inch diameter buried pipelines. The gathering system would transport gas from individual well pads to a central location where the gas would be compressed into a sales pipeline.

Design Criteria. The design, materials, construction, operation, maintenance and abandonment of the gathering system pipelines would be in accordance with API 1104 and safe and proven

engineering practices. Typically, the gathering system would be installed adjacent to existing roads. In most cases, the pipelines would be installed in a 50-foot wide permanent right-of-way, part of which overlaps the adjacent road.

Construction. Prior to construction, the pipeline's centerline and possibly exterior limits of the construction right-of-way would be surveyed and staked. These stakes would be maintained throughout construction. On lands supporting taller shrub-type vegetation cover (*e.g.*, sagebrush, rabbitbrush, etc.), the right-of-way would be cleared by scalping off the tops of the shrubs (grasses and forbs would remain intact) with a motor-grader or a bulldozer. Vegetation cover types such as grass, low shrubs, or other low growth vegetation would not be cleared except in areas directly over the trench or where grading would be required. The cleared vegetation material would be stored on the edge of the right-of-way and spread back over the right-of-way during final restoration. This material will increase moisture retention and reduce wind and water erosion and is considered to be the functional equivalent of mulch and a source of native seed.

Topsoil would not be salvaged during construction of the gathering system unless the ditch width exceeds 2 feet (see Appendix A) or the subsoil is rocky. The depth of the ditch would be sufficient to allow for adequate cover (approximately 30 inches). Crossing depths for roads would be determined by the managing agency/owner.

After ditching is complete, the pipe sections would be strung along the trench, bent to fit the contour of the trench, aligned, welded together, and placed on temporary supports along the edge of the trench. Welds would be visually and/or radiographically inspected and repaired, if necessary. The pipe assembly would then be lowered into the trench by side-boom tractors and the trench would be backfilled using a backfilling machine or bladed equipment. Pipeline trenches would be wheel compacted twice during the backfilling procedure to minimize trench settling. No foreign substance, including skids, welding rods, containers, brush, trees, or refuse of any kind, would be permitted in the backfill.

Road crossings would comply with requirements of the agency responsible for permitting the road crossing. Roads would be either bored or open-cut. Typically, dirt or gravel surfaced roads would be open-cut and the pipeline installed, the road repaired, and the crossing completed within 1 day. If additional repair of the road is required, final repair would be completed during cleanup. Crossings at paved roads would typically be made by horizontal boring at a minimum depth of 5 feet beneath the surface of the road.

Depending upon moisture conditions, compacted areas of the right-of-way would be scarified to loosen compacted soils prior to respreading topsoil (if salvaged). Scarifying the subsoil would promote water infiltration, improve soil aeration and aid root penetration. On slopes, scarification would also be important to provide a roughened interface between the topsoil and subsoil to reduce the potential for soil slippage. Scarification would leave the soil surface in a gouged and roughened condition. Chiseling/scarifying would be done on the contour where feasible. Where available, rocks and slash would be pulled back onto the right-of-way. Small pockets in the soil of varying size and depth would trap seed and runoff. In this way the roughened surface would reduce erosion and conserve moisture for seed germination. Waterbars would be installed to manage runoff. Depending upon site-specific slope and soil conditions, BLM could require mulching or matting.

Testing. Gathering pipelines would be pressure tested. Testing would comply with applicable American National Standards Institute (ANSI) standards. All leaks that are found would be repaired. Test water would be removed and disposed of in accordance with appropriate state and Federal regulations. Test water would be obtained from commercial water haulers or from water supply wells. If used, test water would be surface discharged, the operator's would need to submit to WDEQ/WQD a notice of intent for coverage under the general NPDES permit for a temporary discharge of hydrostatic test water.

Maintenance and Operation. Pipelines would be operated and maintained in compliance with applicable Federal, industry and ANSI standards. The operators would monitor and control the system by conducting on-site inspections of project facilities. Inspections generally would be conducted on a weekly basis. The primary cause of pipeline failure is third-party damage typically associated with construction machinery hitting buried lines. The operators would sign pipeline routes that cross roads,

ditches or other areas where they could be subject to damage.

Abandonment. Upon reaching the end of the useful life of the pipelines, the operators would be required to contact the BLM and prepare an abandonment plan. Unless otherwise required by BLM, the operator's would leave the pipe in place, purge the pipeline of all contents, remove all surface facilities and reclaim disturbed areas. Wastes generated by purging would flow directly into a tank or truck and would be hauled to a disposal facility permitted by WDEQ.

2.5.7 Sales Pipeline. As was stated in Chapter 1, existing sales pipeline capacity is not sufficient to transport gas anticipated to be produced from the project area. It may be necessary to construct additional sales pipeline capacity from the project area to transport gas from the PAPA.

This EIS evaluates sales pipelines to transport gas from the project area to existing pipeline hubs in southwestern Wyoming. Information was provided by Western Gas and Jonah Gas. Their proposals involve the construction of multiple diameter pipelines in an existing pipeline corridor (see Figure 2-9).

Over the life of the project, Jonah Gas and Western Gas could construct a number of pipelines in the existing corridor. The number and diameter of the pipelines constructed would depend on eventual production from the project area and cannot be predicted at this point in time. Western Gas would transport gas from the project area to Mountain Gas Resource's existing Granger Plant located near Granger, Wyoming. Jonah Gas would transport gas from the project area to William's Field Service's existing Opal Plant located near Opal, Wyoming and to the Granger Plant.

Because the number of pipelines required to transport the gas is currently not known, this EIS assumes that an additional 200-foot wide right-of-way area would be disturbed to accommodate multiple pipelines the entire length of the existing 119.9-mile pipeline corridor to Granger and Opal. The sales pipelines would be designed, constructed, operated, and maintained in accordance with applicable Federal and state regulations. Construction would be similar to the techniques described above for the gathering system.

2.5.8 Compression. To transport gas from the PAPA, Jonah Gas would install compression on either private land at its existing Nerd Farm Site in Section 3, T. 31 N., R. 109 W. and/or on state land in Section 36, T. 30 N., R. 108 W. Western Gas would install compression at either their existing permitted compressor station site in the Jonah Field (Section 34, T. 29 N., R. 108 W.) or in Section 4, T. 30 N., R. 108 W. Ultra may install compression in Section 16, T. 31 N., R. 108 W. Proposed locations for the compression are shown on Figure 2-10. Disturbance at these sites would be approximately 7 acres. All companies could also select other sites. It is not possible to predict the amount of compression necessary to transport gas from the PAPA because compression requirements are primarily dependent on production rates. This EIS considers the impacts of installing 26,000 horsepower (hp) of compression. The compression would be installed at 1 or more of the locations addressed above. The distribution of compression between the sites is largely dependent on the volume of gas transported from the PAPA by Jonah Gas, Ultra and Western Gas. For purposes of impact analysis, it is assumed compression could be placed at any of the 5 potential compressor station sites listed above. Acceptable compression engine NO_x emission levels would be determined by WDEQ/AQD in the permit review for each of the compressor engines. Therefore 3 levels of compressor engine NO_x emissions are analyzed: 1.5, 1.0 and 0.7 grams/hp/hour.

2.5.9 BP Amoco's Proposed Field Office. BP Amoco proposes to construct a field office in the southern portion of the PAPA adjacent to the Luman Road which provides access to the Jonah II Field from U.S. Highway 191. The location of the proposed field office, Section 22, T. 29 N., R. 107 W., is shown on Figure 2-10. The office site is on Federal lands. An office trailer and parking would be provided on the 5 acre site. Power is available adjacent to the site. Lights would be installed but would be used only when employees are on the premises. No storage would occur at the site.

2.5.10 Seismic Surveys. During scoping and at the workshops members of the public suggested that 3-D seismic surveys might be useful in predicting the location of economically recoverable reserves and that such surveys may reduce overall impacts to the environment by eliminating the need for exploratory drilling of non-productive areas. The BLM recently received applications from Veritas DGC Land, Inc.

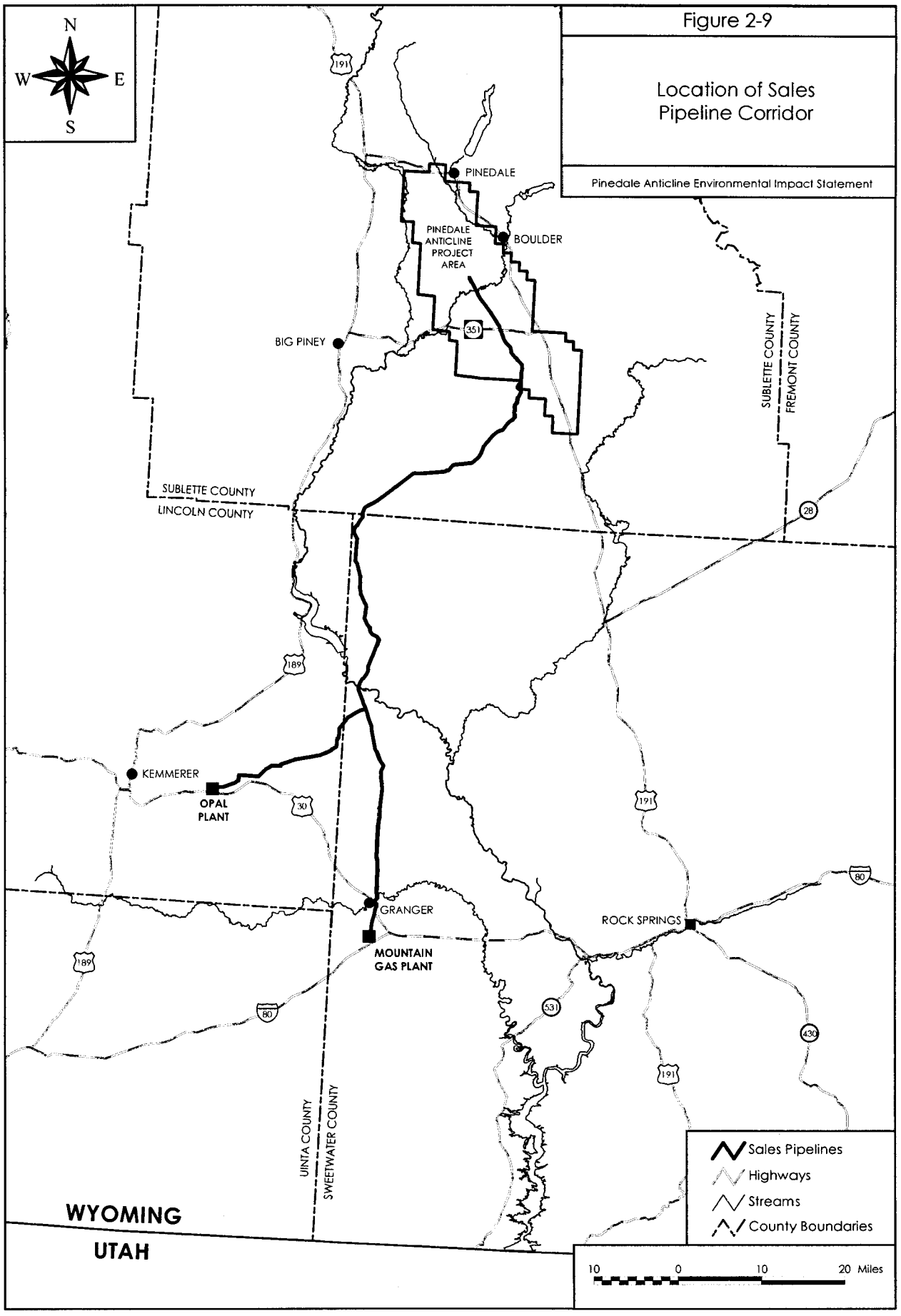
Figure 2-9
Location of Sales Pipeline Corridor
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N
W
E
S
PINEDALE
BOULDER
PINEDALE ANTICLINE PROJECT AREA
BIG PINEY
SUBLETTE COUNTY
LINCOLN COUNTY
SUBLETTE COUNTY
FREMONT COUNTY
KEMMERER
OPAL PLANT
GRANGER
MOUNTAIN GAS PLANT
ROCK SPRINGS
UINTA COUNTY
SWEETWATER COUNTY
WYOMING
UTAH
191
351
28
189
30
80
531
430
Sales Pipelines
Highways
Streams
County Boundaries
10 0 10 20 Miles

Figure 2-10

Location of Potential Compressor Station Sites, Seismic Survey Areas, and BP Amoco's Proposed Field Office

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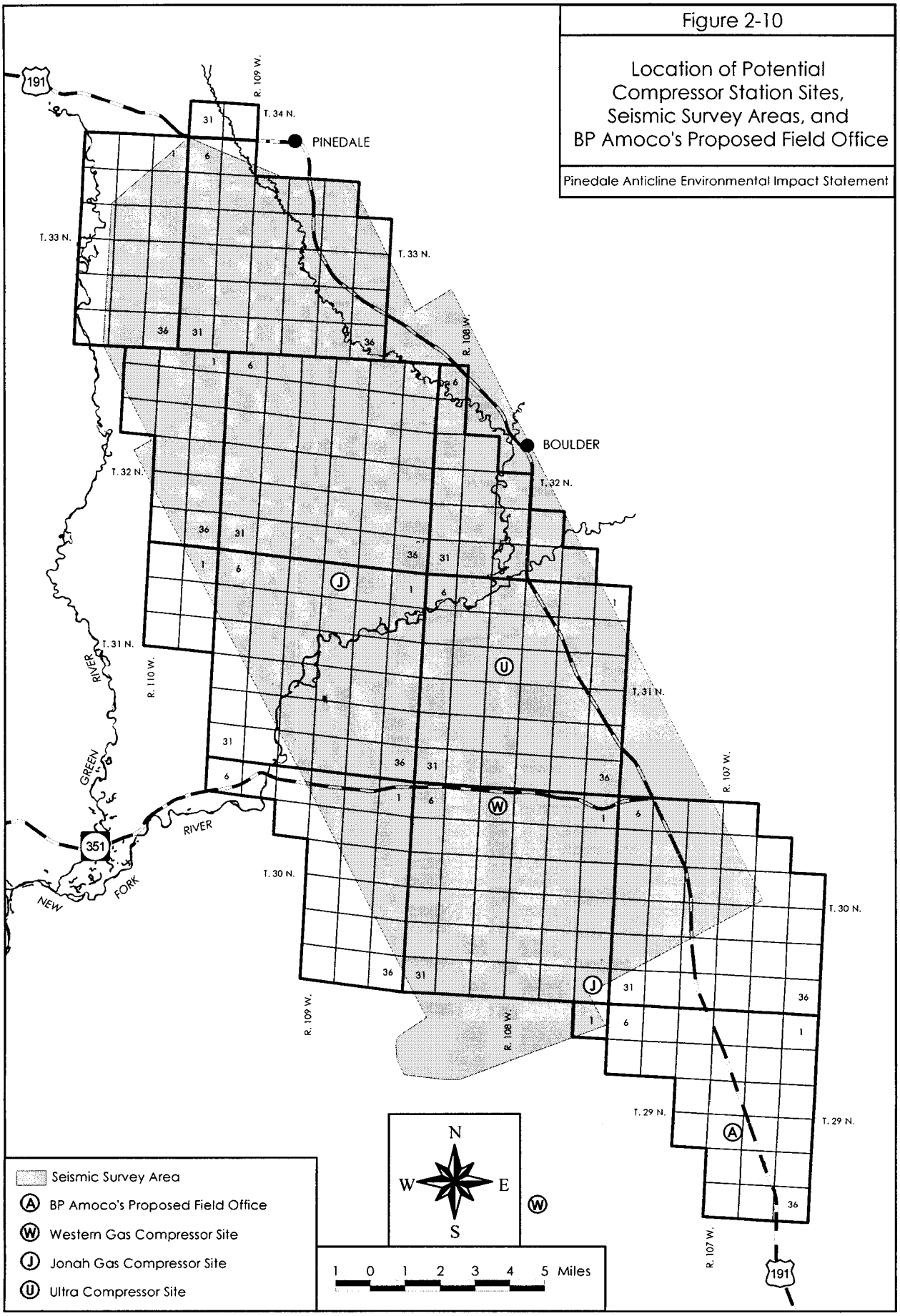

and Western Geophysical to conduct 3-D seismic surveys on a portion of the project area. An environmental analysis was prepared separately on each seismic project by the BLM, including public review and comment. These surveys will use vibroseis methods. Vibroseis buggies would be used as the energy source and will use low ground pressure tires and a staggered spread pattern to minimize surface impacts. Compliance with seasonal restrictions have delayed the surveys until the late summer and fall of 1999. The surveys will be complete by November 15, 1999. The general area over which the seismic surveys will be conducted is shown on Figure 2-10.

Additional seismic programs may be conducted in the project area in the future. Generally, the impacts associated with these programs are relatively minor and very short-term. This EIS cannot predict when and where seismic activity would occur in the future. Rather, the impacts of these surveys would be evaluated on a case-by-case basis. BLM supports and encourages the collection of seismic data from the project area because it may be useful in predicting where impacts are likely to occur and not occur.

2.6 Management Areas for Resource Protection

The PAPA contains a number of sensitive human/environmental resources which could be adversely affected by continued exploration and development activities. This is one of the reasons why BLM required early preparation of this EIS and why there is considerable public interest in the project. Each of these resources has been designated as a Sensitive Resource Management Zone (SRMZ). Each SRMZ is described in detail and mapped in Chapter 3. The following SRMZs (including their respective Chapter 3 location maps) have been identified within the PAPA:

- Residential Areas SRMZ (see Figure 3-7);
- BLM Recreation Sites SRMZ (see Figure 3-8);
- Sensitive Viewshed SRMZ (see Figure 3-10);
- Lander Trail SRMZ (see Figure 3-11);
- Sensitive Soils SRMZ (see Figure 3-15);
- Wetlands SRMZ (see Figure 3-17);
- 100-year Flood Plain SRMZ (see Figure 3-18);
- Antelope Crucial Winter Range SRMZ (see Figure 3-19);
- Deer Winter and Crucial Winter Range SRMZ (see Figure 3-20);
- Moose Crucial Winter/Yearlong Range SRMZ (see Figure 3-21);
- Sage Grouse Leks and Nesting Habitat SRMZ (see Figure 3-22);
- Raptor Nests SRMZ (not mapped to protect nest sites); and
- The Mesa Breaks SRMZ (see Figure 4-9).

When combined, these SRMZs cover nearly all of the PAPA, particularly in the northern two-thirds of the project area. Table 2-6 shows the potential number of well pad "spots" (based on 40-acre spacing throughout the PAPA) in each of the SRMZs by surface and mineral owner. As with the surface restrictions, many of these SRMZs overlap, making management of any particular area of the PAPA complicated. For instance, on the northern part of the PAPA, areas which have been identified as visually sensitive overlap with winter and crucial winter range for deer, residential areas, sage grouse lek buffers and nesting habitat, and the Mesa Breaks. To address the overlapping SRMZs, the BLM has divided the entire PAPA into the 9 distinct Management Areas (MA) shown on Figure 2-11. MAs 1 through 8 apply only to Federal lands and minerals. All non-Federal lands and minerals have been combined into MA 9. Each of the MAs have different management objectives based on the combination of SRMZs present. The acreage of each MA in the PAPA is provided on Table 2-7 and the management objectives are listed below:

MA 1- Lander Trail. Management objective is to preserve the integrity of the trail. No well pads would be allowed within 0.25 miles of the trail or the visual horizon, whichever is less. Roads and pipelines may cross the trail in areas with existing disturbance. The management objective includes maintenance of the integrity of the trail viewshed within 3 miles on both sides of the trail (see Figure 3-11), where practicable, and continued maintenance of livestock grazing and trailing operations.

MA 2 - The Mesa Breaks. The management objective of this MA is to maintain the existing quality, suitability and effectiveness of this deer crucial winter range; protect this area against surface disturbance and increased human activities which could displace deer from winter ranges resulting in mortalities and reduced population levels; avoid disturbance on steep slopes and sensitive soils to prevent erosion and visual impacts; retain the existing character of the landscape and sensitive viewshed; protect cultural/

Figure 2-11

Management Areas for Resource Protection on Federal Lands and Minerals

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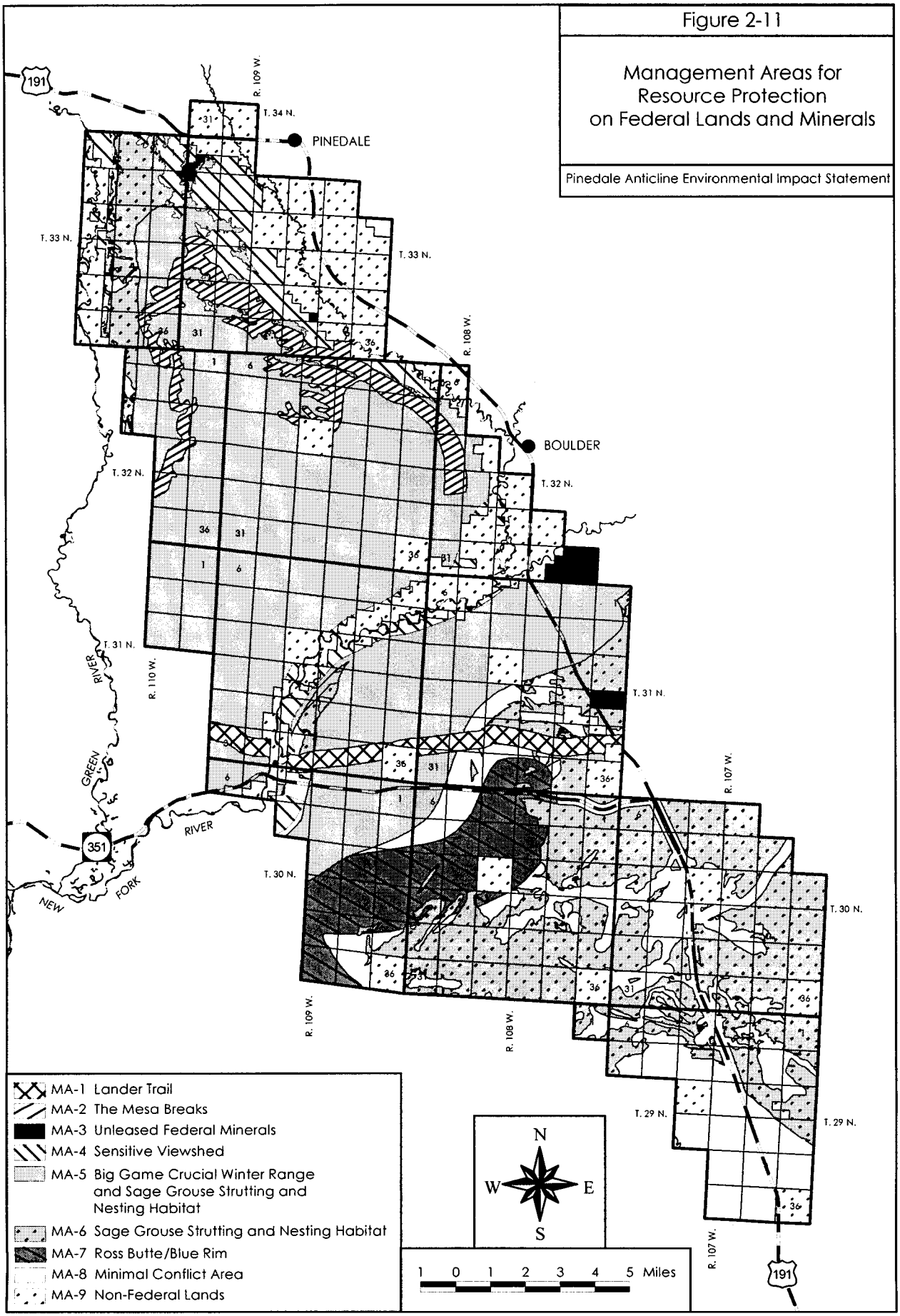


Table 2-6
Acres and Number of Potential Well Pad Spots in Each Sensitive Resource Management Zone in the Project Area

Surface Owner	Federal	Federal	Private	Private	Private	State
Mineral Owner	Federal	State	Federal	State	Private	State
Residential Areas SRMZ						
Acres of Residential Areas SRMZ	1,428	0	1,268	89	7,299	303
Potential well pad spots within Residential Areas SRMZ	31	0	22	2	186	8
BLM Recreation Sites SRMZ						
Number of BLM recreation sites	1	0	0	0	0	0
Acres of 0.25 mile recreation site buffer	60	0	3	0	62	0
Potential well pad spots within 0.25 mile recreation site buffer	0	0	0	0	2	0
Sensitive Viewshed SRMZ						
Acres of Sensitive Viewshed SRMZ	26,200	0	1,207	75	9,062	2,394
Potential well pad spots within Sensitive Viewshed SRMZ	627	0	28	1	224	56
Lander Trail SRMZ						
Acres of 0.25 mile trail buffer	2,910	0	550	0	283	222
Potential well pad spots within 0.25 mile trail buffer	0	0	0	0	7	6
Sensitive Soils SRMZ						
Acres of Sensitive Soils SRMZ	10,279	122	67	11	116	305
Potential well pad spots within Sensitive Soils SRMZ	213	3	0	0	2	7
Wetlands SRMZ						
Acres of wetlands	536	0	301	157	9,847	417
Potential well pad spots within wetlands	0	0	0	5	246	8
100-year Flood Plains						
Acres of 100-year flood plains	1,542	0	325	139	8,273	658
Potential well pad spots within 100-year flood plains	0	0	0	3	214	15
Antelope Crucial Winter Range SRMZ						
Acres of antelope crucial winter range	36,502	0	4,569	0	3,829	2,526
Potential well pad spots within antelope crucial winter range	817	0	82	0	97	64
Deer Winter and Crucial Winter Range SRMZ						
Acres of deer winter and crucial winter range	42,573	639	1,389	159	5,781	2,809
Potential well pad spots within deer winter and crucial winter range	977	16	25	4	147	71
Moose Crucial Winter/Yearlong Range SRMZ						
Acres of moose crucial winter/yearlong range	3,894	0	1,730	281	13,025	1,143
Potential well pad spots within moose crucial winter/yearlong range	61	0	29	7	331	32
Sage Grouse Leks and Nesting Habitat SRMZ						
Number of sage grouse leks	39	0	1	0	2	2
Acres within 0.25 mile sage grouse lek buffer	4,895	0	146	3	178	203
Potential well pad spots within 0.25 mile sage grouse lek buffer	2	0	0	0	6	5
Acres within sage grouse nesting habitat (2 mile buffer from leks)	121,666	1275	4,653	338	12,219	6,871
Potential well pad spots within sage grouse nesting habitat	2,733	32	82	8	306	171
Raptor Nests SRMZ						
Number of raptor nests	36	0	2	1	23	7
Acres of raptor nest buffers	1,391	0	130	60	1,414	293
Potential well pad spots within raptor nest buffers	0	0	0	2	34	8

Table 2-6
Concluded

Surface Owner	Federal	Federal	Private	Private	Private	State
Mineral Owner	Federal	State	Federal	State	Private	State
The Mesa Breaks						
Acres of The Mesa Breaks	7,054	189	0	0	0	253
Potential well pad spots within the Mesa Breaks	163	5	0	0	0	6

Native American sacred sites; provide for the development of recreation opportunities such as a bike trail (so long as development of recreation opportunities is consistent with other components of the management objective); and continue maintenance of livestock grazing and trailing operations.

Table 2-7
Acres Within Each Management Area in the PAPA

Management Area	Acres
MA-1	3,460
MA-2	7,366
MA-3	1,347
MA-4	8,686
MA-5	67,801
MA-6	39,205
MA-7	10,953
MA-8	26,605
MA-9	31,925

MA 3 - Unleased Federal Minerals. These Federal minerals have been closed to mineral lease. They include Federal minerals under the Industrial Park west of Pinedale, several tracts near Boulder that were withdrawn at the request of the Department of Defense, etc. The management object of this MA is to continue to prohibit development in these areas.

MA 4 - Sensitive Viewshed. This MA includes the "face of the Mesa" and areas currently identified in the Pinedale RMP as Visual Resource Management Class II along the Green and New Fork rivers. Management objective of this area is to protect the sensitive viewshed by retaining the existing character of the landscape; management activities may be seen but should not attract the attention of the casual observer; construction activities should avoid steep slopes and sensitive soils to prevent erosion and visual impacts; maintain winter and crucial winter deer range, where present; protect cultural/Native American sacred sites; provide for development of recreation opportunities such as a bike, jogging, and/or hiking trail (so long as development of recreation opportunities is consistent with other components of the management objective); protect wetland/riparian areas; protect raptor nests and nesting habitat; and continue maintenance of livestock grazing and trailing operations.

MA 5 - Big Game Crucial Winter Range and Sage Grouse Strutting and Nesting Habitat. This MA includes overlapping deer winter and crucial winter ranges and sage grouse strutting and nesting habitat on the top of the Mesa and slopes west towards the Green River and south/southeast to the New Fork River. This MA also includes an area of overlapping deer and antelope winter and crucial winter ranges and sage grouse strutting and nesting habitat south/southeast of the New Fork and East Fork rivers. Management objective is to protect this area against excessive surface disturbance and increased human activities which could displace deer and antelope from winter ranges and sage grouse from strutting and nesting habitat resulting in mortalities and reduced population levels; protect cultural/Native American sacred sites; and continue maintenance of livestock grazing and trailing operations. This MA also includes areas on each side of the New Fork and Green rivers which are classified in the Pinedale RMP as Visual Resource Management Class III. Here the management objective is to partially retain the existing character of the landscape, i.e., measures would be taken to screen activities and facilities so they do not dominate the view of the casual observer.

MA 6 - Sage Grouse Strutting and Nesting Habitat. This area includes sage grouse strutting and nesting habitat on either side of U.S. Highway 191 and State Highway 351 that was identified by the nesting habitat model to be suitable for sage grouse nesting with probability of 80 percent or greater. Management objective is to protect this area from excessive surface disturbance and increased human activities which could displace sage grouse from crucial strutting and nesting habitat resulting in mortalities and reduced population levels. A portion of the area along US Highway 191 is also identified by the WGFD as a migration pathway used by antelope

traveling south from northern summer ranges. Activities and facilities should avoid creating barriers to the seasonal movements of these animals. This MA also includes an area on each side of U.S. Highway 191 which is classified in the Pinedale RMP as Visual Resource Management Class III. Here the management objective is to partially retain the existing character of the landscape, i.e., measures should be taken to screen activities and facilities so they do not dominate the view of the casual observer. Management objective also includes protection of the Lander Trail viewshed; sensitive soils; cultural and Native American sacred sites; and continued maintenance of livestock grazing and trailing operations.

MA 7 - Ross Butte/Blue Rim. This MA contains highly erodible soils, sensitive plant populations and shale beds of the Wasatch Formation where erosion has created a badland topography with potential for exposed fossils. This landscape provides a concentration area for raptor nesting and habitat for several sensitive plant species. Management objective is to avoid disturbance to the fossil-bearing formations on a site-specific, case-by-case basis; avoid disturbance of highly erodible soils; maintain soil stability and productivity; protect and maintain existing raptor nesting habitat; protect sensitive plant species; protect paleontological fossil resources; and continue maintenance of livestock grazing and trailing operations.

MA 8 - Minimal Conflict Area. This area includes parts of the project area located north and south of State Highway 351, and east and west of U.S. Highway 191. Management objective is to provide for antelope summer range and migration; protect the Lander Trail viewshed; avoid sensitive soils; and continue maintenance of livestock grazing and trailing operations. This MA also includes an area on each side of U.S. Highway 191 which is classified in the Pinedale RMP as Visual Resource Management Class III. The management objective is to partially retain the existing character of the landscape, i.e., measures should be taken to screen activities and facilities so they do not dominate the view of the casual observer.

MA 9 - Non-Federal Lands. This area includes lands located along either side of the New Fork River, Green River, and East Fork River, and others scattered throughout the project area. These lands are private- and state-owned and not under the jurisdiction of the BLM. Lands along the rivers include most of the wetland/riparian areas found in the PAPA, farm and ranch lands, and 100-year flood plains of the New Fork and Green rivers. The COE regulates the discharge of dredged or fill materials into waters of the United States, and would require operators to demonstrate that impacts to special aquatic sites, including wetlands, have been avoided and minimized to the maximum extent practicable. BLM cannot adopt a management objective for these lands. Private ranches and irrigated hay fields form a "rural cultural landscape" which are historically significant. However, it was suggested during the public workshops that the operators voluntarily adopt certain objectives for these areas. Recommendations included maintenance, improvement and restoration of riparian habitat to provide enhanced wildlife and livestock forage/habitat and to protect water quality; avoidance of disturbance to scrub-shrub or forested wetland types; cooperation with private landowners to avoid impacts to area residences; protecting raptor nesting habitat; and continuing the maintenance of livestock grazing and trailing operations.

2.7 Mitigation Alternatives

Two mitigation alternatives are considered - Standard Stipulations (SS) Alternative and Resource Protection (RP) Alternative. The SS Alternative incorporates standard mitigation measures and practices adopted by the BLM, WOGCC, EPA, COE and a number of other regulatory agencies to reduce impacts from oil and gas development. The RP Alternative includes all of the standard mitigation measures and practices addressed for the SS Alternative. However this alternative incorporates a number of additional mitigation opportunities designed to specifically address site-specific characteristics of the PAPA and the manner and pace of future development. Table 2-8 provides a complete list of the differences in the specific mitigation approaches provided by the alternatives.

2.7.1 Standard Stipulations Alternative. Project components and construction-related disturbance associated with the SS Alternative are presented on Tables 2-9 and 2-10. Table 2-9 provides an estimate of disturbance assuming that 700 productive well pads are developed in the PAPA in the next 10 to 15 years. Table 2-10 provides the same information but assumes that 500 productive well pads are developed over the same period. These tables assume that 150 and 200 dry holes, respectively, would be drilled to achieve the 500 and 700 productive well pads. The dry holes would be reclaimed and returned to a productive herbaceous vegetative state within 3 years. To implement this

Table 2-8
Summary of Mitigation Alternative Requirements

	Standard Stipulations Alternative	Resource Protection Alternative on Federal Lands and Minerals	Resource Protection Alternative on All Lands and Minerals
Number of Rigs Operating	Average of 8 rigs working in the PAPA year-round.	No more than 5 rigs operating the PAPA, only 2 of which would be allowed to work on new locations at any one time north of the New Fork River on Federal lands and minerals.	Same as RP Alternative on Federal lands and minerals.
Residential Areas SRMZ	Avoid placement of production equipment within 350 feet of occupied dwellings on private and state lands and minerals (WOGCC regulation) and within 0.25 miles of occupied dwellings on Federal lands and minerals.	Avoid placement of production equipment within 350 feet of occupied dwellings on private and state lands and minerals (WOGCC regulation) and within 0.25 miles of occupied dwellings and areas zoned for residential use by Sublette County and subdivisions and subdivided lands on Federal lands and minerals.	Avoid placing well pads anywhere within the Residential Areas SRMZ shown on Figure 3-7.
BLM Recreation Sites SRMZ	No restrictions would be placed on non-Federal lands and minerals to protect recreation sites. On Federal lands and minerals, BLM would limit well pad density in the Wind River Front SRMA to 4 well pads/section and well pads within 0.25 miles of BLM developed recreation sites would be avoided. BLM would start the process of designating the entire project area as limited to ORV use which would restrict ORV use to existing roads and trails.	No restrictions would be placed on non-Federal lands and minerals. Well pad density in leases WYW130234, WYW8593, and part of WYW128255 would be limited to 4 well pads/section to reduce impacts to recreation users along the Pinedale South and Mesa roads (see Figure 4-4). Wells on these leases not in deer winter range would be drilled in the winter when conflicts with recreation use would be minimized. BLM would consider not reissuing leases WYW130234, WYW8593, and WYW128255, if they expire, to protect sensitive visual and recreation values. Well pads on Federal lands and minerals within 0.25 miles of all recreation sites would be avoided and well pad density on Federal lands and minerals in the Wind River Front SRMA would be limited to 4 well pads/section. BLM would start the process of designating the entire project area as limited to ORV use which would restrict ORV use to existing roads and trails.	The 0.25 mile buffer around recreation sites would be applied to non-Federal lands and minerals. Well pad density in leases WYW130234, WYW8593, and part of WYW128255 would be limited to 4 well pads/section (see Figure 4-4). Wells on these leases not in deer winter range would be drilled in the winter when conflicts with recreation use would be minimized. BLM would consider not reissuing leases WYW130234, WYW8593, and WYW128255, if they expire, to protect sensitive visual and recreation values. Well pad density on all lands in the Wind River Front SRMA would be limited to 4 well pads/section. BLM would start the process of designating the entire project area as limited to ORV use. ORV use would be restricted to existing roads and trails.
Sensitive Viewshed SRMZ	No restrictions would be placed on non-Federal lands and minerals to protect visual resources. Well pads would not be allowed in VRM Class II areas on Federal lands and minerals until it could be clearly demonstrated that the well pad and its associated facilities would not result in degradation of the Class II visual integrity. No disturbance would be allowed on slopes 25 percent or greater in the VRM Class II area. Up to 16 well pads/section would be allowed on Federal lands and minerals in the Sensitive Viewshed SRMZ (but not within the VRM Class II area) shown on Figure 3-10 unless lower densities are required to protect other resources. BLM would consider not reissuing leases in VRM Class II areas if they expire. BLM would start the process of updating the VRM classification for the project area.	No restrictions would be placed on non-Federal lands and minerals to protect visual resources. Well pads would not be allowed in VRM Class II areas on Federal lands and minerals until it could be clearly demonstrated that the well pad and its associated facilities would not result in degradation of the Class II visual integrity. Up to 4 well pads/section would be allowed on Federal lands and minerals in the Sensitive Viewshed SRMZ (but not within the VRM Class II area) shown on Figure 3-10. No development activities (including roads and pipelines) would be allowed on slopes in excess of 15 percent and low-profile tanks would be required on Federal lands and minerals throughout the entire SRMZ. BLM would consider not reissuing leases in VRM Class II areas if they expire. BLM would start the process of updating the VRM classification for the project area.	No well pads would be allowed in VRM Class II areas on Federal lands and minerals until it could be clearly demonstrated that the well pad and its associated facilities would not result in degradation of the Class II visual integrity. Up to 4 well pads/section would be allowed on all lands and minerals in the Sensitive Viewshed SRMZ shown on Figure 3-10. No development activities (including roads and pipelines) would be allowed on slopes in excess of 15 percent and low-profile tanks would be required throughout the entire SRMZ (Federal and non-Federal lands). Site-specific plans would be prepared by the operators to disguise production facilities to the maximum extent possible on private and state lands in the SRMZ. BLM would consider not reissuing leases in VRM Class II areas if they expire. BLM would start the process of updating the VRM classification for the project area.

Table 2-8
Continued

	Standard Stipulations Alternative	Resource Protection Alternative on Federal Lands and Minerals	Resource Protection Alternative on All Lands and Minerals
Lander Trail	No restrictions would be placed on non-Federal lands and minerals to protect the trail. On Federal lands and minerals, no well locations or visible production equipment would be allowed within 0.25 miles of the Lander Trail (or visual horizon whichever is closer). Roads and pipelines would be allowed to cross the trail in areas with existing disturbance.	No restrictions would be placed on non-Federal lands and minerals to protect the trail. On Federal lands and minerals, no well locations or visible production equipment would be allowed within 0.25 miles of the Lander Trail (or visual horizon whichever is closer). Roads and pipelines would be allowed to cross the trail in areas with existing disturbance. In addition, every effort would be made on Federal lands and minerals to locate production equipment between 0.25 and 1.5 miles of the Lander Trail and north of State Highway 351 in areas not visible from the trail. No more than 2 visible well pads per section would be allowed between 0.25 and 1.5 miles of the trail, where possible. However, more than 2 visible well pads may be allowed if centralized production facilities are constructed that are not visible and eliminate the need for tanks at visible locations. Other production equipment could be installed at the visible well pads. Between 1.5 and 3 miles north of the trail no more than 8 well pads/section would be allowed. The Programmatic Agreement will address protection of physical trail features as well as the trail setting (viewshed).	This alternative would apply the RP Alternative on Federal Lands and Minerals to all lands adjacent to the trail and within the Lander Trail SRMZ shown on Figure 3-11.
Green River Sub-basins	Up to 16 well pads/section could be developed in sub-basins that drain to the Green River on all lands and minerals. Inspection of all well pad storm water controls in these sub-basins would be required by WDEQ/WQD.	No restrictions would be applied to well density on non-Federal lands and minerals to protect these sub-basins. On Federal lands and minerals, development in sub-basins that drain to the Green River would be limited to 8 well pads/section. Inspection of all well pad storm water controls in these sub-basins would be required by WDEQ/WQD.	On all lands and minerals, development in sub-basins that drain to the Green River would be limited to 8 well pads/section. Inspection of all well pad storm water controls in these sub-basins would be required by WDEQ/WQD.
Stream, Wetland and Riparian	No well pad locations would be allowed within 500 feet of perennial streams, wetlands and riparian areas and 100 feet of ephemeral and those intermittent streams not exhibiting riparian characteristics on Federal lands and minerals. Well pad placement within wetlands on private and state lands would be subject to permitting requirements of the COE. The COE would allow placement of well pads within wetlands only if no other practicable alternative to avoiding impacts to the wetland exist.	Same as the SS Alternative except that a goal of zero discharge from storm water runoff would be adopted for well pads within 1,000 feet of streams, wetlands and riparian areas.	No well pad locations would be allowed within 500 feet of perennial streams, wetlands and riparian areas and 100 feet of ephemeral or those intermittent streams not exhibiting riparian characteristics on any lands within the PAPA. A goal of zero discharge from storm water runoff would be adopted for well pads within 1,000 feet of streams, wetlands and riparian areas.
Steep Slopes	Avoid well pad disturbance on slopes in excess of 25 percent on Federal lands and minerals. Sublette County restrictions would apply to non-Federal lands and minerals.	Within the Sensitive Viewshed SRMZ avoid disturbance of all project components on slopes in excess of 15 percent on Federal lands and minerals. On other areas, avoid well pad disturbance on slopes in excess of 25 percent on Federal lands and minerals. Sublette County restrictions would apply to non-Federal lands and minerals.	Within the Sensitive Viewshed SRMZ avoid disturbance of all project components on slopes in excess of 15 percent on all lands. On other areas, avoid well pad disturbance on slopes in excess of 25 percent.

Table 2-8
Continued

	Standard Stipulations Alternative	Resource Protection Alternative on Federal Lands and Minerals	Resource Protection Alternative on All Lands and Minerals
Saline Soils	On Federal lands and minerals there would be no development on saline soils unless site specific plans are prepared by the operator demonstrating that a well location and associated facilities would not result in degradation of water quality. On non-Federal lands and minerals within the Green and New Fork river's flood plains, development would occur on saline soils.	Same as SS Alternative.	Development would not occur on any lands within the Green River and New Fork River flood plains on saline soils.
Temporarily Flooded Soils	On Federal lands and minerals there would be no development on temporarily flooded soils unless site specific plans are prepared by the operator demonstrating that a well location and associated facilities would not result in degradation of water quality. On non-Federal lands and minerals within the Green and New Fork river's flood plains, development would occur on temporarily flooded soils.	Same as SS Alternative.	Development would not occur on private and state lands within the Green River and New Fork River flood plains on temporarily flooded soils.
100-year Flood Plain	Well pads would not be developed in 100-year flood plains on Federal lands and minerals. Potential well pad locations could be located in flood plains on non-Federal lands and minerals.	Same as SS Alternative.	Well pad locations would not be developed in 100-year flood plains.
Bald Eagle Nest Sites	On Federal lands and minerals, a zone would be established excluding surface disturbances or occupancy within 2,000 feet of bald eagle nests and exclusion of any construction activities within 1 mile of the nest during the nesting period. Development of up to 16 wells per section could occur on non-Federal lands and minerals near the only bald eagle nest in the project area. On Federal lands and minerals, BLM would consult with the USFWS and WGFD to determine an acceptable well density in the vicinity of the bald eagle nest.	Same as SS Alternative.	A zone would be established excluding surface disturbances or occupancy within 2,000 feet of bald eagle nests and exclusion of any construction activities within 1 mile of the nest during the nesting period regardless of land and mineral ownership. This alternative would require consultation with the USFWS and WGFD to determine what level of development, based on the site-specific characteristics of the bald eagle nest, should be allowed.
Antelope Crucial Winter Range	No restrictions would be placed on non-Federal lands and minerals to protect wintering antelope. On Federal lands and minerals, construction activities would be restricted within crucial winter range during the period from November 15 through April 30. A maximum of 16 well pads per section would be allowed in crucial winter range.	No restrictions would be placed on non-Federal lands and minerals to protect antelope crucial winter range. On Federal lands and minerals, construction activities would be restricted within crucial winter range during the period from November 15 through April 30. There will be a maximum of 4 well pads/section in crucial winter range on Federal lands and minerals. However, up to 16 well pads/section may be allowed if centralized production facilities are constructed so that only emergency trips would be required during the crucial winter period.	Same as RP Alternative on Federal Lands and Minerals but also applied to non-Federal lands and minerals throughout the project area.

Table 2-8
Continued

	Standard Stipulations Alternative	Resource Protection Alternative on Federal Lands and Minerals	Resource Protection Alternative on All Lands and Minerals
Deer Winter and Crucial Winter Range	No restrictions would be placed on non-Federal lands and minerals to protect wintering deer. On Federal lands and minerals, construction activities would be restricted within crucial winter range during the period from November 15 through April 30. A maximum of 16 well pads per section would be allowed in crucial winter range.	No restrictions would be placed on non-Federal lands and minerals to protect wintering deer. On Federal lands and minerals, construction activities would be restricted within winter and crucial winter range during the period from November 15 through April 30. There would be a maximum of 4 well pads/section in winter and crucial winter range. However, up to 16 well pads/section may be allowed if centralized production facilities are constructed so that no monthly trips would be required during the crucial winter period. No well pads or other surface disturbing activities would be allowed in the Mesa Breaks Management Area. Bottomholes under the breaks would be required to be directionally drilled from outside the breaks.	Same as RP Alternative on Federal Lands and Minerals but also applied to non-Federal lands and minerals throughout the project area.
Moose Crucial Winter/Yearlong Range	No restrictions would be placed on non-Federal lands and minerals to protect wintering moose. On Federal lands and minerals, construction activities would be restricted within crucial winter/yearlong range during the period from November 15 through April 30. A maximum of 16 well pads per section would be allowed in crucial winter/yearlong range.	No restrictions would be placed on non-Federal lands and minerals to protect wintering moose. On Federal lands and minerals, construction activities would be restricted within crucial winter/yearlong range during the period from November 15 through April 30. There will be a maximum of 4 well pads/section in crucial winter/yearlong range on Federal lands and minerals. However, up to 16 well pads/section may be allowed if centralized production facilities are constructed so that no monthly trips would be required during the crucial winter period.	Same as RP Alternative on Federal Lands and Minerals but also applied to non-Federal lands and minerals throughout the project area.
Sage Grouse Leks	No restrictions to protect sage grouse leks would be placed on non-Federal lands and minerals. On Federal lands and minerals, surveys for sage grouse leks would be conducted each year to determine activity status and to locate new leks. Sage grouse leks would be defined and mapped as the entire strutting ground rather than a point location (the current practice). Development planning would be adjusted annually as new leks are found. On Federal lands and minerals, placement of well pads, roads and above-ground structures within 0.25 miles of active sage grouse leks would be avoided. No construction activities would be allowed within 2 miles of sage grouse leks between March 1 and June 30 on Federal lands and minerals.	No restrictions to protect sage grouse leks would be placed on non-Federal lands and minerals. On Federal lands and minerals, surveys for sage grouse leks and nesting sites or concentration areas would be conducted each year to determine activity status and to locate new leks. Sage grouse leks would be defined and mapped as the entire strutting ground rather than a point location (the current practice). Development planning would be adjusted annually as new leks are found. On Federal lands and minerals, placement of well pads, roads and above-ground structures within 0.25 miles of active sage grouse leks would be avoided. No construction activities would be allowed within 2 miles of sage grouse leks between March 1 and June 30 on Federal lands and minerals. Noise from project activities on Federal lands and minerals would be managed near leks while they are actively attended (approximately March 1 to May 15) during the hours from midnight to 9 a.m. so that no more than a 10 dBA increase in background noise occurs at the lek. Sage grouse population status would be monitored annually to determine trends in population growth or decline. More restrictive measures could be required if populations decline or the sage grouse becomes listed pursuant to the Endangered Species Act.	Same as RP Alternative on Federal lands and minerals but also applied to non-Federal lands and minerals throughout the project area.

Table 2-8
Continued

	Standard Stipulations Alternative	Resource Protection Alternative on Federal Lands and Minerals	Resource Protection Alternative on All Lands and Minerals
Sage Grouse Nesting Habitat	No restrictions would be placed on non-Federal lands and minerals to protect sage grouse nesting. On Federal lands and minerals, construction activities would be avoided within a 2-mile radius of active sage grouse leks during the period from March 1 through June 30 to protect nesting. A maximum of 16 well pads per section in sage grouse nesting habitat would be allowed.	No restrictions would be placed on non-Federal lands and minerals to protect sage grouse nesting. On Federal lands and minerals, construction activities would be avoided within a 2-mile radius of active sage grouse leks during the period from March 1 through June 30 to protect nesting. Up to 4 well pads/section would be allowed in high quality sage grouse nesting habitat. In lower quality nesting habitat, up to 8 well pads/section would be allowed.	Same as RP Alternative on Federal lands and minerals but also applied to non-Federal lands and minerals throughout the project area.
Raptor Nest Sites	No protective buffers would be applied to raptor nest sites on non-Federal lands and minerals. However, direct taking of a nest or its occupants would be prohibited by the Migratory Bird Treaty Act and/or the Bald Eagle Protection Act. On Federal lands and minerals, construction activities would be restricted within 0.5 miles of active or occupied raptor nests (1 mile for ferruginous hawks and bald eagles) during the period from February 1 through July 31. Placement of well pads, roads and any other facilities which require human presence would be avoided within 825 feet of all nests (1,000 feet for ferruginous hawks, 2,000 feet for bald eagles) that have been active during 1 of the past 3 years. Annual surveys for nesting raptors would be conducted and protective measures adopted for new occupied nests.	Same as SS Alternative.	Same as RP Alternative on Federal lands and minerals but also applied to non-Federal lands and minerals throughout the project area.
Blue Rim Soils and Paleontology	Up to 16 well pads/section would be allowed on all lands.	No restrictions would be applied to non-Federal lands and minerals to protect paleontological resources or sensitive soils. On Federal lands and minerals, development would be limited to 4 well pads/section. Roads and pipelines would be located to avoid sensitive paleontological sites.	Same as RP Alternative on Federal Lands and Minerals but also applied to non-Federal lands and minerals throughout the project area.

Table 2-8
Concluded

	Standard Stipulations Alternative	Resource Protection Alternative on Federal Lands and Minerals	Resource Protection Alternative on All Lands and Minerals
Cultural Resources	No restrictions would be placed on non-Federal lands and minerals to protect cultural properties. Surveys may be required on non-Federal lands if a Federal right-of-way is required. On Federal lands, any undertaking by operators will follow the Section 106 compliance process prior to any surface-disturbing activity and will either avoid or protect cultural resource properties. The preferred strategy for treating potential adverse effects on cultural properties will be "avoidance" If avoidance is imprudent or unfeasible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, Native American consultation, archival or ethnographic studies, or other physical and administrative measures.	Same as the SS Alternative except that the project would be managed in accordance with a Programmatic Agreement - groups of actions or undertakings and groups of sites or site types would be managed holistically, precluding site specific consultation or repetitious mitigation. Mitigation measures would be implemented according to a mitigation plan reviewed as part of Section 106 consultation for National Register eligible or listed properties.	This alternative would apply the RP Alternative for Federal Lands and Minerals to all lands.
Native American Sacred Sites	No restrictions would be placed on non-Federal lands and minerals to protect Native American sacred sites. On Federal lands, any undertaking by operators would follow the Section 106 compliance process prior to any surface-disturbing activity and would either avoid or protect sacred sites. Activity objective would be to avoid Native American respected places. Traditional elders would be consulted regarding the importance of specific features identified, and for their recommendations on appropriate avoidance distances. Avoidance distances would depend on the importance of the features involved and their topographic setting as well as the technical and economic feasibility of meeting the rights of the mineral lessee. Viewshed (vista) and noise analysis may be conducted to help determine appropriate avoidance distances.	Same as the SS Alternative except that 1) avoidance distances would range from 100 feet to 1 mile depending on the importance of the features involved and their topographic setting as well as the technical and economic feasibility of meeting the rights of the mineral lessee; and 2) the project would be managed in accordance with an Agreement Document - i.e., groups of actions or undertakings and groups of sites or site types would be managed holistically, precluding site specific consultation or repetitious mitigation. Mitigation measures would be implemented according to a mitigation plan reviewed as part of Section 106 consultation for National Register eligible or listed properties.	This alternative would apply the RP Alternative for Federal Lands and Minerals to all lands.

Table 2-9
Summary of Project Components and Disturbance Associated with the 700 Productive Well Pad Level of Development and the Standard Stipulations Alternative

Disturbance Type	Number or Miles	Short-Term Disturbance Factor	Long-Term Disturbance Factor	Short-Term Disturbance	Long-Term Disturbance
Producing well pads	700	3.7 acres/well	1.5 acres/well	2,590 acres	1,050 acres
Dry hole well pads	200	3.7 acres/well	0 acres/well	740 acres	0 acres
Collector roads (1)	6.0	6.3 acres/mile	4.4 acres/mile	38 acres	26 acres
Local and resource roads with adjacent gathering pipelines (2)	280	8.5 acres/mile	2.9 acres/mile	2,380 acres	812 acres
Resource roads from dry holes (3)	80	4.8 acres/mile	0 acres/mile	384 acres	0 acres
Compressor sites	3	7 acres	7 acres	21 acres	21 acres
Sales pipeline	119.9	24.24 acres/mile	0 acres/mile	2,906 acres	0 acres
BP Amoco Field Office			5 acres	5 acres	5 acres
Total				9,064 acres	1,914 acres

1 = Assumes construction of approximately 6 miles of new collector road (Anticline Crest and Industrial Park roads) requiring 52-foot of disturbance for construction and 36-feet of long-term disturbance.
2 = Assumes 0.4 miles of road and gathering pipeline/well pad, 70-foot disturbance width for joint road and pipeline and a long-term disturbance width of 24 feet.
3 = Assumes 0.4 miles of resource road needed to access each dry hole well pad with a disturbance width of 40-foot with roads being reclaimed immediately after well pad reclamation.

Table 2-10
Summary of Project Components and Disturbance Associated with the 500 Productive Well Pad Level of Development and the Standard Stipulations Alternative

Disturbance Type	Number or Miles	Short-Term Disturbance Factor	Long-Term Disturbance Factor	Short-Term Disturbance	Long-Term Disturbance
Producing well pads	500	3.7 acres/well	1.5 acres/well	1,850 acres	750 acres
Dry hole well pads	150	3.7 acres/well	0 acres/well	555 acres	0 acres
Collector roads (1)	6.0	6.3 acres/mile	4.4 acres/mile	38 acres	26 acres
Local and resource roads with adjacent gathering pipelines (2)	200	8.5 acres/mile	2.9 acres/mile	1,700 acres	580 acres
Resource roads from dry holes (3)	60	4.8 acres/mile	0 acres/mile	288 acres	0 acres
Compressor sites	3	7 acres	7 acres	21 acres	21 acres
Sales pipeline	119.9	24.24 acres/mile	0 acres/mile	2,906 acres	0 acres
BP Amoco Field Office			5 acres	5 acres	5 acres
Total				7, 363 acres	1, 382 acres

1 = Assumes construction of approximately 6 miles of new collector road (Anticline Crest and Industrial Park roads) requiring 52-foot of disturbance for construction and 36-feet of long-term disturbance.
2 = Assumes 0.4 miles of road and gathering pipeline/well pad, 70-foot disturbance width for joint road and pipeline and a long-term disturbance width of 24 feet.
3 = Assumes 0.4 miles of resource road needed to access each dry hole well pad with a disturbance width of 40-foot with roads being reclaimed immediately after well pad reclamation.

alternative, between 60 to 90 wells would be drilled annually using an average of 8 rigs operating in the PAPA year-round. Each rig would be expected to drill a well each month. If the level of development reaches 700 productive well pads over the next 10 to 15 years, approximately 9,064 acres of short-term (construction-related) and 1,914 acres of long-term (operation-related) disturbance would occur. Any disturbance not returned to at least a productive herbaceous vegetative state within 5 years of initial

disturbance is considered a long-term impact. Long-term disturbance estimated in the tables would persist for the life of the project (estimated at 40 to 50 years). If the level of development reaches 500 productive well pads, 7,363 acres of short-term disturbance and 1,382 acres of long-term disturbance would occur.

This alternative includes a number of standard measures designed to protect sensitive resources (see Table 2-8) including all of the measures described in Section 2.5.5 and contained in Appendix A.

2.7.2 Resource Protection Alternative on Federal Lands and Minerals. The purpose of this alternative is to implement the following on Federal lands and minerals:

- allow maximum economic recovery of natural gas from the leaseholds;
- preserve, to the extent practicable and reasonable, unique and valuable characteristics of the natural resources present in the PAPA;
- develop mitigation measures, where practicable and reasonable, to offset impacts which cannot be avoided;
- develop monitoring programs to assure that predictions made regarding impacts associated with this alternative are not understated and to allow for early resolution of unpredicted impacts; and
- establish a mechanism by which the public can have continual and meaningful input into development in the PAPA.

Many of the issues raised by the WGFD and public during scoping and during the workshops involved the need to minimize surface disturbance and human presence (seasonally) in certain areas of the PAPA. Examples of these areas include, but are not limited to:

- big game winter ranges (minimize habitat loss and human presence during winter);
- sensitive viewshed (minimize visual impacts by reducing surface disturbance);
- sage grouse nesting habitat (minimize nesting habitat loss and human presence during strutting and nesting); and
- the Lander Trail viewshed (minimize visual impacts by reducing surface disturbance).

The RP Alternative was designed to evaluate options that would result in reduced surface disturbance and human presence in these types of areas. Two options are addressed - pad drilling and centralized production facilities. Both options could be used to significantly reduce human presence as well as surface disturbance in sensitive areas. However, it is important to point out that there is not agreement among the operators that either of these options can be successfully implemented on a large scale in the PAPA without adversely affecting their ability to achieve maximum ultimate recovery. BLM agrees with the operators that much more remains to be learned before it can be demonstrated that these options can be implemented in a cost-effective manner.

The differences between the SS and RP alternatives are not solely based on the size or level of the development, but rather how quickly, where and to what extent the disturbance would be allowed to occur.

These differences are best demonstrated by studying the alternative comparison on Table 2-8. For example, the RP Alternatives would continue to utilize the BLM's standard mitigation measure which establishes a 0.25-mile protective buffer around sage grouse leks. However, in addition the alternatives recommend a limit on increased noise at leks during their use period to no more than 10 decibels (dBA) above background between midnight and 9 a.m. In this specific case, surface disturbance associated with the SS and RP alternatives would be identical. But, the RP Alternatives would place limits on the noise associated with that disturbance. For big game winter ranges and high quality sage grouse nesting habitat, no more than 4 well pads/section would be allowed on Federal lands and minerals under the RP Alternatives. In the Mesa Breaks (Management Area 2 - see Figure 2-11), the RP Alternatives recommend no well pads or roads and the operators would be required to directionally drill bottomholes under all of this very important deer winter habitat. In both of these examples, the RP Alternatives would result in less surface disturbance than the SS Alternative.

The RP Alternatives would significantly expand protection of the Lander Trail by reducing potential impacts to the trail's setting from 0.25 to 1.5 miles on either side of the trail. This alternative would expand the current BLM 0.25 mile buffer around occupied dwellings to include all lands zoned as residential by Sublette County or from subdivisions currently approved by Sublette County. Visual resource protection would be expanded to include the entire

Sensitive Viewshed SRMZ, not just the Visual Resource Management Class II area. The Programmatic Agreement provides for the development of a trails management plan in consultation with the Oregon California Trails Association (OCTA), NPS and SHPO to further direct proactive historic trails management efforts.

BLM received several comments during scoping expressing concerns regarding the pace of development in the project area. One obvious way to reduce impacts would be to stagger development over time. Slowing down the pace of projected development, while extending the development period, would:

- reduce the number of workers in the project area;
- decrease impacts from traffic;
- reduce the amount of disturbance left unreclaimed at any time; and
- reduce emissions from drilling equipment.

The operators have noted that slowing the pace could adversely affect project economics, particularly for pipelines. However, BLM can regulate the manner and pace of development.[8] In fact, the Interior Board of Land Appeal (IBLA), based on 42 U.S.C. 4322(2)(E), considered staggering development over time an *"obvious alternative"*.[9] The RP Alternatives would limit the number of rigs working in the PAPA at any one time (on Federal and non-Federal lands and minerals combined) to no more than 5. In addition, no more than 2 rigs would be allowed to work at any one time on new locations in the SRMZs on the Mesa. Rigs drilling wells on pad locations would be excluded from the 2 rig limit in the SRMZs. BLM recognizes the inherent difficulty in determining which of the operators would be allowed to drill when. BLM also recognizes that the agency can do nothing to control the pace of development on non-Federal lands and minerals. None-the-less, as is shown in Chapter 4 and as was suggested during public scoping and the workshops, many of the impacts could be significantly reduced by slowing the pace of development. It is therefore appropriate to present to the public in this EIS the benefits associated with this "*obvious alternative*".

As with the SS Alternative, no provisions are included in the RP Alternatives to drill in areas with seasonal constraints during closed periods (i.e., big game crucial winter range between November 15 and April 30 and sage grouse nesting habitat and leks between March 1 and June 30). No information is currently available to suggest that waiving the seasonal constraints in the project area would not be detrimental to the resources the seasonal restrictions are intended to protect.

2.7.3 Resource Protection Alternative on All Lands and Minerals. Many of the sensitive resources in the PAPA are found on non-Federal lands and minerals (see Table 2-6). Significant impacts to the environment could occur from further exploration and development in the PAPA regardless of controls imposed by BLM because of the impacts that would occur on non-Federal lands and minerals and the inability of agencies to reduce or offset these impacts. This alternative is being analyzed in detail in compliance with the regulations for implementing NEPA. CEQ questions and answers about the NEPA regulations (1981) states at 2(b), "*An alternative that is outside the legal jurisdiction of the lead agency must still be analyzed in the EIS if it is reasonable.*" The emphasis is on what is reasonable. Because the PAPA contains private and state land, the impact analysis must consider the impacts to these lands. Some of the most sensitive resources in the PAPA (moose crucial winter range, wetlands, 100-year flood plain, etc.) are located almost entirely on non-Federal lands and minerals. CEQ regulations require that all relevant, reasonable mitigation measures that could improve the project are to be identified, even if they are outside the jurisdiction of the lead agency or the cooperating agencies, and would thus not be committed as part of the RODs of these agencies. This is intended to alert agencies or officials who can implement these extra measures, and will encourage them to do so. Because the EIS is the most comprehensive environmental document, it is an ideal vehicle in which to lay out not only the full range of environmental impacts but also the full spectrum of appropriate mitigation (see CEQ questions and answers #19b).

This alternative would apply RP Alternative mitigation measures developed for Federal lands and minerals to all lands in the PAPA. Obviously, operator compliance with any of these recommendations would be strictly voluntary on non-Federal lands and minerals.

State mineral leases in Wyoming are managed by the Office of State Lands and Investments (State Lands). State Lands has recognized that state leases were not issued with any specific stipulations

[8] Wyoming Outdoor Council, 147 IBLA 105 (1998).

[9] Powder River Basin Resource Council, 120 IBLA 47 (1991).

regarding development in areas like the PAPA (see Appendix C - Letter 1). However, State Lands has asked the operators to accommodate, where possible, direct environmental concerns for state mineral land locations. Specifically, State Lands has asked the operators to provide *"consideration...for concerns over development closer than a quarter mile of the Lander Cut-off Trail...or critical winter range drilling activity, or drilling within a quarter mile of sage grouse leks during strutting and nesting"*.

2.7.4 Options for Reducing Surface Disturbance and Human Presence. It is anticipated that the operators would have a choice between which of the options discussed in this section would be applied on-the-ground if the ROD requires reduced surface disturbance and human presence in portions of the PAPA. In other words, if the ROD dictates reduced surface disturbance and human presence in any of the management areas, the operators would then decide, based on site-specific characteristics and in consultation with the BLM, how to achieve the reduced surface disturbance and human presence. Site-specific characteristics may make one option more attractive. For instance, the centralized production facilities (CPF) option requires the CPFs to be located downhill of the well pads. If the operators are required to place a CPF uphill of well pads, pumps and perhaps compression at individual well pad locations may be required. This equipment at the well pads would require daily inspection which would effectively defeat a major environmental benefit of this option. A great deal of flexibility will be required by the operators, the BLM and cooperating agencies and the public if reduced surface disturbance and human presence is to be effectively achieved in sensitive areas in the PAPA.

As is shown on Table 2-8, the RP Alternative recommends reduced well pad density in a number of areas to reduce surface disturbance and human presence. As was stated earlier, well pad density reduction would have to be accomplished on Federal lands and minerals without restricting the operator's ability to develop the leases[10]. Originally, it was believed that the only effective way to achieve reduced surface disturbance and human presence was to directionally drill a number of wells from a single well pad (pad drilling). Indeed, before this EIS was initiated, Ultra held numerous discussions with the public and environmental groups about future development in the PAPA based on the premise that protection of environmental resources in the PAPA would be achieved using pad drilling. However, after further investigation Ultra suggested that an equally effective way to achieve the same environmental benefits (and perhaps more) would be to develop sensitive areas utilizing centralized production facilities. Chapter 4 presents the impacts of both options. Pad drilling and CPF are explained below:

Pad Drilling Option. To determine the level of well density necessary to allow the operators to develop the leases, BLM evaluated the technical feasibility of drilling and completing directionally drilled bottomholes in the project area. The analysis assumed that the drainage characteristics of the tight sands may require the operators to drill a well into each 40-acre spaced bottomhole (i.e., 16 wells per section). In other words, without 40-acre spaced bottomholes, the operators may not be able to remove all of the leased resource in a leasehold.

Limited directional drilling has been used in the project area to date. Success has been variable. Both BP Amoco and Ultra have had difficulties drilling and completing directional holes in the anticline area and in Jonah. However, McMurry completed the Jensen #4 well which consisted of a deviated bottomhole of nearly 1,170 feet. McMurry avoided the problems encountered by the other operators by installing an intermediate casing string in the well bore. This intermediate casing string prevented the well bore from collapsing and allowed for relatively trouble-free completion of the well. However, installing the intermediate casing string increased the cost of the well by approximately $250,000. McMurry voluntarily directionally drilled the Jensen #4 to avoid placing the surface well pad in or adjacent to the New Fork River. From an upland location, McMurry was successful in locating the bottomhole under the river.

From a technical feasibility standpoint (economic questions still remain), McMurry's success with the Jensen #4 suggests that it is probable that the PAPA could be developed with as few as 4 well pads per section. WOGCC rule [Chapter 3, Section 2(a)] allows the operators to place a well (bottomhole) within 200 feet from the center of a 40-acre spot in any direction (400 foot window). However, spacing

[10] 43 CFR 3101.1-2 addresses surface use rights associated with a Federal oil and gas lease. That section states *"A lessee shall have the right to use so much of the leased lands as is necessary to explore for, mine, extract, remove and dispose of all the leased resources in the leasehold subject to: Stipulations attached to the lease; restrictions deriving from specific nondiscretionary statutes; and such reasonable measures as may be required by the authorized officer to minimize adverse impacts to other resource values, land uses or users not addressed in the lease stipulations at the time operations are proposed"*.

exceptions could be granted to permit further moves. If a well pad was placed in the center of each quarter section (4 well pads per square mile), the deviation required for a directional hole to reach each 40-acre spaced bottomhole in that quarter section would be approximately 930 feet. Because much of the area is unexplored, the operators may choose not to drill the first well in an unexplored area in the center of the quarter section. The operator may choose to drill the first well over a quarter-quarter spot as a conventional (straight) hole. This would reduce their dollar loss if the area proved uneconomical and offset wells were not drilled. If economic reserves were discovered by this first well, offset wells using pad drilling would require approximately 1,866 foot and 1,320 foot deviations. Using this information, BLM believes that limiting the number of well pads (surface locations) to no more than 4 per section may still allow the operators to develop all the leased resources.

However, economic questions which remain to be answered could make directional drilling unreasonable. Difficulties with some directional wells drilled in the PAPA suggest that directional drilling may be difficult, expensive and risky. If these economic hurdles cannot be overcome, reserves will remain left in the ground and maximum ultimate recovery of the reserve would not be accomplished if well pad density is restricted to 4 per section.

BLM previously imposed a general limit of 4 well pads per section in the Moxa Arch Field. Moxa was analyzed at an average of 4 wells per section with up to 8 wells per section in some areas. In the ROD for the Expanded Moxa Arch Area Natural Gas Development Project (BLM, 1997b), BLM concluded that well field development in excess of 160-acre spacing (i.e., 4 well pads per section) would cause adverse impacts to wildlife and wildlife habitat. As a result, BLM placed limits on the number of well pads allowed within each of 4 crucial winter range zones to avoid unnecessary and undue adverse impacts from development. The Moxa Arch ROD states "*within crucial winter range, once four pads exist within a section, consideration for drilling additional wells from an existing pad will be evaluated*". In Moxa Arch, if an operator desired to construct more than 4 well pads in a section, the operator would first be required to submit technical and economic justification as to why the additional wells could not be drilled directionally from an existing well pad. BLM would then perform an independent evaluation of the operator-submitted information. The additional well pads would be allowed only if the BLM determines that drilling the well from an existing pad is not technically or economically feasible.

In the Green River Resource Area RMP (BLM, 1992), pad drilling was also proposed. In the Wind River Front Special Recreation Management Area, the BLM recommended *"designing multiple wells and production facilities to occupy one disturbed site"* as a means to reduce visual, recreation and other impacts (see Section 4.7.3).

The economic feasibility of limiting the number of well pads in the project area to no more than 4 per section remains a concern with the operators. Ultra estimates that the typical cost of drilling and completing a straight hole well in the PAPA is about $2.5 million whereas a directionally drilled hole costs about $3 million (or about $500,000 more to drill and complete a directional hole). McMurry reported that directionally drilling the Jensen #4 well cost over $250,000, or about half of Ultra's estimate. By limiting the number of well pads per section to 4, BLM would require the operators to drill up to 4 bottomhole locations from a single well pad in areas where 40-acre spacing is required to adequately drain the reservoir (totaling 12 directional wells/section). If 80-acre spacing is sufficient to drain the reservoir, 2 wells would be drilled from each well pad (totaling 8 directional wells/section). Either scenario would be defined as pad drilling.

Ultra has provided preliminary economics for pad drilling in the PAPA. Ultra estimates that the cost of drilling and completing 4 straight hole wells in the project area (not pad drilling) to be approximately $10 million. Drilling and completing 4 wells from a single well pad (i.e., pad drilling) would cost the operators about $11.5 million (assuming the first well is conventional and the other 3 are directional at an additional cost of $500,000 for each directional well). However, the operators could realize savings on site preparation as well as the cost of production facilities if pad drilling was used. For instance, site preparation costs would be reduced from $200,000 for 4 straight hole wells to about $75,000 for a single well pad from which 4 wells would be drilled. Similarly, the costs of production equipment would decrease from about $560,000 to $300,000 from the use of common production facilities, possibly leading to a savings of $260,000 per pad location. Given that a pad location with multiple wells has never been drilled in the PAPA, Ultra has stated that their estimates are "best case". If Ultra's cost estimates prove to be correct, an additional $1.15 million could be required for every

pad location with 4 successful well bores (or about $280,000 extra per well). Ultra has concluded that if, in fact, the estimated cost savings from common production facilities were proven and the anticipated cost increases from directional drilling were partially offset by savings, the additional cost per well associated with pad drilling could average approximately 10 percent, but this would only occur after substantial industry experience with directional drilling in the PAPA. According to Ultra's preliminary estimates, the cost of finding and producing gas in the project area would increase from $0.50 to $0.55/MCF if pad drilling is required. Other operators have taken exception to Ultra's preliminary estimate.

BLM has independently evaluated the feasibility of pad drilling in the project area (see Appendix D). The BLM's Reservoir Management Group (RMG) concluded that there are no geologic or physical reasons to preclude directional drilling in the project area. RMG suggested that at today's gas prices, some directional well requirements at 80-acre spacing are expected to be economic but would have to be addressed on a well-by-well basis. The RMG was asked to specifically address the question - "if drilling is limited to 4 well pads per section, would a directional drilling requirement cause additional wells to not be drilled due to economics"? Their response can be found in Appendix D on page 4. RMG concluded "Analysis shows that at the present price of $2.00 per million cubic feet of gas, vertical wells with projected recoverable gas reserves of 3.35 billion cubic feet would be marginally economic to drill. Directional wells with projected recoverable gas reserves of 3.95 billion cubic feet would not be economic to drill".

Well Location Size. If the RP Alternatives are adopted, in some locations in the PAPA only 4 well pads would be allowed in each section. Obviously, because 4 wells would be drilled from each well pad, the size of the pad drilling well pads would need to be increased. Ultra and McMurry have stated that the pad drilling well pads would need to be about 5 acres in size. To some degree the size of the pad drilling well pads would depend on how far each well is spaced from the adjacent well on the pad. Ultra has suggested that spacing between the wells could be as little as 25 feet, whereas McMurry suggested that it may be necessary to space individual wells as far as 100 feet apart. Because of these and other questions, the configuration and actual size of these pad drilling well pads cannot be determined at this time. However, for purposes of this analysis, it was assumed that the well pads associated with pad drilling would be 5 acres in size during drilling and reduced to about 2.5 acres in size during production.

Using the assumptions provided above, Tables 2-11 and 2-12 provide estimates of disturbance associated with the RP Alternatives using the pad drilling option for the 700 and 500 well pad levels of development. These tables estimate the acres of disturbance using a combination of conventional and pad drilling techniques. For purposes of the estimates, the tables assume that the operators would develop about 50 percent of the wells in the PAPA using pad drilling with 4 wells/well pad. The remaining wells would be developed using conventional drilling. As was discussed before, it is impossible to accurately estimate what percentage of wells would be drilled using pad drilling because it is not known where economically recoverable reserves will be discovered in the future. The estimates on Tables 2-11 and 2-12 are designed to show only one of many ways that development under the RP Alternative could proceed. It would not be appropriate to compare disturbance estimates for the RP Alternatives (Tables 2-11 and 2-12) with those prepared for the SS Alternative (Tables 2-9 and 2-10). The assumptions used to determine what portion of the project area would be developed using pad drilling are too general to allow for meaningful comparison.

It is anticipated that daily inspections and hauling of condensate and water would be required from each of the pad drilling well pads regardless of season. These activities would comply with BLM's current seasonal restrictions which do not seasonally-restrict operational and maintenance activities (see Section 2.5.5). Ultra has estimated that approximately 10 trips monthly would be necessary to haul condensate and 8 trips monthly to haul water from each of the pad drilling well pads.

Centralized Production Facilities. Some of the operators, in particular Ultra, have investigated other opportunities for reducing impacts to sensitive resources which may be more cost effective and less risky than pad drilling. Ultra believes that the use of centralized production facilities represents an opportunity to both reduce the costs and risks associated with directional drilling and provide a higher level of environmental protection than conventional development or pad drilling. From Ultra's perspective this option is attractive because it could allow up to 16 conventional wells to be drilled in a section. Ultra has stated that development using

Table 2-11
Summary of Project Components and Disturbance Associated with the 700 Productive Well Pad Level of Development and the Resource Protection Alternatives Using the Pad Drilling Option

Disturbance Type	Number or Miles	Short-Term Disturbance Factor	Long-Term Disturbance Factor	Short-Term Disturbance	Long-Term Disturbance
Producing single well pads	340	3.7 acres/well	1.5 acres/well	1,258 acres	510 acres
Producing well pads with multiple wells	90	5 acres/well	2.5 acres/well	450 acres	225 acres
Dry hole well pads	200	3.7 acres/well	0 acres/well	740 acres	0 acres
Collector roads (1)	6.0	3.9 acres/mile	1.9 acres/mile	58 acres	28 acres
Local and resource roads with adjacent gathering pipelines (2), (3)	190	8.5 acres/mile	2.9 acres/mile	1,615 acres	551 acres
Resource roads for dry holes (4)	80	4.8 acres/mile	0 acres/mile	384 acres	0 acres
Compressor sites	3	7 acres	7 acres	21 acres	21 acres
Sales pipeline	119.9	24.24 acres/mile	0 acres/mile	2,906 acres	0 acres
BP Amoco Field Office			5 acres	5 acres	5 acres
Total				7,437 acres	1,340 acres

1 = Assumes construction of approximately 6 miles of new collector road (Anticline Crest and Industrial Park roads) requiring 52-foot of disturbance for construction and 36-feet of long-term disturbance.
2 = Assumes 0.4 miles of road and gathering pipeline for single well pads, 70-foot disturbance width for joint road and pipeline and a long-term disturbance width of 24 feet.
3 = Assumes 0.6 mile of road and gathering pipeline for each pad drilling site, 70-foot disturbance width for joint road and pipeline and a long-term disturbance width of 24 feet.
4 = Assumes 0.4 miles of resource road needed to access each dry hole well pad with a disturbance width of 40-foot with roads being reclaimed immediately after well pad reclamation.

Table 2-12
Summary of Project Components and Disturbance Associated with the 500 Productive Well Pad Level of Development and the Resource Protection Alternatives Using the Pad Drilling Option

Disturbance Type	Number or Miles	Short-Term Disturbance Factor	Long-Term Disturbance Factor	Short-Term Disturbance	Long-Term Disturbance
Producing single well pads	260	3.7 acres/well	1.5 acres/well	962 acres	390 acres
Producing well pads with multiple wells	60	5 acres/well	2.5 acres/well	300 acres	150 acres
Dry hole well pads	150	3.7 acres/well	0 acres/well	555 acres	0 acres
Collector roads (1)	6.0	6.3 acres/mile	4.4 acres/mile	38 acres	26 acres
Local and resource roads with adjacent gathering pipelines (2), (3)	140	8.5 acres/mile	2.9 acres/mile	1,190 acres	406 acres
Resource roads for dry holes (4)	60	4.8 acres/mile	0 acres/mile	288 acres	0 acres
Compressor sites	3	7 acres	7 acres	21 acres	21 acres
Sales pipeline	119.9	24.24 acres/mile	0 acres/mile	2,906 acres	0 acres
BP Amoco Field Office			5 acres	5 acres	5 acres
Total				6,265 acres	998 acres

1 = Assumes construction of approximately 6 miles of new collector road (Anticline Crest and Industrial Park roads) requiring 52-foot of disturbance for construction and 36-feet of long-term disturbance.
2 = Assumes 0.4 miles of road and gathering pipeline for single well pads, 70-foot disturbance width for joint road and pipeline and a long-term disturbance width of 24 feet.
3 = Assumes 0.6 mile of road and gathering pipeline for each pad drilling site, 70-foot disturbance width for joint road and pipeline and a long-term disturbance width of 24 feet.
4 = Assumes 0.4 miles of resource road needed to access each dry hole well pad with a disturbance width of 40-foot with roads being reclaimed immediately after well pad reclamation.

This option would centralize at one location production equipment commonly found at each well pad. The analysis in this EIS assumes that 2 levels of CPF are used in the PAPA - 1 CPF for every 16 well pads (1 CPF per square mile) and 1 CPF for every 8 well pads (2 CPFs per square mile). The CPFs may be located at 1 or 2 well pads in the section or they may be located off well pads altogether. A conceptual schematic plot plan of a centralized production facility is shown on Figure 2-12.

Basically, the equipment at each CPF would be similar to the equipment currently found on well pads in the PAPA. The major difference is the number and capacity of the equipment. The equipment at the CPF would need to be sized to test, separate, dehydrate and store the flow from 8 or 16 wells rather than from an individual well. A list of the types of equipment which Ultra believes may be required at each CPF is provided below:

1 CPF per section (1 CPF/16 wells)	**2 CPFs per section (1 CPF/8 wells)**
2 - 8 well manifolds	2 - 8 well manifolds
4 - test separators	4 - test separators
4 - test dehydrators	4 - test dehydrators
4 - 16 production separators	4 - 16 production separators
4 - 16 production dehydrators	4 - 16 production dehydrators
1 - 2 meter runs	2 - 4 meter runs
1 - 10,000 barrel production tank	1 - 5,000 barrel production tank
1 - 8,000 barrel water tank	1 - 3,000 barrel water tank
5 - 100 barrel dehy tubs	5 - 100 barrel dehy tubs
1 - 400 barrel methanol tank	2 - 400 barrel methanol tank
automation equipment	automation equipment
combustor, vapor recovery or stabilizer	combustor, vapor recovery or stabilizer

One of the primary environmental advantages of CPF is the elimination of production equipment at each well pad. Generally, eliminating production equipment from the well pads has 4 environmental advantages:

- reduces the need for daily equipment inspections at well pads, thereby minimizing the need to keep roads open to well pads year long;
- eliminates the need for hauling of condensate and water from individual well pads, thereby eliminating the need to keep roads open to well pads year long;
- allows for much reduced long-term impacts at well pads (from about 1.5 to less than 0.5 acres); and
- makes the well pads much less visible.

Ultra believes that the only equipment that would need to remain at each well pad would be the well head and T-Pack. Because no equipment would be needed on site, the operational well pad size could be significantly reduced. Conventional operating well pads in the PAPA would be approximately 1.5 acres. Under the CPF, the well pads would be reclaimed to 0.5 acres or less during operations. The roads to the well pads would only be lightly traveled. Because of the lack of traffic to the well pads under this option, Ultra has suggested that it may be possible to actually seed the road travelway during the operational life of the well to further reduce long-term vegetative loss. The roads could be gated and locked to prevent increased vehicle and human intrusion into areas adjacent to the well pads.

Flow from the well head would be piped to the CPF where all other production operations (testing, separation, dehydration, metering, etc.) would be performed. A return line for methanol from the CPF to each well pad would be necessary.

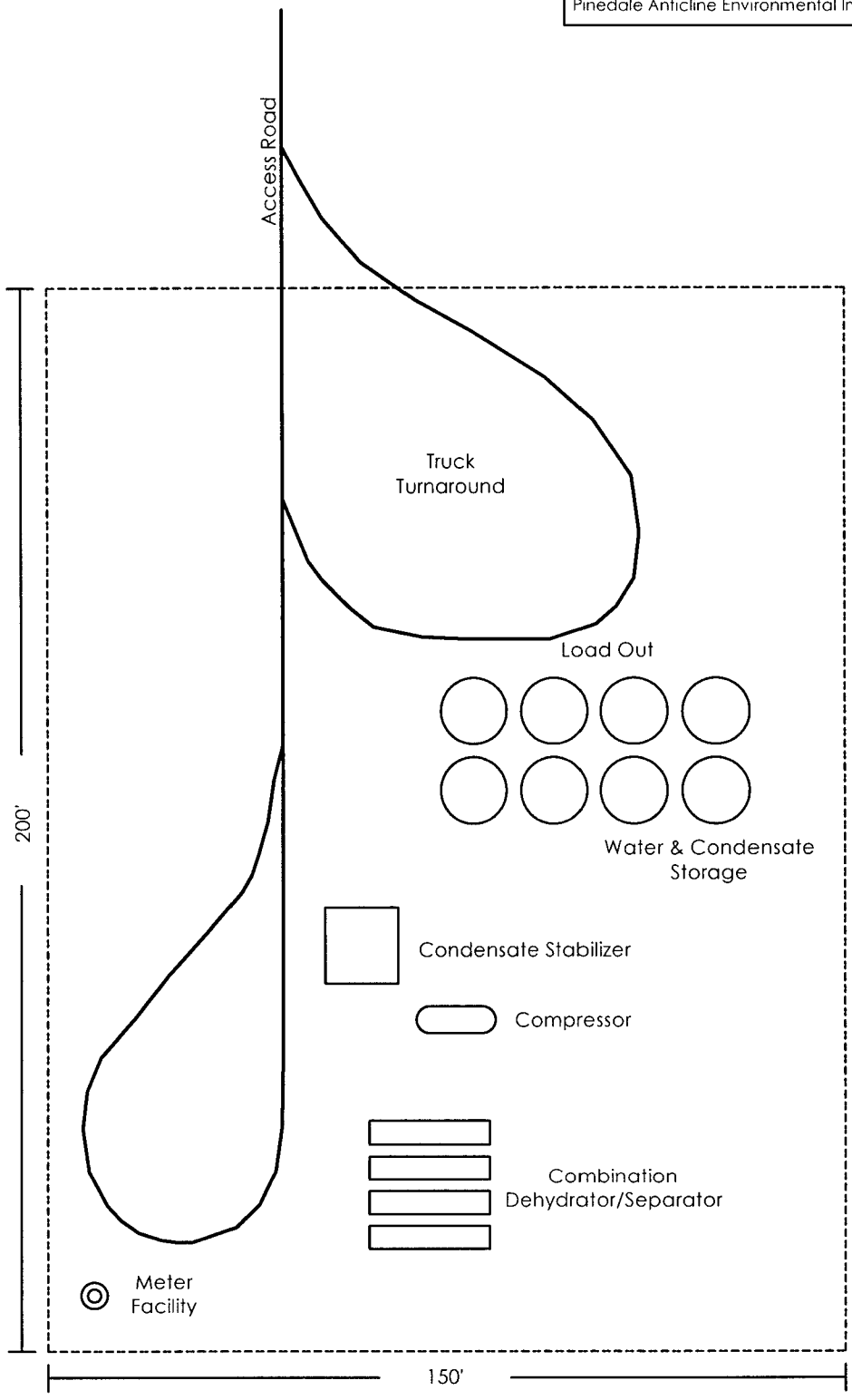
Each CPF would occupy an area of about 5 acres and would generally need to be located at the lowest elevation in reference to the well pads piped to the CPF. Being downhill would reduce the need for pumps to move fluids. Water and condensate would need to be hauled from the CPFs on a daily basis. According to Ultra, 35 to 40 loads of condensate and 25 to 30 loads of water would be hauled from each CPF monthly for the 1 CPF/16 well pad options. Ultra has stated that power is not necessary at the CPFs but may be installed if adjacent power is readily available.

Perhaps the biggest environmental advantage to the CPF option is the elimination of the need to inspect each well pad on a daily basis and to haul condensate and water from the locations (daily inspections and hauling of condensate and water would still be required at each of the CPFs). This is the only alternative identified and evaluated in this EIS that significantly reduces the impacts to wintering big game and other seasonally sensitive resources in the PAPA. Even though the pad drilling option would concentrate human activities in the PAPA, that option would still require daily inspections and hauling of condensate and water from at least 4 well pads per

Figure 2-12

Conceptual Schematic Layout for a Centralized Production Facility

Pinedale Anticline Environmental Impact Statement



square mile. The SS Alternative would require daily inspections and hauling of condensate and water from up to 16 well pads per section. In contrast, the CPF option could restrict daily inspections and hauling of condensate and water to only 1 or 2 locations in each square mile except for emergency situations. To avoid any confusion, the operators have specifically defined what constitutes an emergency situation:

- blowouts or other unplanned, uncontrolled releases of gas, condensate, or other substances;
- medical emergencies;
- critical equipment repairs, such as casing/tubing/packer repairs, wellhead valves repair/replacement, flow lines repairs, etc.
- natural disasters, such as severe storms, floods, fires, or earthquakes; and
- loss of production.

The frequency of these visits is difficult to determine since they all involve unplanned events and the production characteristics of the reservoirs in the project area are not currently understood. The operators estimate that it may be necessary to visit approximately 5 percent of the well pads each winter. Given the estimates of 500 to 700 producing well pads, this would result in 1 visit to approximately 25 to 35 well pads per winter season. The duration of the visits will ultimately depend on the circumstances. It is anticipated that initial visits would be of relatively short duration once the problem has been ascertained. The operators believe it would be possible in most circumstances to visit the well pads long enough to address the situation and secure the well pads in less than approximately two 8 hour days. In less than 1 percent of the cases, longer visits may be required or return visits may occur. Given the estimates of 500 to 700 producing well pads, this scenario would result in "human intrusion" for approximately 400 to 560 hours per winter season throughout the entire project area. Any such emergency visits would be coordinated with the BLM.

These numbers are only approximations based on the operator's previous experience with similar production operations. Visits to individual well pads may be less than 25 to 35 per season, or more. Duration of visits to well pads may be less than 16 hours, or more. These numbers will be dependent on the number of wells ultimately drilled in the project area, the production characteristics of the reservoirs, and circumstances beyond the operator's control. During non-critical periods the operators would be free to visit the well pads as frequently as necessary.

It is particularly difficult to predict what disturbance might be associated with developing part of the PAPA using CPF. Approximations, using very general assumptions, are provided on Tables 2-13 and 2-14. Like the pad drilling estimates (see Table 2-11 and 2-12), these tables assume that about half the PAPA would be developed using CPF. The tables also assume that about half the CPFs would support 8 well pads and the remainder would support 16 well pads. As was discussed before, it is impossible to accurately estimate what percentage of wells would be dedicated to CPF because it is not known where economically recoverable reserves will be discovered in the future. Little is understood about the economic feasibility of this option in the PAPA. The estimates on Tables 2-13 and 2-14 are designed to show only one of many ways that development under the RP Alternative could proceed using the CPF option. Again, the assumptions used to determine what portion of the project area would be developed using CPF are too general to allow for meaningful comparison with the other alternative disturbance tables (Tables 2-9 through 2-12).

It is important to note that the operators have not installed CPF in the PAPA to date and many questions remain about how this option would be implemented. BP Amoco uses a type of CPF in its Wamsutter Field in southwestern Wyoming. However, its application in the PAPA needs further study.

2.8 Royalty Rate Reduction

The Federal government collects a substantial royalty from production of Federal mineral interests. This royalty is 12.5 percent of the value of production removed or sold. However, 43 CFR Part 3103.4-1 provides provisions for reducing Federal royalty. That regulation states "*in order to encourage the greatest ultimate recovery of oil or gas and in the interest of conservation, the Secretary, upon a determination that it is necessary to promote development or that the leases cannot be successfully operated under the terms provided herein, may waive, suspend or reduce the rental or minimum royalty or reduce the royalty on an entire leasehold, or any portion thereof.*" To date, royalty reductions have been applied for reasons other than protecting the environment (*i.e.*, stripper wells). However, it has been suggested by some operators that reduced Federal royalties might be

Table 2-13
Summary of Project Components and Disturbance Associated with the 700 Productive Well Pad Level of Development and the Resource Protection Alternatives Using the Centralized Production Facilities Option

Disturbance Type	Number or Miles	Short-Term Disturbance Factor	Long-Term Disturbance Factor	Short-Term Acres Disturbance	Long-Term Acres Disturbed
Producing single well pads	340	3.7 acres/well	1.5 acres/well	1,258 acres	510 acres
Producing CPF well pads	360	3.7 acres/well	0.5 acres/well	1,332 acres	180 acres
Dry hole well pads	200	3.7 acres/well	0 acres/well	740 acres	0 acres
CPFs	30	5.0 acres/CPF	5.0 acres/CPF	150 acres	150 acres
Collector roads (1)	6.0	3.9 acres/mile	1.9 acres/mile	58 acres	28 acres
Local and resource roads with adjacent gathering pipelines (2),	280	8.5 acres/mile	2.9 acres/mile	2,380 acres	812 acres
Resource roads for dry holes (3)	80	4.8 acres/mile	0 acres/mile	384 acres	0 acres
Compressor sites	3	7 acres	7 acres	21 acres	21 acres
Sales pipeline	119.9	24.24 acres/mile	0 acres/mile	2,906 acres	0 acres
BP Amoco Field Office			5 acres	5 acres	5 acres
Total				9,234 acres	1,706 acres

1 = Assumes construction of approximately 6 miles of new collector road (Anticline Crest and Industrial Park roads) requiring 52-foot of disturbance for construction and 36-feet of long-term disturbance.
2 = Assumes 0.4 miles of road and gathering pipeline for each well pad, 70-foot disturbance width for joint road and pipeline and a long-term disturbance width of 24 feet. Assumes CPFs would be located at one of the well pads.
3 = Assumes 0.4 miles of resource road needed to access each dry hole well pad with a disturbance width of 40-foot with roads being reclaimed immediately after well pad reclamation.

Table 2-14
Summary of Project Components and Disturbance Associated with the 500 Productive Well Pad Level of Development and the Resource Protection Alternatives Using the Centralized Production Facilities Option

Disturbance Type	Number or Miles	Short-Term Disturbance Factor	Long-Term Disturbance Factor	Short-Term Disturbance	Long-Term Disturbance
Producing single well pads	260	3.7 acres/well	1.5 acres/well	962 acres	390 acres
Producing CPF well pads	240	3.7 acres/well	0.5 acres/well	888 acres	120 acres
Dry hole well pads	150	3.7 acres/well	0 acres/well	555 acres	0 acres
CPFs	20	5.0 acres/CPF	5.0 acres/CPF	100 acres	100 acres
Collector roads (1)	6.0	3.9 acres/mile	1.9 acres/mile	58 acres	28 acres
Local and resource roads with adjacent gathering pipelines (2),	200	8.5 acres/mile	2.9 acres/mile	1,700 acres	580 acres
Resource roads for dry holes (3)	60	4.8 acres/mile	0 acres/mile	288 acres	0 acres
Compressor sites	3	7 acres	7 acres	21 acres	21 acres
Sales pipeline	119.9	24.24 acres/mile	0 acres/mile	2,906 acres	0 acres
BP Amoco Field Office			5 acres	5 acres	5 acres
Total				7,483 acres	1,244 acres

1 = Assumes construction of approximately 6 miles of new collector road (Anticline Crest and Industrial Park roads) requiring 52-foot of disturbance for construction and 36-feet of long-term disturbance.
2 = Assumes 0.4 miles of road and gathering pipeline for each well pad, 70-foot disturbance width for joint road and pipeline and a long-term disturbance width of 24 feet. Assumes CPFs would be located at one of the well pads.
3 = Assumes 0.4 miles of resource road needed to access each dry hole well pad with a disturbance width of 40-foot with roads being reclaimed immediately after well pad reclamation.

sufficient incentive for the operators to maximize protection of the environment in the project area.

As is discussed above, pad drilling would increase the operator's costs. The significance of this cost increase is not currently known but the operators have questioned the impact of the increased cost on overall project economics. Under pad drilling, one way to still protect the environment and continue to provide the operators with adequate economic incentive to develop the area would be to allow the operators to recover the additional costs of pad drilling over a number of years through reduced Federal royalties. BLM has investigated the possibility of granting Federal royalty rate reductions to provide the operators relief from the added expense of directionally drilling in the PAPA. The current regulations allow for royalty rate reduction when operating expense becomes excessive on existing properties. Congress would need to pass legislation to allow for royalty rate reduction to provide relief for excessive exploration and development costs. The BLM would consider exploration and development relief if Congress provides the statutory authority to do so.

2.9 Hazardous Materials

The operators have reviewed the EPA's Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 to identify any hazardous substances proposed for production, use, storage, transport or disposal by this project. The operators have also reviewed EPA's List of Extremely Hazardous Substances as defined in 40 CFR 355 and determined that numerous materials listed as hazardous and/or extremely hazardous would be used or generated by this project. Hazardous materials anticipated to be used or produced during the implementation of the project generally can be included in the following categories: drilling materials, casing and cementing materials, fracturing materials, production products, fuels, combustion emissions, and miscellaneous materials.

The operators and their contractors and subcontractors would comply with all applicable hazardous material laws and regulations and would locate, handle, and store hazardous substances in an appropriate manner to prevent them from contaminating sensitive resources.

A Hazardous Material Plan is provided in Appendix E. Any release of hazardous substances (leaks, spills, etc.) in excess of the reportable quantities established by 40 CFR Part 117 would be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). If the release of a hazardous substance in a reportable quantity does occur, a copy of the report would be furnished to the BLM and all other appropriate state and Federal agencies.

2.10 Additional Planning Requirements

Where required, operators would prepare and implement the following plans and/or policies:

- Spill Prevention, Control, and Countermeasure Plan for sites which have storage volumes above the threshold levels established by 40 CFR Part 112;
- spill response plans for condensate;
- an inventory of hazardous chemical categories listed in Section 312 of SARA;
- emergency response plans; and
- storm water pollution prevention plans as required by the Clean Water Act for disturbance of 5 acres or more.

2.11 Impact and Mitigation Monitoring and Reporting

Appendix F of this EIS contains a framework for an Adaptive Environmental Management Plan that would be adopted for this project. This framework was developed to:

- verify implementation of mitigation measures adopted in the ROD;
- measure the success rate of those mitigation measures;
- make appropriate modifications to mitigation based on actual performance;
- allow for peer review of mitigation and monitoring results; and
- provide feedback to the interested public.

This plan is consistent with EPA's recent recommendation for adopting an "Adaptive Environmental Management Plan" for the Continental Divide/Wamsutter II Project.

2.12 Applicant Committed Mitigation

The operators have committed to comply with Wyoming BLM's Mitigation Guidelines (see Appendix A) and the rules and regulations of regulatory agencies with jurisdiction over the operators activities. In addition, the operators have funded other programs that will reduce or allow better understanding of impacts from project-related activities. Ultra has funded wildlife studies to assess the distribution and migration of mule deer and antelope in the Upper Green River Basin. In addition, studies funded by Ultra will prove extremely beneficial to determining what habitat is important to nesting sage grouse. These wildlife studies, if funded long-term, have the potential of answering a number of questions that will help in better understanding wildlife interaction with oil and gas development.

Ultra, in cooperation with PacifiCorp, has voluntarily reduced overall NO_x emissions from the Naughton Power Plant. This reduction was intended to offset the impacts associated with development within the PAPA. More information about the effect of this reduction on Air Quality Related Values in southwestern Wyoming is provided in Chapter 5.

2.13 Comparison of Alternatives

Table 2-15 provides a comparison of impacts associated with each of the alternatives. Detailed descriptions of the impacts are found in Chapters 4 and 5.

Table 2-15
Comparison of Alternative Impacts

Standard Stipulations Alternative	RP Alternative on Federal Lands and Minerals	RP Alternative on All Lands and Minerals
An average of 8 drilling rigs working in the project area year-round.	No more than 5 rigs operating in the project area, only 2 of which would be allowed to work on new locations at any one time north of the New Fork River on Federal lands and minerals.	Same as RP Alternative on Federal Lands and Minerals
60 to 90 wells drilled in the project area annually	40 to 60 wells drilled in the project area annually.	Same as RP Alternative on Federal Lands and Minerals
At 500 and 700 well pads, between 7,363 and 9,064 acres of short-term disturbance, respectively.	At 500 and 700 well pads, between 6,265 and 7,437 acres of short-term disturbance, respectively, with the Pad Drilling Option; and between 7,483 and 9,234 acres of short-term disturbance, respectively, with the CPF Option.	Same as RP Alternative on Federal Lands and Minerals
At 500 and 700 well pads, between 1,382 and 1,914 acres of long-term disturbance, respectively.	At 500 and 700 well pads, between 998 and 1340 acres of long-term disturbance, respectively, with the Pad Drilling Option; between 1,244 and 1,706 acres of long-term disturbance, respectively, with the CPF Option	Same as RP Alternative on Federal Lands and Minerals
Significant positive impacts on local, state and Federal government revenues are expected.	Significant positive impacts on local, state and Federal government revenues are expected. However, it would take as much as 50 percent longer to collect those revenues because the number of wells drilled annually would be less.	Same as RP Alternative on Federal Lands and Minerals
A peak workforce of approximately 320 workers is expected.	A peak workforce of approximately 186 workers is expected.	Same as RP Alternative on Federal Lands and Minerals.
Project revenues are expected to exceed service and facility demands on local governments.	Same as SS Alternative	Same as SS Alternative
Peak daily round trip traffic level for heavy vehicles is estimated at 110.	Peak daily round trip traffic level for heavy vehicles is estimated at 60.	Same as RP Alternative on Federal Lands and Minerals
Peak daily round trip traffic level for light vehicles is estimated at 190.	Peak daily round trip traffic level for light vehicles is estimated at 80.	Same as RP Alternative on Federal Lands and Minerals
30 to 40 percent increase in daily traffic volume on U.S. Highway 191 if all traffic uses this highway.	14 to 24 percent increase in daily traffic volume on U.S. Highway 191 if all traffic uses this highway	Same as RP Alternative on Federal Lands and Minerals
Daily traffic volume on State Highway 351 would be tripled if all traffic uses this highway.	Daily traffic volume on State Highway 351 would be doubled if all traffic uses this highway.	Same as RP Alternative on Federal Lands and Minerals.
No change in level of service is expected for U.S. Highway 191 or State Highway 351.	Same as SS Alternative	Same as SS Alternative
Project Wide Scenario(PWS) - 249 potential well pad locations could be developed in the Residential Area SRMZ in the project area. Anticline Crest Scenario (ACS) - Fewer potential well pad locations are available.	PWS - 196 potential well pad locations could be developed in the Residential Area SRMZ in the project area. ACS - Fewer potential well pad locations are available.	No well pads would be developed in the Residential Area SRMZ.

Table 2-15
Continued

Standard Stipulations Alternative	RP Alternative on Federal Lands and Minerals	RP Alternative on All Lands and Minerals
PWS - 42 potential well pad locations would be located in subdivisions or subdivided lands in the project area. ACS - Only 10 potential well pad locations would be within subdivisions or subdivided areas.	PWS - On Federal lands and minerals, no well pads would be developed within 0.25 mile of subdivisions or subdivided lands. However, 42 potential well pad locations could be developed in subdivisions or subdivided lands on non-Federal lands and minerals. ACS - Only 10 potential well pad locations would be within subdivisions or subdivided areas.	Potential well pad locations would not be developed within 0.25 mile of subdivisions or subdivided lands throughout the project area.
PWS - 51 potential well pad locations would be in areas zoned by Sublette County for residential use. ACS - Only 2 potential well pad locations would be within residential zones.	PWS - On Federal lands and minerals, no well pads would be developed within 0.25 mile of areas zoned as residential by Sublette County. However, 51 potential well pad locations could be developed in areas zoned by Sublette County for residential on non-Federal lands and minerals. ACS - Only 2 potential well pad locations would be within residential zones.	Potential well pad locations would not be developed within 0.25 mile of areas zoned for residential use by Sublette County.
Wells would not be drilled within 0.25 miles of a residence on Federal lands. Wells could be drilled within 350 feet of residence on non-Federal lands and minerals.	Same as SS Alternative	Wells would not be drilled with 0.25 mile of residences.
PWS - Significant impact to dispersed recreation use could occur along the Pinedale South Road and Mesa Road. ACS - Impacts to dispersed recreation would be greatly reduced.	Same as SS Alternative	Same as SS Alternative
Significant impact could occur to a small portion of the Wind River Front Special Recreation Management Area.	Impacts to the Wind River Front Special Recreation Management Area would be insignificant.	Same as RP Alternative
VRM Class II - Well pad placement would be limited in VRM Class II areas so that no degradation of the visual integrity of the Class II area occurs. No significant impacts are anticipated in the Class II area. No limitations on non-Federal lands.	Same as SS Alternative	Same as SS Alternative

Table 2-15
Continued

Standard Stipulations Alternative	RP Alternative on Federal Lands and Minerals	RP Alternative on All Lands and Minerals
Sensitive Viewshed SRMZ - Up to 16 well pads/section with production facilities could be located in the Sensitive Viewshed SRMZ shown on Figure 3-10 outside VRM II areas. No development activities would be allowed on slopes in excess of 25 percent on Federal lands and minerals. Recreationists on the Mesa would have their viewshed significantly impaired. Development at this level of well pad density would result in a significant impact to the viewshed and impacts would be readily noticeable to casual observers in Pinedale, residential areas, and along U.S. Highway 191. Foreground visual impacts on non-Federal lands and minerals, with development at 16 pads/section, would also be significant and the natural landscape would be converted to an oil and gas development zone/setting. PWS - As many as 936 potential well pad locations could be developed in the Sensitive Viewshed SRMZ outside VRM II; ACS - As many as 311 potential locations could be developed in the Sensitive Viewshed SRMZ outside VRM II.	Sensitive Viewshed SRMZ - Up to 4 well pads/section with production facilities could be located in the Sensitive Viewshed SRMZ shown on Figure 3-10 outside VRM II areas but production facilities would be designed so that they would, for the most part, not be visible. Pad Drilling could be an inherent part of this RP Alternative. Development at this level would significantly reduce impacts to the integrity of the viewshed on Federal lands and minerals but no change in impact on non-Federal lands and minerals. However, recreationists on the Mesa would still have viewsheds impaired, but at a reduced scale. CPFs - Impacts would be further reduced over the long-term under the CPF option where CPFs could be located out of sight in the SRMZ. Impacts on non-federal lands and minerals would still be significant, but would be further reduced over the long-term under the CPF option. No development activities would be allowed on slopes in excess of 15 percent on Federal lands and minerals. Impacts on Federal lands and minerals would be less obvious than impacts in foreground views on non-Federal lands and minerals. Visual impacts on Federal lands and minerals would not be noticeable to casual observers in Pinedale, residential areas, and along U.S. Highway 191 as long as every effort is made to comply with recommendations to reduce visual impairment. ACS - CPFs should reduce visual impacts markedly in the long-term under the ACS.	This alternative would significantly reduce impacts to visual resources. Under this alternative, no more than 4 well pads/section with production facilities would be allowed anywhere in the Sensitive Viewshed SRMZ and production facilities would be designed so that they would, for the most part, not be visible.
PWS - Direct impacts could occur to the Lander Trail. A significant change in the setting of the trail could occur. ACS - Less change is expected under the ACS.	PWS - Direct impacts could occur to the Lander Trail on non-Federal lands. On Federal lands and minerals, a change in the setting of the trail could occur, but this change would be reduced by screening well pads so no more than 2 are visible/section where possible; with CPFs 2 visible pads allowed if CPFs are not visible eliminating the need for tanks at well pads. The impact to the setting would still be considered significant. ACS - Less change is expected under the ACS.	No direct impact would occur to the Lander Trail. The impact to the setting would still be considered significant.
No significant impact should occur to cultural resources on Federal lands and minerals because of requirements for compliance with Section 106 of the NHPA and the ARPA. Some unexpected discoveries could be damaged or destroyed. Significant impact could occur on non-Federal lands and minerals because the regulations do not apply.	Same as SS Alternative	Same as SS Alternative on Federal lands and minerals

Table 2-15
Continued

Standard Stipulations Alternative	RP Alternative on Federal Lands and Minerals	RP Alternative on All Lands and Minerals
On Federal lands and minerals, Native American sensitive sites would be either avoided or protected. Traditional elders would be consulted regarding recommendations on appropriate avoidance distances. On non-Federal lands and minerals significant impact could occur.	Same as SS Alternative	Same as SS Alternative on Federal lands and minerals
No significant impacts are expected from geologic hazards.	Same as SS Alternative	Same as SS Alternative
PWS - 154 well pad locations could be developed on slopes in excess of 15 percent. ACS - 66 well pads on the anticline crest could be developed on those slopes.	PWS - 13 well pad locations could be developed on slopes in excess of 15 percent. ACS - 3 well pads on the anticline crest could be developed on those slopes.	No well pad locations would be developed on slopes in excess of 15 percent
Scientifically important paleontological resources could be uncovered and/or destroyed by project activities.	Same as SS Alternative	Same as SS Alternative
No significant impacts to ground water are anticipated. Adequate regulatory mechanism are in place to protect groundwater quality and quantity.	Same as SS Alternative	Same as SS Alternative
At 500 and 700 producing well pads, the total annual water used to drill wells is anticipated to be 200 to 300 acre-feet/year, respectively.	At 500 and 700 producing well pads, the total annual water used to drill wells is anticipated to be 130 to 200 acre-feet/year, respectively.	Same as RP Alternative on Federal Lands and Minerals
PWS/ACS - Maximum drawdown of the groundwater aquifers is estimated to be 1 to 1.5 feet/year. The same is expected with the Anticline Crest Scenario.	PWS/ACS - Maximum drawdown of the groundwater aquifers is estimated to be 0.7 to 1.0 feet/year. The same is expected with the Anticline Crest Scenario.	Same as RP Alternative on Federal Lands and Minerals
Significant impacts from non-point source pollutants could occur in area waters if regulatory requirements to control these sources are not being adequately implemented by the operators. BLM and WDEQ/WQD would jointly improve enforcement to ensure that current regulatory requirements regarding non-point source pollutants are adequately applied.	Same as SS Alternative	Same as SS Alternative
PWS - 225 potential well pad locations could be developed in the Sensitive Soils SRMZ. ACS - 98 potential locations in the SRMZ could be developed with the Anticline Crest Scenario.	PWS - No potential well pads would be located in the Sensitive Soils SRMZ on Federal lands and minerals. Nine potential well pad locations would remain in the Sensitive Soils SRMZ on non-Federal lands and minerals. ACS - fewer well pads could be developed with the Anticline Crest Scenario.	No well pads would be located on the Sensitive Soils SRMZ.
Development could occur on saline soils on private lands and minerals in the flood plains of the Green and New Fork rivers.	Same as SS Alternative	No development could occur on saline soils on private lands and minerals in the flood plains of the Green and New Fork rivers.

Table 2-15
Continued

Standard Stipulations Alternative	RP Alternative on Federal Lands and Minerals	RP Alternative on All Lands and Minerals
Development could occur on seasonally flooded soils on private lands and minerals in the flood plains of the Green and New Fork rivers.	Same as SS Alternative	No development would occur on seasonally flooded soils on private lands and minerals in the flood plains of the Green and New Fork rivers.
At 500 and 700 producing well locations (one straight hole well per pad), this alternative would disturb between 7,363 and 9,064 acres of vegetation in the short-term and between 1,382 and 1,914 acres in the long-term, respectively.	At 500 and 700 producing well locations, under this alternative, pad drilling (multiple wells drilled from a single pad and no more than 4 pads per square mile) would disturb between 1,098 and 1,627 acres less vegetation in the short-term and between 384 and 574 acres less in the long-term than the SS Alternative; using CPF would disturb between 246 and 366 acres less long-term disturbance to vegetation would occur than with the SS Alternative or pad drilling option.	Same as RP Alternative on Federal Lands and Minerals
Noxious weeds may become established at disturbed sites.	Because this alternative would have less surface disturbed at any one time, establishment of noxious weeds would be less likely.	Same as RP Alternative on Federal Lands and Minerals
PWS - 16 grazing allotments would be affected with an estimated peak annual loss of 64 AUMs and, at 500 and 700 well pads, 320 and 395 AUMs, respectively, of peak net loss in year five. ACS - 11 grazing allotments would be affected with the same estimated peak annual and net fifth year losses as for PWS.	PWS - With pad drilling, 16 grazing allotments would be affected with an estimated peak annual loss of 36 AUMs and, at 500 and 700 well pads, 180 and 215 AUMs, respectively, of peak net loss in year five. ACS - 11 grazing allotments would be affected with the same estimated peak annual and net fifth year losses as for PWS. PWS/ACS - With CPF, same as SS Alternative.	Same as RP Alternative on Federal Lands and Minerals
PWS - Under the current COE permitting process, this alternative would protect approximately 837 acres of the 11,258 acres of wetlands (7.4 percent) in the project area from disturbance by well pads. ACS - 290 acres out of 1,427 acres (20.3 percent) of the wetlands in the Anticline Crest Scenario could be disturbed.	Same as SS Alternative	This alternative would eliminate placement of all well pad locations in area wetlands.
PWS - 259 potential well pad locations could be developed in wetlands on private and state lands and minerals. ACS - 25 potential sites could be developed with the Anticline Crest Scenario.	Same as SS Alternative	This alternative would eliminate placement of all well pad locations in project area wetlands.
PWS - 232 potential well pad locations could be developed in 100-year flood plains on private and state lands and minerals. ACS - 32 potential sites could be developed with the Anticline Crest Scenario.	Same as SS Alternative	This alternative would eliminate placement of all well pad locations in 100-year flood plains in the project area.

Table 2-15
Continued

Standard Stipulations Alternative	RP Alternative on Federal Lands and Minerals	RP Alternative on All Lands and Minerals
PWS - Private lands surround the bald eagle nest and could be developed to densities of 16 pads/section. If extensive development occurs, it could be a significant impact to nesting bald eagles. ACS - No impact would occur under the Anticline Crest Scenario.	Same as SS Alternative	All lands surrounding the bald eagle nest would be protected from any well field development so that impacts would be insignificant
PWS - Potential bald eagle winter habitats are on private lands and minerals and would have no protection from maximum well pad density development which, if it occurs, could be a significant loss of habitat function. ACS - Less potential impact would occur under the Anticline Crest Scenario.	Same as SS Alternative	All potential bald eagle winter habitat would be protected from any well field development so that impacts would be insignificant.
PWS - Significant impacts to nesting mountain plovers would occur if extensive development occurs in nesting habitat. ACS - Less potential impact would occur under the Anticline Crest Scenario.	Same as SS Alternative	Same as SS Alternative
PWS - Significant impact to antelope crucial winter range would occur if extensive development occurs in this habitat because of overall loss of habitat function. ACS - Less potential impact would occur under the Anticline Crest Scenario.	PWS - Significant impact to antelope crucial winter range would occur if extensive development occurs in this habitat but overall impact levels would be decidedly less than for the SS Alternative. ACS - Even less potential impact would occur under the Anticline Crest Scenario.	Same as RP Alternative on Federal Lands and Minerals
PWS - Significant impact to mule deer winter range and crucial winter range would occur if extensive development occurs in these habitats because of overall loss of habitat function. ACS - Less potential impact would occur under the Anticline Crest Scenario.	PWS - Significant impacts to mule deer winter range and crucial winter range would occur if extensive development occurs in these habitats but overall impact levels would be decidedly less. No development would occur within the Mesa Breaks. ACS - Even less potential impact would occur under the Anticline Crest Scenario.	Same as RP Alternative on Federal Lands and Minerals
PWS - The majority of moose crucial winter/yearlong range is on private lands and minerals and would have no protection from maximum well pad density development which, if it occurred, could be a significant impact from loss of habitat function. ACS - Less potential impact would occur under the Anticline Crest Scenario.	Same as SS Alternative	Well field development would be excluded from most moose crucial winter/yearlong range and the remainder would be limited to 4 pads/section, reducing impacts to nearly insignificant levels, especially with the Anticline Crest Scenario.

Table 2-15
Concluded

Standard Stipulations Alternative	RP Alternative on Federal Lands and Minerals	RP Alternative on All Lands and Minerals
PWS - Well field traffic during operations and maintenance is expected to produce noise impacts to sage grouse attending leks which would occur throughout the life of the project. Decreased lek attendance due to noise would be a significant impact. ACS - Less potential impact would occur with the Anticline Crest Scenario.	PWS - Noise near leks would be managed during periods of lek attendance to reduce impacts and reduced well densities near leks would also reduce impacts. Impacts to leks during development would be less than the SS Alternative but could still be significant once the well field is operational. ACS - Less potential impact would occur with the Anticline Crest Scenario.	Same as RP Alternative on Federal Lands and Minerals
PWS - Unless vegetation and habitat characteristics in undisturbed areas can be enhanced to provide more suitable habitat than currently exists, there would be a net loss of habitat function and impacts to sage grouse nesting habitat would be significant. ACS - Less potential impact would occur with the Anticline Crest Scenario.	PWS - Unless vegetation and habitat characteristics in undisturbed areas can be enhanced to provide more suitable habitat than currently exists, there would be a net loss of habitat function and impacts to sage grouse nesting habitat would be significant. However, overall impact levels would be decidedly less. ACS - Less potential impact would occur with the Anticline Crest Scenario.	Same as RP Alternative on Federal Lands and Minerals
PWS - A significant impact to nesting raptors would occur under this alternative on non-Federal lands and minerals. ACS -Less potential impact would occur with the Anticline Crest Scenario.	Same as SS Alternative	All raptor nests would be protected by spatial and temporal buffers and impacts would be reduced to insignificant levels, especially with the Anticline Crest Scenario.
PWS -If extensive development occurs in flood plains of the Green or New Fork rivers, potentially significant impacts to cold water fisheries could occur. These impacts would occur on non-Federal lands and minerals. Impacts on Federal lands may include increased erosion, water quality degradation and head cutting. ACS - Impacts would be less under the Anticline Crest Scenario.	Same as SS Alternative	Implementation of this alternative would reduce potential impacts to fisheries to insignificant levels because no well pads would be located within 500 feet of wetlands, riparian areas or perennial streams and no well pads would be within 100-year flood plains.