CHAPTER 2

PROPOSED ACTION AND ALTERNATIVES

2.0 SUMMARY

The DFPA currently contains 63 active producing wells, with accompanying production related facilities, roads, and pipelines. The Desolation Flats Operators have proposed to drill approximately 385 wells at 361 well locations in addition to the 63 wells previously approved in the DFPA. Some of these wells would be classified as exploration/delineation wells because natural gas production potential has not been totally defined due to geological complexities. Other wells, where production potential is better known, would be classified as in-fill or development wells. The precise number of additional wells, locations of the wells, and timing of drilling associated with the proposed natural gas development project would be directed by the success of development drilling and production technology and economic considerations such as the cost of development of leases within the project area with marginal profitability. Drilling would typically occur at 2 to 4 wells per section where hydrocarbons are encountered. Development would likely occur sporadically and not be uniformly spaced throughout the DFPA. The Operators anticipate that future development in the DFPA would likely be concentrated within or near existing fields rather than in outlying areas where development currently does not exist.

Based on the planning information provided by the Operators and alternatives identified through the scoping process, this EIS addresses the Operators' Proposed Action, one alternative to the Proposed Action, and the No Action Alternative. The alternative selection process is discussed in the following section.

2.1 ALTERNATIVE SELECTION PROCESS

2.1.1 Proposed Action

The Proposed Action of drilling approximately 385 natural gas wells at 361 well locations, with a forecasted success rate of 65 percent (250 producing wells) was determined by summarizing drilling plans projected by the Desolation Flats Operators over the next twenty-year planning period. Drilling estimations were based on reasonably foreseeable spacing and drilling projections into areas within the project area where the planned production and development activities would occur. The drilling proposal is in addition to existing drilling and production operations. The Operators anticipate that 237 of the 250 producing wells would be located within the RFO administrative area, with the remaining 13 wells located within the Monument Valley Management Area (MVMA), RSFO administrative area.

The previously approved Mulligan Draw Project (Mulligan Draw EIS, USDI-BLM 1992b) is located within the DFPA and is included in the proposed Desolation Flats EIS for analysis of the potential for increased well density. A segment of the MVMA is located within the Mulligan Draw project area. Drilling in the portion of the MVMA located in the DFPA was analyzed in the Mulligan Draw EIS. The Mulligan Draw ROD authorized the Mulligan Draw operators to drill and develop a maximum of 45 wells on 640-acre spacing, therefore a maximum of 13 wells would be drilled within the MVMA portion of the project area.

Existing disturbance within the DFPA is approximately 1,506 acres, or 0.6 percent of the 233,542

acres comprising the project area. During the construction phase, the Proposed Action would disturb up to 4,923 acres. Disturbance areas within the DFPA would be reduced following reclamation of pipeline ROW's and unused portions of the drill pad and ancillary facility disturbances during the production phase. Under the Proposed Action, reclamation would reduce impacts to 2,139 acres for a total disturbance of 3,645.4 acres or 1.6 percent of the DFPA (Table 2-1).

Table 2-1. Types and Approximate Acreages of Existing and Proposed Surface Disturbance, Desolation Flats Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 2002.

Disturbance Type	Existing	Proposed Action		Alternative A		No Action Alternative	
		New	LOP	New	LOP	New	LOP
Wells Locations	90[1]	1440	336	2220	516	**	**
Roads	1128[2]	2624	1706	4035	2623	**	**
Pipelines	40	758	0	1166	0	**	**
Ancillary Facilities	--	97	97	161	161	**	**
Other Developments	249[3]	–	–	–	–	–	--
Subtotal	1506	4923	2139	7582	3300	**	**
Total Disturbance	–	6429	3645	9088	4806	**	**
Percent of DFPA	0.6	2.8	1.6	3.9	2.1	**	**

[1] 63 existing wells x 1.43 acres per well
[2] Existing roads network: primary roads (611 ac), resource roads (322 ac), 2-track roads (195 ac)
[3] Other developments minus allowance for the 63 existing wells
** Determined as APD's are granted

2.1.2 Alternatives to the Proposed Action

Alternatives to the Proposed Action, as determined from the scoping process and BLM management concerns, include a maximum development alternative and the No Action alternative. Alternatives to the Proposed Action are summarized as follows:

- Alternative A - Alternative A would consist of an increased density of surface well pads beyond that described in the Proposed Action to 592 natural gas wells at 555 locations in addition to 63 wells previously approved in the project area (see Section 2.3 of this EIS for a detailed description of Alternative A). Assuming a success rate of 65 percent, the Operators anticipate that 372 of the 385 new producing wells would be located within the RFO administrative area, with the remaining 13 wells located within the MVMA, RSFO administrative area. During the construction phase, Alternative A would disturb up to 7,582 acres. With Implementation of reclamation under Alternative A, impacts would be reduced to 3,300 acres for a total disturbance of 4,806.4 acres or about 2.1 percent of the DFPA (Table 2-1).

- Alternative B - No Action. Under this alternative, previously approved authorizations would

remain in effect, including the Mulligan Draw natural gas project and the Dripping Rock Unit/Cedar Breaks oil and gas field development (Dripping Rock Unit/Cedar Breaks Oil and Gas Field Development EA and DR, USDI-BLM 1985). Alternative B may also allow Applications for Permit to Drill (APD's) and ROW actions to be granted by the BLM on a case-by-case basis through individual project and site-specific environmental analysis. Additional natural gas development could occur on State and private lands within the project area under APD's approved by the WOGCC (see Section 2.4 for a detailed description of Alternative B). Under Alternative B, additional surface disturbance would occur on a case-by-case basis. Coordinated, area-wide monitoring and protective plans (e.g, transportation, wildlife monitoring) would not be required under the No Action Alternative.

The Proposed Action and alternatives to the Proposed Action are discussed in detail in the following sections.

2.2 PROPOSED ACTION - DRILL 385 NATURAL GAS WELLS AT 361 WELL LOCATIONS WITHIN THE DESOLATION FLATS NATURAL GAS PROJECT AREA IN ADDITION TO EXISTING DRILLING AND PRODUCTION OPERATIONS

Accurately predicting the total number of wells and the timing of drilling operations is difficult due to the limited amount of natural gas exploration and the geological complexities in the DFPA. However, the Operators have indicated that approximately 385 wells at 361 well locations, with a forecasted success rate of 65 percent (250 producing wells at 235 well locations), may be drilled in the DFPA. This is in addition to 63 wells previously approved in the DFPA.

Development would begin in 2003 (subsequent to the release of the ROD) within the DFPA and continue for approximately 20 years, with a life-of-project (LOP) of 30-50 years. Various associated facilities (e.g., roads, pipelines, power lines, water wells, disposal wells, evaporation ponds, compressor stations, gas processing facility) would also be constructed throughout the DFPA. The Operators anticipate that 237 of the 250 producing wells would be located within the RFO administrative area, with the remaining 13 wells located within the MVMA, RSFO administrative area.

The DFPA would have a maximum of: 1,444 acres of new surface disturbance from well locations (including on-site gathering, measurement, and dehydration facilities); 542 miles (2,624 acres) of new roads or upgrades of existing roads, 361 miles (758 acres) of new pipeline and approximately 97 acres of new surface disturbance from ancillary facilities (i.e., 4 compressor stations [16 acres], one gas processing plant [30 acres], 3 water evaporation ponds [12 acres], 2 disposal wells [14 acres], and 10 water wells [25 acres]). Total new short-term surface disturbance resulting from the Proposed Action would be 4,923 acres (approximately 2.1 percent of the DFPA).

During the LOP (30-50 years), total disturbances would be reduced to 2,139 acres (336 acres associated with 235 wells having 1.43 acres of remaining disturbance per well site, 1,706 acres of roads [this assumes a 65 percent drilling success rate with roads to unsuccessful wells being reclaimed], and 97 acres of surface disturbance associated with ancillary facilities) or approximately 0.92 percent of the DFPA.

Specific components of the Desolation Flats Natural Gas Development program are discussed in the following sections. Additional site-specific proposal and resource information would be

contained in the individual well APD and/or ROW applications when submitted to the BLM. Prior to surface disturbance on some drill sites and associated roads, pipelines, and ancillary facilities located on federal surface or federal minerals, additional site-specific analyses may be required.

2.3 ALTERNATIVE A - DRILL AND DEVELOP 592 NATURAL GAS WELLS AT 555 WELL LOCATIONS WITHIN THE DESOLATION FLATS NATURAL GAS PROJECT AREA IN ADDITION TO EXISTING DRILLING AND PRODUCTION OPERATIONS

National demand for natural gas is expected to increase during the LOP, as is the likelihood that increased natural gas prices would also occur. With increased realized profits by the oil/gas industry from such demand, the economic realm of new drilling and production technology would also expand. Those areas within the DFPA that are currently considered marginal properties from an economic standpoint by the DFPA Operators may become economically feasible to develop by industry in the future. Should attempts by the Operators to develop marginal properties within the DFPA be successful, then the level of drilling and production activity on marginal properties could potentially increase. In order to analyze for the potential increases in drilling activity in the DFPA beyond those levels described in the Proposed Action, Alternative A was developed for analysis in this EIS. Alternative A would consist of an increased density of surface well pads and production facilities beyond that described in the Proposed Action to 592 natural gas wells at 555 locations. This is in addition to 63 wells previously approved in the DFPA. Assuming a success rate of 65 percent, the Operators anticipate that 372 of the 385 new producing wells would be located within the RFO administrative area, with the remaining 13 wells located within the MVMA, RSFO administrative area. The levels of drilling activity provided in Alternative A were developed by BLM, in consultation with the DFPA Operators, and represent a potential increase in drilling activity that could be realized through further development of marginal properties within the DFPA.

Alternative A would be similar to the Proposed Action in that development would begin in 2003 (subsequent to the release of the ROD) within the DFPA and continue for approximately 20 years, with an LOP of 30-50 years. Various associated facilities (e.g., roads, pipelines, power lines, water wells, disposal wells, evaporation ponds, compressor stations, gas processing facility) would also be constructed throughout the DFPA.

The DFPA would have a maximum of: 2,220 acres of new surface disturbance from well locations (including on-site gathering, measurement, and dehydration facilities); 833 miles (4,035 acres) of new roads or upgrades of existing roads, 555 miles (1,166 acres) of new pipeline, and approximately 161 acres of new surface disturbance from ancillary facilities (i.e., 6 compressor stations [24 acres], 2 gas processing plant [60 acres], 4 water evaporation ponds [16 acres], 3 disposal wells [21 acres], and 16 water wells [40 acres]). Total new short-term surface disturbance resulting from Alternative A would be 7,582 acres (approximately 3.2 percent of the DFPA).

During the LOP (30-50 years), total disturbances would be reduced to 3,300 acres (516 acres associated with 361 well locations having 1.43 acres of remaining disturbance per well site, 2,623 acres of roads [this assumes a 65 percent drilling success rate with roads to unsuccessful wells being reclaimed] and 161 acres of surface disturbance associated with ancillary facilities), or approximately 1.4 percent of the DFPA.

The technical requirements for Alternative A are the same as described for the Proposed Action; however, more overall site disturbance requirements would be necessary for the additional well sites, access roads, pipelines, and ancillary facilities.

As with the Proposed Action, additional site-specific proposals and resource information would be contained in the individual well APD and/or ROW applications when submitted to the BLM. The BLM would prepare environmental assessments tiered to the EIS when necessary.

2.4 ALTERNATIVE B - NO ACTION

The regulations implementing Section 1502.14(d) of the NEPA require that the alternatives analysis in the EIS "include the alternative of no action" (43 CFR 1502.14 (d). For this project, the No Action Alternative is denial of the drilling and development proposal as submitted by the Operators. However, the Department of the Interior's authority to implement a "No Action" alternative which precludes drilling by denying the project is limited. An explanation of this limitation and the discretion the Department has in this regard is as follows:

An oil and gas lease grants the lessee the "exclusive right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits" in the leased lands, subject to the terms and conditions incorporated in the lease (Form 3100-11). Because the Secretary of the Interior has the authority and responsibility to protect the environment within federal oil and gas leases, restrictions are imposed on the lease terms.

Leases within the DFPA contain various stipulations concerning surface disturbance, surface occupancy, and limited surface use. In addition, the lease stipulations provide that the Department of the Interior may impose "such reasonable conditions, not inconsistent with the purposes for which (the) lease is issued, as the (BLM) may require to protect the surface of the leased lands and the environment." None of the stipulations, however, would empower the Secretary of the Interior to deny all drilling activity because of environmental concerns.

Provisions in leases that expressly provide Secretarial authority to deny or restrict APD development in whole or in part would depend on an opinion provided by the U.S. Fish and Wildlife Service (FWS) regarding impacts to endangered or threatened species or habitats of plants or animals that are listed or proposed for listing. If the FWS concludes that the Proposed Action and its alternatives would likely jeopardize the continued existence of any endangered or threatened plant or animal species, then the APD(s) and Desolation Flats development may be denied in whole or in part.

Authorizations granted in previously approved projects located within the DFPA would remain in effect until an ROD is approved for the Desolation Flats project. These projects include the Mulligan Draw natural gas project (Mulligan Draw EIS and ROD, USDI-BLM 1992b), and the Dripping Rock Unit/Cedar Breaks oil and gas field development (Dripping Rock Unit/Cedar Breaks Oil and Gas Field Development EA and DR, USDI-BLM 1985).

Based on the above explanation, this alternative would deny the proposal as submitted but would allow consideration of individual APD's on federal lands on a case-by-case basis through individual project and site-specific environmental analyses. The No Action Alternative would allow drilling and development of 23 additional wells is the Mulligan Draw project area, and drilling and development of 34 additional wells in the Dripping Rock/Cedar Breaks project area (Table 1-5). Drilling outside the Mulligan Draw and Dripping Rock/Cedar Breaks project areas, but within the DFPA could continue on a case-by-case basis until BLM made a determination that further drilling activities would result in field development. At that point, additional environmental analysis to determine the effects of field development would be necessary. In order to estimate future drilling activity under the No Action Alternative , it is assumed that wells drilled in the DFPA would be drilled at the same

rate as the existing wells in the DFPA. As noted earlier, 63 wells have been drilled within the DFPA to date. Of the 63 wells drilled, 46 (73 percent) were drilled in the Mulligan Draw and Dripping Rock fields. Based on past drilling history, 23 additional wells could be drilled in the Mulligan Draw project area (2 of which could be drilled in the MVMA), and 34 additional wells could be drilled in the Dripping Rock/Cedar Breaks project area. Assuming that the operators would drill 57 wells in the Mulligan Draw and Dripping Rock fields (Table 1-5), the remaining 27 percent of the wells (21 wells) would be drilled in the DFPA outside the Mulligan Draw and Dripping Rock fields. Total wells drilled under the No Action Alternative is estimated at 78. The technical requirements for Alternative B - No Action are the same as described for the Proposed Action (Section 2.5 - Plan of Operations). Additional infrastructure necessary to support existing wells within the DFPA and future wells drilled under the No Action Alternative would be considered on a case-by-case basis. Additional gas development could occur on State and private lands within the project area under APD's approved by the WOGCC.

Road and pipeline construction disturbances per well site associated with Alternative B would be similar to the Proposed Action. The No Action Alternative would have approximately 1,043 acres of total new short-term surface disturbance (13.37 acres per well) from well locations, new roads or upgrades of existing roads, and new pipelines. It is anticipated that the existing natural gas production infrastructure within the DFPA (e.g., compressors, water disposal wells, etc.) would support the No Action Alternative during the 30 - 50 year LOP.

Total disturbances would be reduced to 441 acres following reclamation of the pipelines and portions of the well pads not needed for production operations.

As with the Proposed Action, additional site-specific proposals and resource information would be contained in the individual well APD and/or ROW applications when submitted to the BLM. The BLM would prepare environmental assessments tiered to the EIS when necessary.

2.5 PLAN OF OPERATIONS

2.5.1 Preconstruction Planning and Site Layout

Development activities proposed on *fee and State of Wyoming surface lands* would be approved by the WOGCC. The WOGCC permitting procedures require filing an APD with the WOGCC and obtaining a ROW from the surface owner.

The Operators would follow the procedures outlined below to gain approval for wells and ancillary facilities on *public lands* within the project area. These procedures would apply to all alternatives.

- Prior to the start of construction activities, the applicant would submit a Notice of Staking (NOS), APD, or ROW Application to the BLM with a map showing the specific location of the proposed activity (e.g., individual drill sites, pipeline corridors, access roads, or other facilities). The application would include site-specific plans where necessary to describe the proposed development (i.e., drilling plans with casing/cementing program, surface use plans with road and drill pad construction details, and site specific reclamation plans, etc.). Approval of all planned operations would be obtained in accordance with authority prescribed in Onshore Oil and Gas Order No. 1 (Approval of Operations on Onshore Federal and Indian Oil and Gas Leases).

- The proposed facility would be staked by the applicant and inspected by an IDT and/or an

official from the BLM to ensure consistency with the approved Great Divide Resource Management Plan, the Green River Resource Management Plan, approved mitigation measures incorporated into the DFPA ROD, and plans provided by the applicant in the APD or ROW Application.

- More detailed construction plans, when required by the BLM for the proposed development, would be submitted to the BLM by the applicant. The plans would address concerns that may exist concerning construction standards, required mitigation, etc. Negotiation of these plans between the applicant and the BLM, if necessary to resolve differences, would be based on field inspection findings and would take place either during or after the BLM on-site inspection.

- The applicant and/or its contractors would revise the APD or ROW Application as necessary per negotiations with the BLM. The BLM would complete a project-specific EA that incorporates agreed upon construction and mitigation standards. The BLM would then approve the specific proposal and attach the Conditions of Approval to the permit. The applicant must then commence with the proposed activity within one year.

Following is a general discussion of construction techniques proposed to be used by the Operators on public lands. These construction techniques would be applicable to drill site, pipeline, and access road proposals within the project area and may vary between the individual Operators.

2.5.2 Construction and Drilling Phase

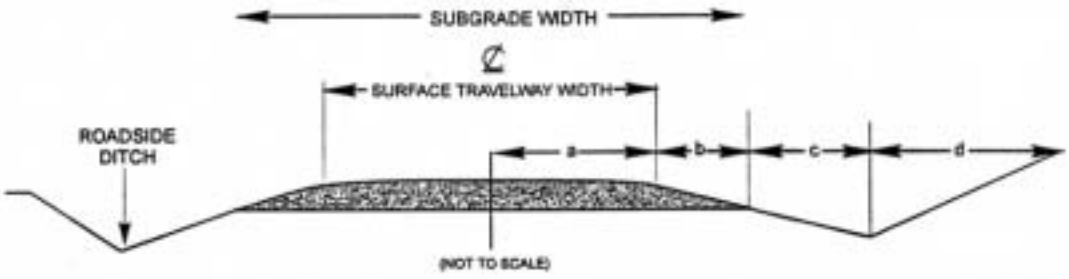
2.5.2.1 Access Road Construction

Access to the DFPA is provided by the two-lane paved WYO 789 from I-80 at Creston Junction south to the intersection with Carbon County Road 608 ("Wamsutter/Dad Road") (Figure 1-2). Access is also provided south from Wamsutter on Carbon County Road 608. Access to the interior of the project area is provided by an existing road network developed to service prior and ongoing drilling and production activities. The road network within the project area is discussed in more detail in Chapter 3, Affected Environment.

BLM Manual Section 9113 road classifications categorize DFPA roads into three separate classes:

1) Collector Roads. These roads normally provide primary access to large blocks of land and connect with or are extensions of a public road system such as WYO 789. Collector roads are two-lane and require application of the highest road standards. The predominant design speed is 30 to 50 mph depending on terrain and/or as determined by BLM, and the subgrade width is a minimum of 28 feet (24 feet full-surfaced travelway). A typical roadway cross-section with width specifications is shown in Figure 2-1.

2) Local Roads. These are low volume roads providing the internal access network within an oil/gas field such as Carbon County Road 608 . The design speed is 20-50 mph depending



	Minimum Subgrade Width (ft.)	Minimum Surfaced Travelway Width (ft)	a (ft)	b (ft)	c (ft)	d (ft)	Approximate Disturbance Width (ft)	Total ROW Width (ft)	Design Speed (mph)
Resource Road	16	14	7	2	4	8	40	50	15-30
Local Road	24	20	10	2	4	8	48	55	20-50
Collector Road	28	24	12	2	4	8	52	60	30-50

DIAGRAM OF TYPICAL TURNOUTS ON RESOURCE ROADS (PLAN VIEW)

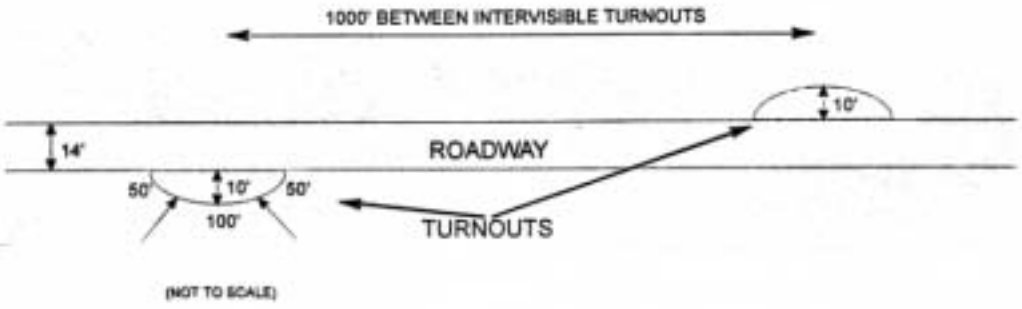


Figure 2-1. Typical Roadway Cross-Section with Width Specifications.

on terrain, and the subgrade width is normally 24 feet (20 feet full-surfaced travelway). Low volume roads in mountainous terrain may be single-lane roads with turnouts.

3) Resource Roads. These are normally spur roads that provide point access. Roads servicing individual oil/gas exploration and production locations fall within this classification. The road has a design speed of 15-30 mph and is constructed to a minimum subgrade of 16 feet (14 feet minimum full-surfaced travelway) with intervisible turnouts.

All new access roads within the DFPA would be constructed for the specific purpose of natural gas field development. Roads would be located to minimize disturbances and maximize transportation efficiency. The operators propose to construct access roads across public lands to wells in accordance with BLM Manual 9113 standards. New access roads would be designed and constructed to resource road standards to facilitate reclamation should the well be a dry hole. Roads located on private lands would be constructed in accordance with standards imposed by the private land owner. The number of roads would be limited to decrease potential impacts by discouraging development of looped roads and by accessing wells from short resource roads off the local roads. Roads would be closed and reclaimed by the operators when they are no longer required for production operations, unless otherwise directed by the BLM or private landowners. Roads would be designed to minimize disturbance and would be built and maintained as specified by the BLM to provide safe operating conditions at all times. Surface disturbance would be contained within the road ROW.

The Operators estimate that each proposed new well would require an average of 1.5 miles of new or upgraded road construction (approximately 542 miles) and 1.0 mile of pipeline. Of this, approximately one-half the pipeline length would be constructed in the roadway. Initial combined access road and pipeline disturbance would be approximately 50 feet in width (0.6 acre per well location for pipeline and 2.42 acres per well location for road). The remaining 0.5 mile of pipeline construction cross-country would occur with a construction width of 25 feet (1.5 acres per well location). Access road construction disturbance width without pipeline would be 40 feet (4.85 acres per well location). Construction of proposed new roads and pipelines is estimated at 3,382 acres (9.37 acres per well x 361 well locations).

Construction equipment and techniques utilized by the operators would be standard (e.g., crown-and-ditch method). The soils in the area would be considered and if necessary, the surface would be graveled before the rig and/or other drilling equipment is moved on to the location (well pad). Should soft spots develop on the roadway during construction or drilling operations, they would be immediately covered with weed-free crushed rock or gravel. Where identified during on-site review by the BLM, problem areas on access roads to producing well sites would be graveled to a depth of 4 to 6 inches to reduce erosion and sedimentation. Surfacing and base course materials would be obtained from existing, operational gravel pits located on fee or federal sources near the project area. Respreading of topsoil and windrowed vegetation to the sideslopes of the newly constructed access roads and revegetation would begin the first appropriate season following the well going on production. Reclamation measures would be implemented the first operating season after well abandonment. The access road to an unproductive well site would be reclaimed upon abandonment of the well using stockpiled topsoil and a seed mixture contained in the approved APD/ROW.

In the event drilling is non-productive, all disturbed areas, including the well site and new access road, would be reclaimed to the approximate landform that existed prior to construction. Reclamation and site stabilization techniques would be applied as specified in the APD Surface

Use Plan or the ROW Plan of Development (POD). If drilling is productive, all access roads to the well site would remain in place for well servicing activities (i.e., maintenance, improvements, etc.). Partial reclamation would be completed on segments of the well pad and access road ROW no longer required.

Estimated traffic requirements for drilling operations, completion operations, and production operations are shown in Table 2-2. This information is based on the estimated traffic impact of well field activities associated with drilling approximately 19 wells annually (385 wells over a 20-year drilling period). The Trip Frequency column indicates the estimated number of round trips to the project area for each activity. The figures provided in Table 2-2 should be considered general estimates. Activity levels vary over time in response to natural gas prices, weather, corporate decisions and other factors.

Table 2-2. Estimated Traffic Associated with Proposed Action-Related Well Field Development and Operations Activities.

Type of Traffic	Trip Frequency
Pre-Approval & Permitting	
Company Personnel	variable
Permitting Contractor	variable
Surveyors	1/well
Resource specialists	variable
Access Roads/Well Pad Construction	
Dozer haul truck	1/well
Grader haul truck	1/well
Backhoe haul truck	1/well
Gravel truck	(Dependent on need and source)
Drilling	
Rig supervisor	1/well/week
Rig crews	2/well/day (12 hour shift)
Rig move & setup	35/well
Drilling Engineer	8/well
Mud logger	1/well/week
Mud engineer	1/well/week
Mud trucks	1/well/week
Well loggers	2/well/week
Fuel trucks	1/well/day
Rig mechanics	1/well/week
Drill bit/tool deliveries	2/well/week

Table 2-2 continued

Completion	
Completion crew	2/well/day
Completion rig equipment truck	4/well
Casing crews	4/well
Casing haulers	6/well
Cementing crews	4/well
Cement trucks	6/well
Cement pumper truck	2/well
Welders	4/well
Equipment/repair trucks	As needed
Fracing crews	2/well/day
Fracing trucks	12/well
Supply trucks	4/well/week
Field Development	
Gathering systems construction crews	2/day for 4 days
Trencher haul truck	1/well
Pipe delivery	6/well
Surveyor	1/well
Welder	1/day for 4 days
Reclamation	variable
Compressor station construction crews	7/day for 7 days
Processing plant construction crews	14/day for 21 days
Production	
Production foreman	2/week
Pumper	1/day
Oil Hauler	2/month
Workover/Service/Maintenance	Variable
Reclamation	
Dozer haul truck	2/well
Grader haul truck	2/well
Seeder haul truck	2/well
Crew truck	7/well

2.5.2.2 Well Pad Design and Construction

The traditional single-well pad design has been utilized in the DFPA in the past and would continue to be the predominant drill site design utilized under the Proposed Action. The traditional well pad would be constructed from native materials located at the site. Drilling activity under the Proposed Action is planned in the Lance, Fox Hills, Lewis, and Almond formations. The well pad size for drilling in all formations is the same and is estimated to be 370 ft. x 400 ft (Figure 2-2). Under the Proposed Action, 361 well locations are planned to be drilled during the planned 20-year drilling and development period, with an approximate drilling success rate of 65 percent (250 producing wells at 235 well locations). The actual well pad size would depend on terrain limitations existing at the site. The well pad would be designed so that construction materials balance (i.e., soil materials taken from cuts would be about the same quantity as that needed for fill to construct a level pad), while attempting to minimize the total disturbed area. After completion of drilling, the productive well pad size would be reclaimed to 250 feet x 250 feet.

Projected disturbance for proposed new well sites, using the average pad size (370 feet by 400 feet) would be 4.0 acres per well. This figure assumes approximately 0.6 acre of disturbance associated with cut/fill areas created during construction. Total disturbance associated with 361 well locations would be 1,444 acres (4.0 acres per well x 361 well locations). Following partial reclamation of the productive well sites and full reclamation of all unproductive well sites, the remaining site disturbance would be 336 acres (1.43 acres per well x 235 well locations).

All available topsoil suitable for reclamation (up to 12 inches) would be stripped from the well pad area and stored adjacent to the well pad. This storage site is to be designated on the well pad design plan in the APD prior to start of actual well pad construction. Cut and fill slopes would be designed, if deemed necessary, in a manner that would hold topsoil during reclamation and subsequent re-establishment of vegetation. Well pad construction and related facilities would usually require approximately 4 to 6 days to complete, depending on site and terrain limitations. After topsoil stripping operations are complete, construction of the well pad would begin. Construction practices would involve use of standard earthmoving equipment. Components of the well pad include construction of a reserve pit to temporarily store drilling fluids, cuttings, and water produced during drilling, and a flare pit for emergency and development flaring (Figure 2-2).

In non-critical areas, and when a fresh water based mud system is being used, the Operators propose to use an unlined earthen reserve pit. Earthen reserve pits would be used only after evaluation of the pit location for distance to surface waters, depth to useable ground water, soil type and permeability, and after evaluation of the fluids which would likely be retained in the pit. If deemed necessary during the individual well site APD review, the reserve pit would be lined with an impermeable liner to prevent seepage. Bentonite or impermeable lining would be used where appropriate as defined during APD review. The synthetic liner would be at least 12 mils (12,000ths of an inch) thick, reinforced with a bursting strength of 174 x 175 pounds per inch (ASTMD 75719), resistant to decay from sunlight and hydrocarbons and compatible with the drilling fluids to be retained.

All reserve pits would be fenced with sheep tight wire on 3 sides immediately following construction. The fencing would remain in place as long as drilling operations are ongoing. The fourth side of the reserve pit would be fenced at the time the rig substructure is moved from the drill site location to minimize the potential for loss of wildlife and domestic animals.

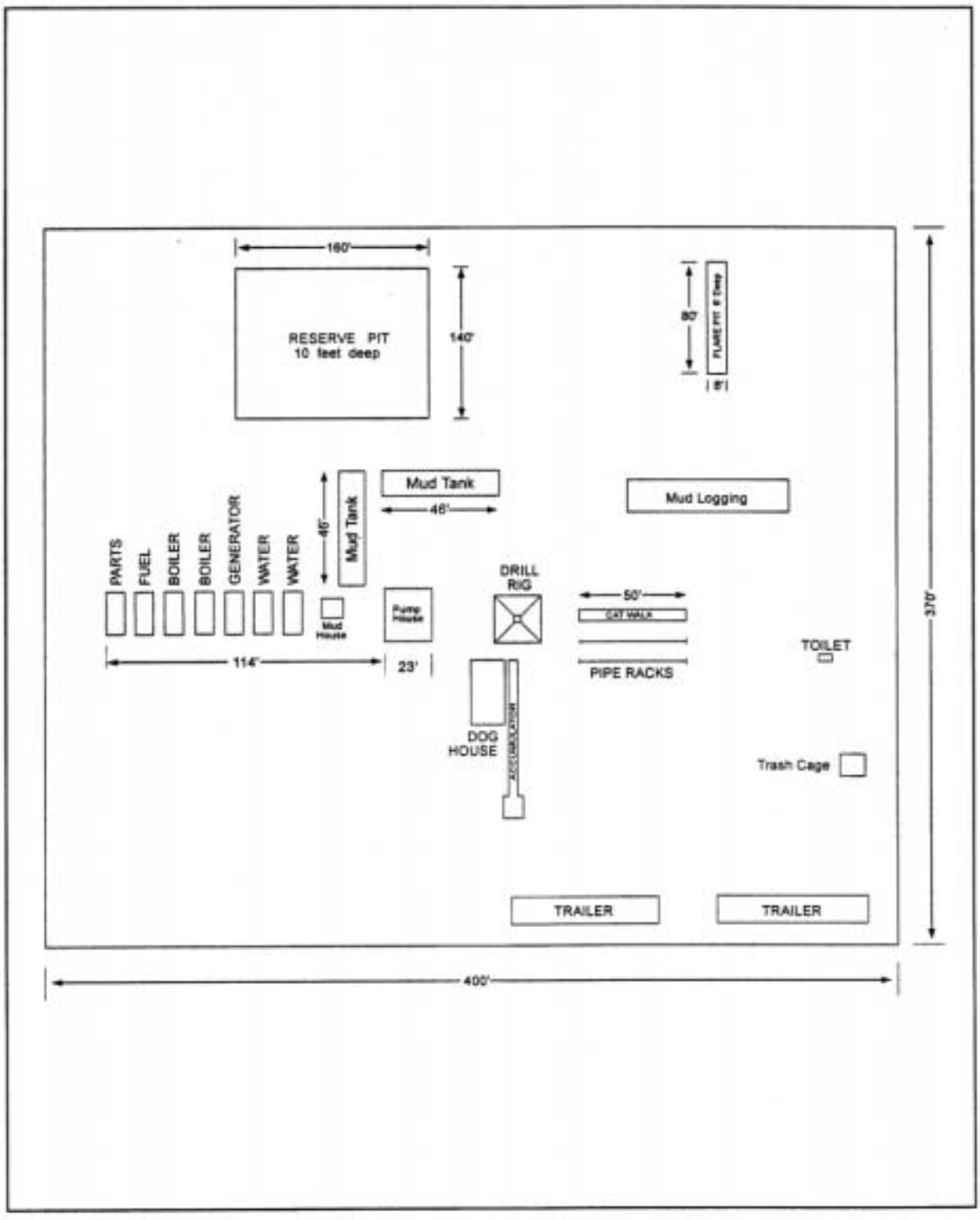


Figure 2-2. Typical Well Pad Layout During Drilling Operations - Lewis/Lance/Almond/ Fox Hills Formations.

Any hydrocarbons floating on the surface of the reserve pit would be removed as soon as possible

after drilling operations are complete. Reserve pit fluids would be allowed to dry by evaporation for approximately one year prior to reserve pit closure and drill site reclamation. BLM regulations allow placement of production water in reserve pits for periods up to 90 days. When the pit is backfilled, cuttings and drilling muds would be covered to a depth of at least three feet. If drilling or production fluids remain in the pit after one year, alternate methods of drying, removal of the fluids, or other treatment measures would be determined by the operators in consultation with the BLM. Necessary permits would be acquired by the operators if fluids are transported off-site for disposal. Reserve pits containing hydrocarbons and/or other potentially hazardous materials would be netted and/or flagged, as deemed appropriate by the BLM.

Service trailers located on the well pad would be self-contained and would not require a septic system. Sewage would be hauled off-site to a State Department of Environmental Quality (DEQ) approved disposal site, or treated on-site, as directed by the BLM.

Hazardous materials associated with well drilling and production are listed in the Hazardous Materials Management Plan located in Appendix D, along with a general description of hazardous materials management policies and procedures.

If a well is productive, site erosion and off-site sedimentation would be controlled by promptly revegetating sites in the first appropriate season (fall or spring) after drilling, and providing surface water drainage controls, such as berms, sediment collection traps, diversion ditches and erosion stops as required. These measures would be described in the individual APD/ROW.

Some surface locations within the DFPA may not be feasible to occupy, either for economical (e.g., high road construction costs), physical (e.g., steep terrain), or other environmental reasons (e.g., sage-grouse lek). A drilling method the Operators may use to access bottom-hole locations in these areas is directional drilling from a single-well pad (multi-well, directional drilling).

The multi-well single pad design provides for construction of one well pad with as few as two or as many as eight wells drilled from a central location. A typical drawing of a multi-well pad is shown on Figure 2-3. The first well is usually drilled as a vertical well and the remaining wells are drilled directionally. This design and setup provides economic and environmental advantages associated with one access route for multiple wells along with common gathering, separation, storage, and transportation facilities. Also, with multi-well drilling, several wells can be serviced at one time with one trip, thus minimizing vehicular traffic, dust control, and disturbance to wildlife. Use of multi-well directional drilling techniques would be contingent on economic considerations such as the cost to develop leases having marginal profitability.

Techniques and equipment for constructing a multi-well directional drill pad would be similar to those utilized in constructing a single-well traditional well pad. Directional drilling requires special drilling tools and procedures to change the direction of the well bore from vertical to directional and possibly horizontal in order to penetrate targets that cannot be reached by conventional vertical drilling methods. Advancement in directional drilling technology makes it possible to reach bottom holes 2,000 or more feet from the rig. Certain geologic features can limit this (e.g., faults, structural dips, etc.). A typical directional drilling schematic showing directional drilling profile well path, target, and limits is shown in Figure 2-4.

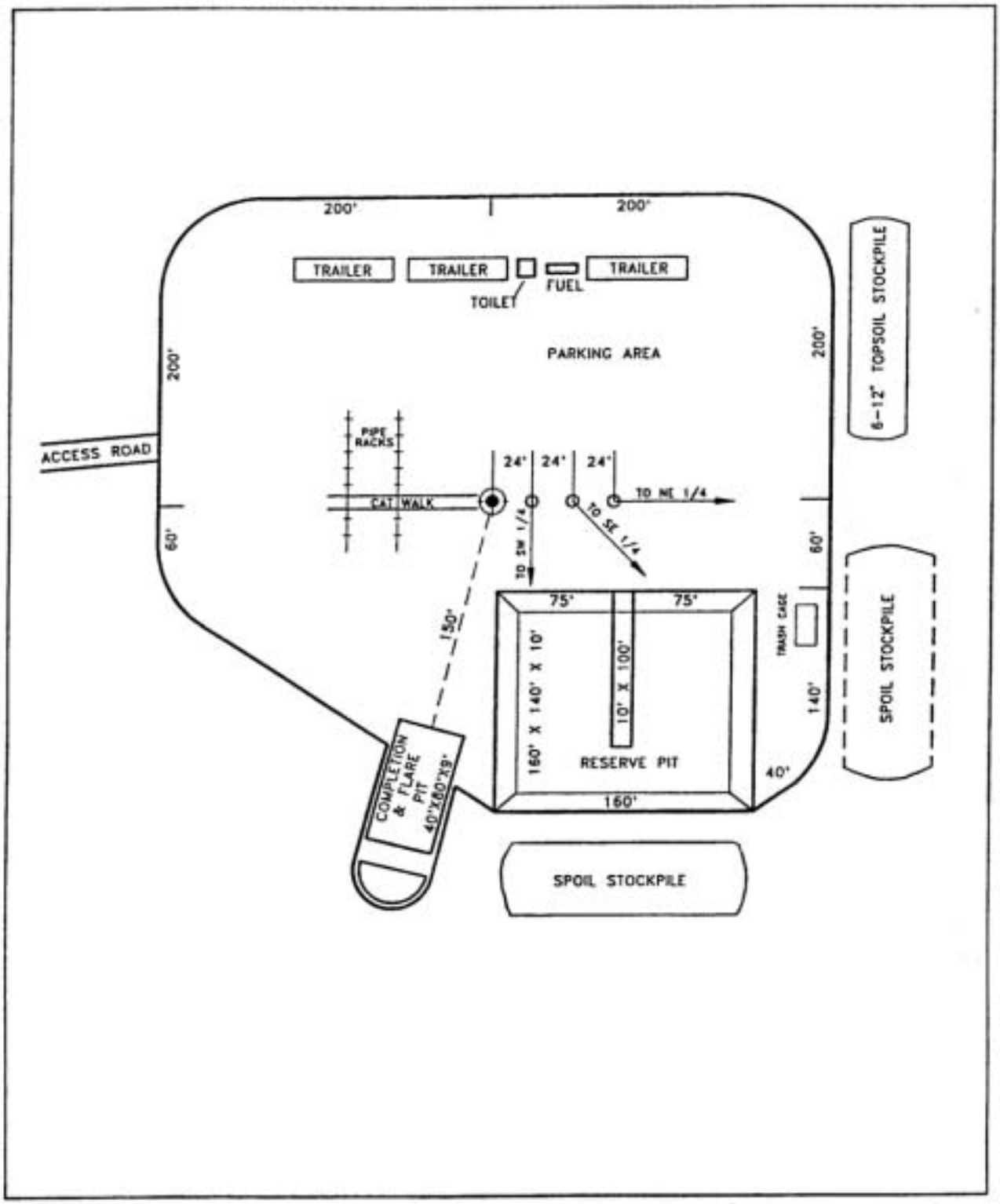


Figure 2-3. Typical Drawing of a Multi-well Pad Showing Location and Spacing of Multiple Wells.

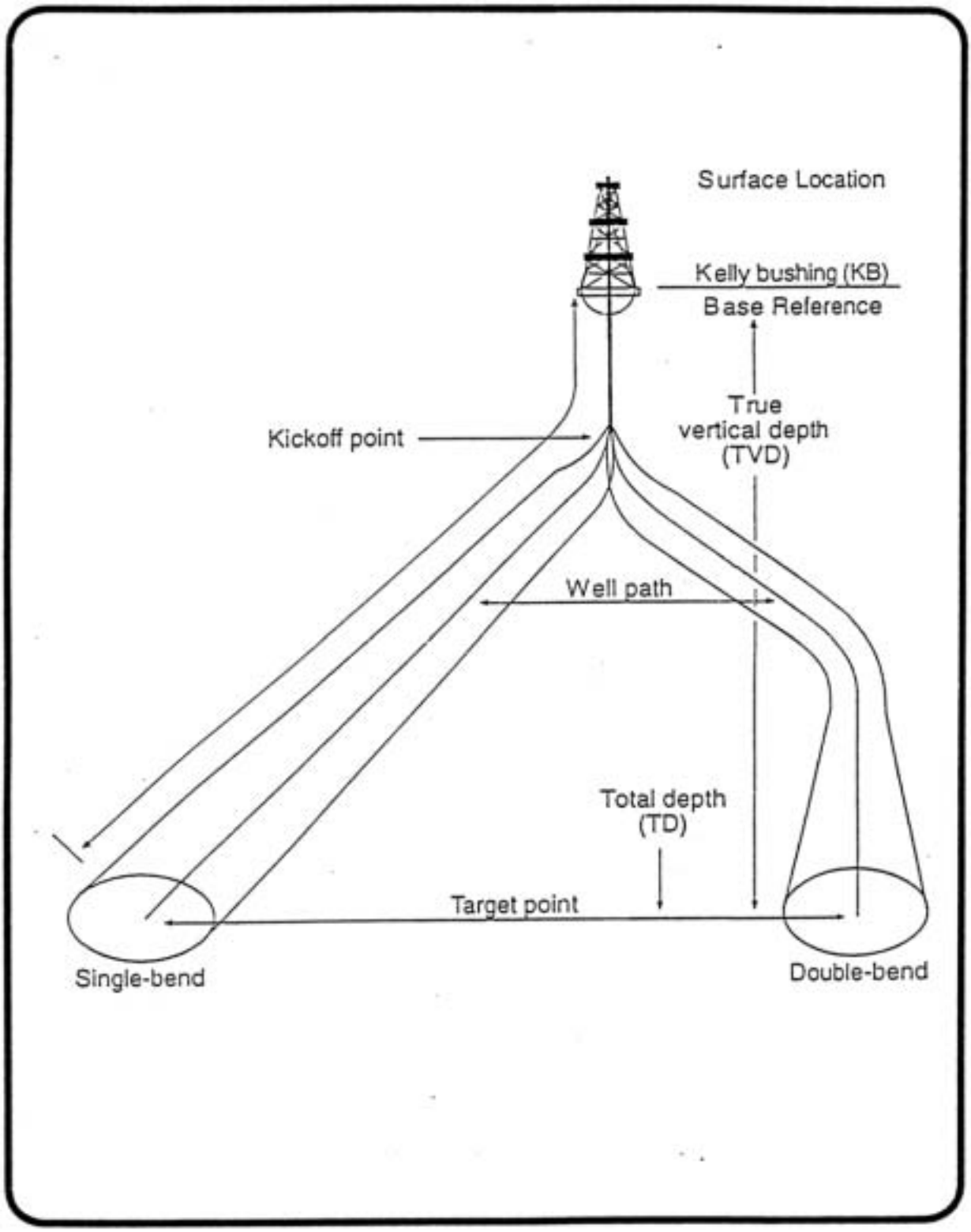


Figure 2-4. Directional Drilling Profile Well Path, Target, and Limits.

Another drilling procedure that may possibly be utilized in the DFPA is horizontal drilling. This drilling technique has been successfully utilized in other gas development programs in Wyoming to improve the productivity of existing marginal wells, and may have application in the DFPA in developed fields exhibiting marginal profitability.

Horizontal drilling involves drilling a curved section from the bottom of a vertical hole, followed by drilling horizontally into the productive formation. Long, horizontally drilled sections may increase oil and gas flows. Figure 2-5 shows a cross-sectional view of horizontal drilling. A schematic showing drilling and completion phases of a horizontal well is shown in Figure 2-6.

2.5.2.3 Drilling Operations

Each drilling operation would require transport of approximately 35 truckloads of drilling-related equipment and materials to facilitate the drilling operation. This number includes transportation of the drill rig, drill pipe, drilling fluid products, and related support equipment, but does not include the truck traffic required for resupplying the operation (e.g., fuel, drilling fluid additives, etc.). Additional traffic would be variable, depending on the phases of the drilling operation, but should average eight or nine vehicles per day per drill site throughout the drilling operation, with substantially higher peaks during rig set-up and relocation and during certain completion activities.
Total rig-up activities and installation of ancillary facilities would take approximately 3 days to complete.

Drilling operations would be spread over the 20-year life of field development, with approximately 15 to 20 wells drilled each year. The number of wells drilled annually would depend on such factors as market prices, permit approval, and rig availability. Completion operations for each productive well would commence as soon as possible after the drilling rig moves off location.

The geologic formations to be tested in the project area are the Lance, Lewis, Almond, and Fox Hills Formations. The drilling depth varies from 9,800 feet to 11,000 feet for a gas well drilled into the Lance Formation, requiring approximately 20 to 30 days to drill vertically, barring any major drilling problems. The approximate drilling depth for a Fox Hills Formation test is 12,000 to 13,000 feet and would take approximately 30 to 40 days to drill vertically. The approximate drilling depth for a Lewis Formation test is 12,500 to 13,500 feet and would take approximately 30 to 40 days to drill vertically. Almond Formation test wells would be drilled from 14,000 to 14,500 feet and require from 40 days to 60 days to drill. Completion operations range from a minimum of 30 days for shallow wells, and more than 60 days for deep wells.

Water, for drilling and service trailer use, would be obtained from State of Wyoming approved locations or local water source wells. Water requirements for drilling average approximately 11,000 barrels (bbls) per well (462,000 gallons). The operators intend to use freshwater-based mud for the majority of their drilling operations.

Methods used for the disposal of produced water (water produced in association with the oil and gas which is separated out at the well location) would vary with each operator but would generally be accomplished by either: (1) disposal in an underground injection well, (2) surface discharge, (3) surface evaporation in lined or unlined ponds, or (4) hauling to an approved disposal facility. Each operator would obtain the permit(s) necessary for the selected disposal method. Depending on timing of availability, quantity, and quality of produced water, some of the produced water could be used in well drilling and completion, and pipeline construction and hydrostatic testing.

2.5.2.4 Pipeline Construction

There are three natural gas pipeline transmission systems currently in operation in the DFPA. Questar Pipeline Company operates approximately 21 miles of 10 inch pipeline and 7 miles of 8 inch pipeline in the project area. CIG operates approximately 16 miles of 20 inch pipeline and 35 miles of 6 inch pipeline within the DFPA. Coastal Field Services operates 11 miles of 6 inch pipeline within the DFPA. New gas gathering lines would be constructed to facilitate transportation of natural gas and would be connected to these pipeline transmission systems by the DFPA Operators. New gathering lines would range in size from 2 to 6 inches in diameter, depending on the production rate at each well.

The actual pipeline location would be surveyed and staked prior to start of any construction activities. Where possible, new pipelines would be located adjacent to access roads. The company installing the pipeline would submit detailed design plans when required by the BLM for pipeline(s) planned on slopes 25 percent or greater. In order to minimize the total amount of surface disturbance, the pipeline corridor may or may not be cleared of heavy brush prior to any activities. This determination would be made by the BLM prior to construction and would consider factors such as construction crew safety concerns, sideslopes, and brush density.

Stripping of topsoil from the pipeline corridor would not be performed. Pipeline construction would occur in a planned sequence of operations common to natural gas pipeline installation specifications and would take place along a corridor of continuous activity. All pipeline installation work would be completed by a contractor working under the supervision of the pipeline company. Cross-country construction activities would be confined to a 25-foot ROW.

The pipeline trench would be excavated mechanically with trenching equipment such as a backhoe or trencher. The width of the trench would be approximately 18 - 24 inches. The trench would be constructed to a minimum depth to maintain 36 inches of normal soil cover and 24 inches of cover in consolidated rock.

Pipe laying activities would include pipe stringing, bending, welding, coating, lowering of pipeline sections, and backfilling. The newly-constructed pipelines would be tested to prove structural soundness using either inert gas or hydrostatically tested with water. Integrity tests would be conducted in full compliance with the mandatory BLM ROW stipulations. Gas-testing procedures are summarized as follows: Certified pipeline welders are utilized during pipeline construction to assure high quality work. Ten percent of the pipeline is randomly x-rayed after welding to check the quality of the welds. All fittings on the pipeline are also x-rayed. The pipeline is slowly pressured-up with produced gas to the maximum operating pressure of the pipeline being tied into. This pressure is maintained for 24 hours, then the natural gas is released to sales. If a leak is discovered, the pipeline is purged to the atmosphere, the pipeline repaired, and the pressure tested again by the same procedures. Policies and plans for spill prevention, reporting and response are discussed in the Hazardous Materials Management Plan (Appendix D).

Necessary water appropriation permits would be obtained from the Wyoming State Engineer's Office. Water would be taken from local water sources near the DFPA. After testing operations are completed, the water would be pumped into water hauling trucks and transported to drilling locations within the project area to be used in conjunction with the drilling operations. If not required for drilling operations, the test water would be disposed of onto undisturbed land having vegetative cover or into an established drainage channel in a manner as not to cause accelerated erosion. Prior to discharge of hydrostatic testing water from the pipeline, the pipeline operator

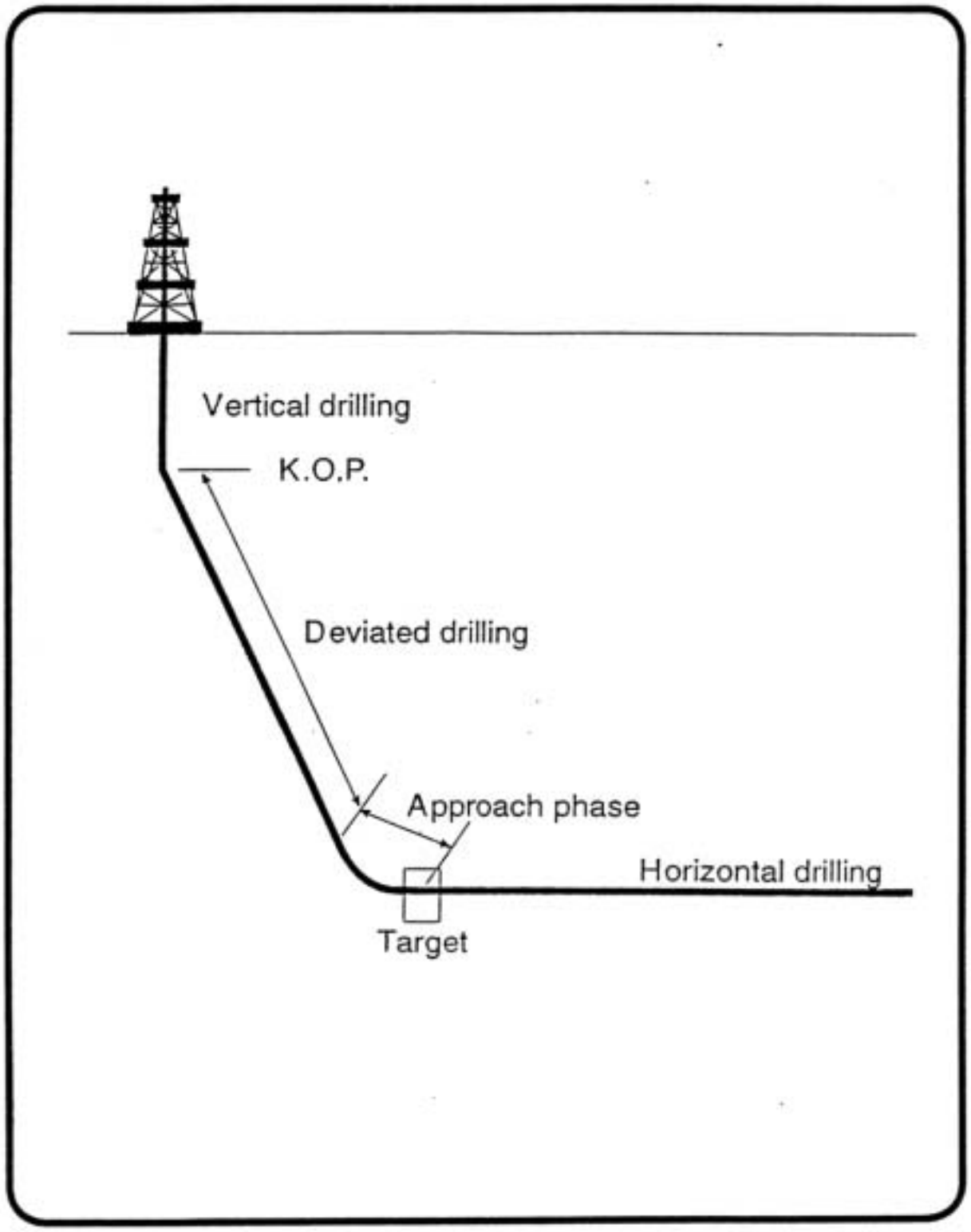


Figure 2-5. Cross-sectional View of Horizontal Drilling.

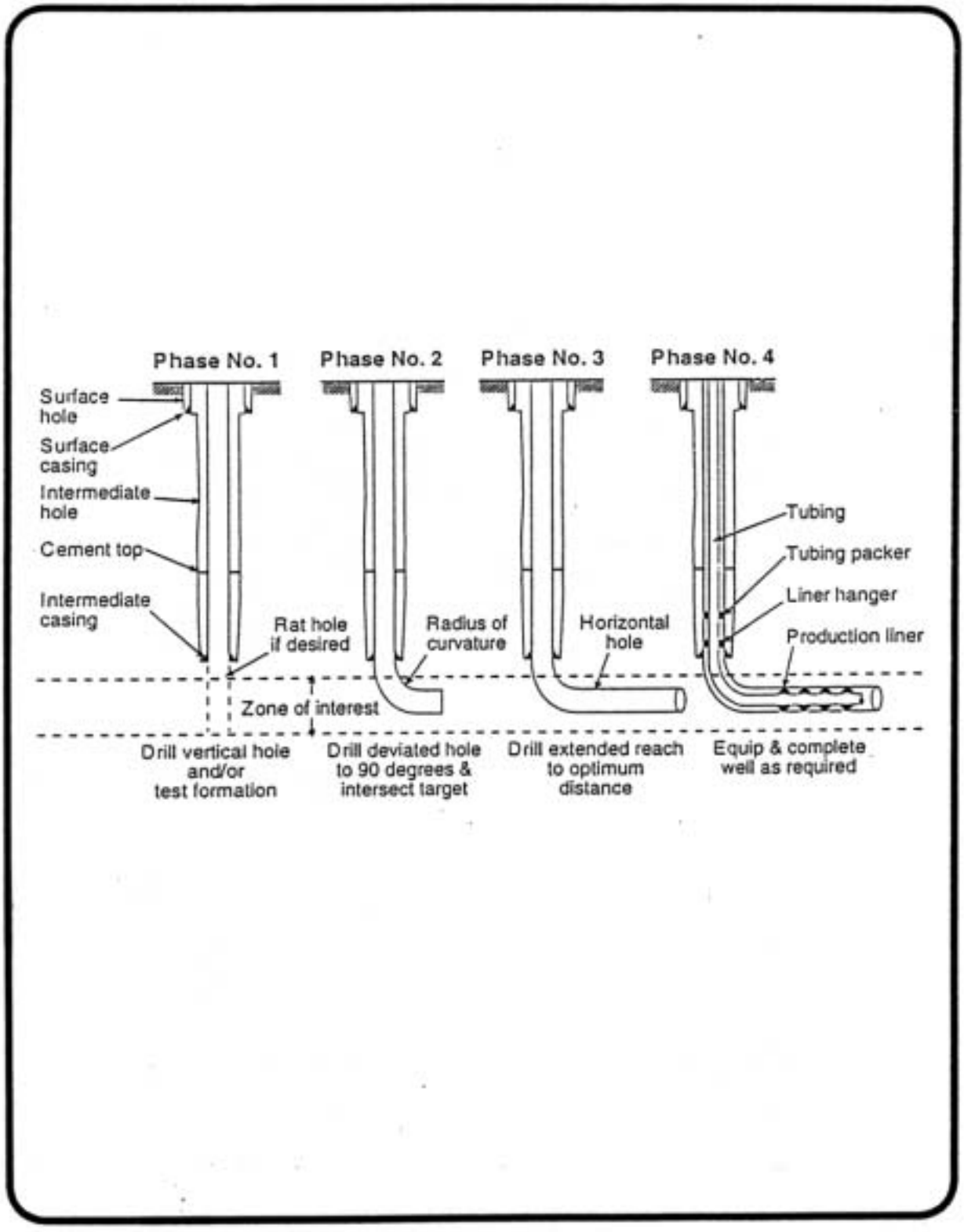


Figure 2-6. Schematic Showing Drilling and Completion Phases of a Horizontal Well.

would design and install a suitable energy dissipater at the outlets, and design and install suitable channel protection structures necessary to ensure that there would be no erosion or scouring of natural channels within the affected watershed as a result of such discharge.

Water produced in association with natural gas or oil production could also be used to hydrostatically test new pipeline. Produced water used for testing would subsequently be disposed of in a manner approved by the BLM in the POD or ROW application.

Subsoil would be backfilled and compacted into the trench over the pipe. Site regrading would occur where necessary. Reclamation of the pipeline route would occur as authorized by the BLM ROW Grant.

Approximately 361 miles of new pipeline would be constructed within the DFPA under the Proposed Action. The Operators estimate that about 1.0 mile of pipeline would be constructed for each well drilled, with about 0.5 mile of pipeline constructed along the access road and about 0.5 mile constructed cross country. The total disturbance width for pipelines constructed along roads would extend 50 feet (roads = 40 feet and pipelines = 10 feet). Cross country construction would require a 25 foot disturbance width.

As discussed in Section 2.5.2.1, Access Road Construction, the Operators estimate that each proposed new well would require an average of 1.5 miles of new or upgraded road construction, (approximately 542 miles), and 1.0 mile of pipeline (approximately 361 miles). Of this, approximately one-half the pipeline length, or 0.50 mile, would be constructed along the roadway. Initial combined access road and cross-country pipeline disturbance would be approximately 50 feet in width. Construction of proposed new roads (1.0 mile x 40 feet per well site) and roads and pipelines combined (0.5 mile x 50 feet per well site) is estimated at 2,841 acres of new site disturbance (7.87 acres of disturbance per well x 361 well locations). Cross country pipeline construction (0.5 mile in length) with a 25-foot disturbance width would create approximately 542 acres of new site disturbance (1.5 acres of disturbance per well x 361 wells).

The ROW would be placed adjacent to existing pipelines or roads where possible. A typical schematic of pipeline installation procedures is shown in Figure 2-7. Figure 2-8 shows a typical roadway cross-section with pipeline installation alongside the road.

2.5.2.5 Natural Gas Production

2.5.2.5.1 Completion and Testing Operations

All access roads to productive well sites would be maintained for well servicing activities (i.e., maintenance, improvements, etc.) if drilling is productive. Reclamation would be completed on segments of the well pad and access road ROW no longer required.

Well completion operations involve the placement and cementing of well casing and perforation, stimulation and testing of potentially productive zones. Well casing involves running steel casing pipe into the open borehole and cementing the pipe in place. Perforation, stimulation, and testing requires large equipment to be transported and utilized at the well site, and flaring of produced gas. A typical cased well bore would consist of conductor pipe, surface casing, and production casing. Well completion operations involve the placement and cementing of well casing.

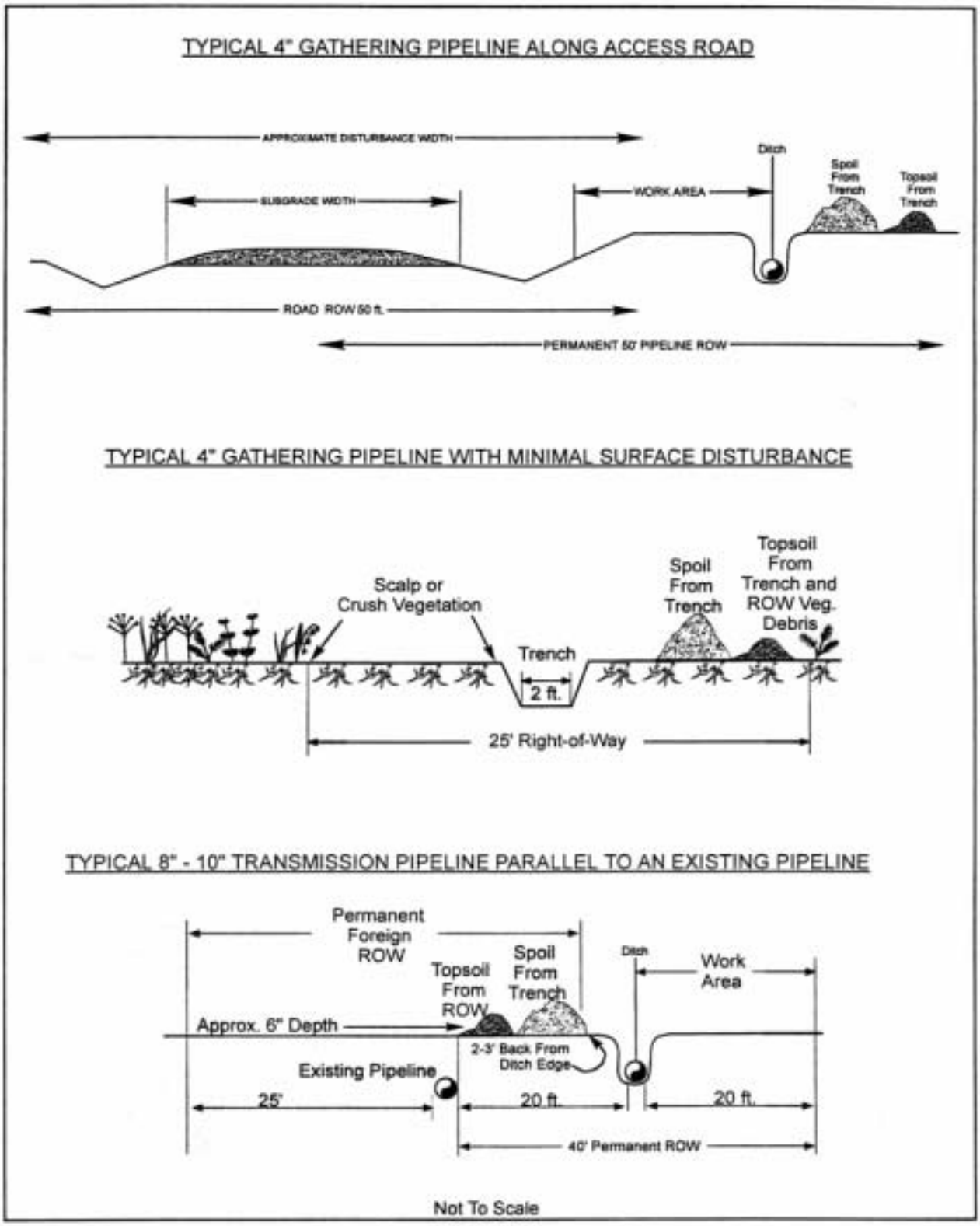
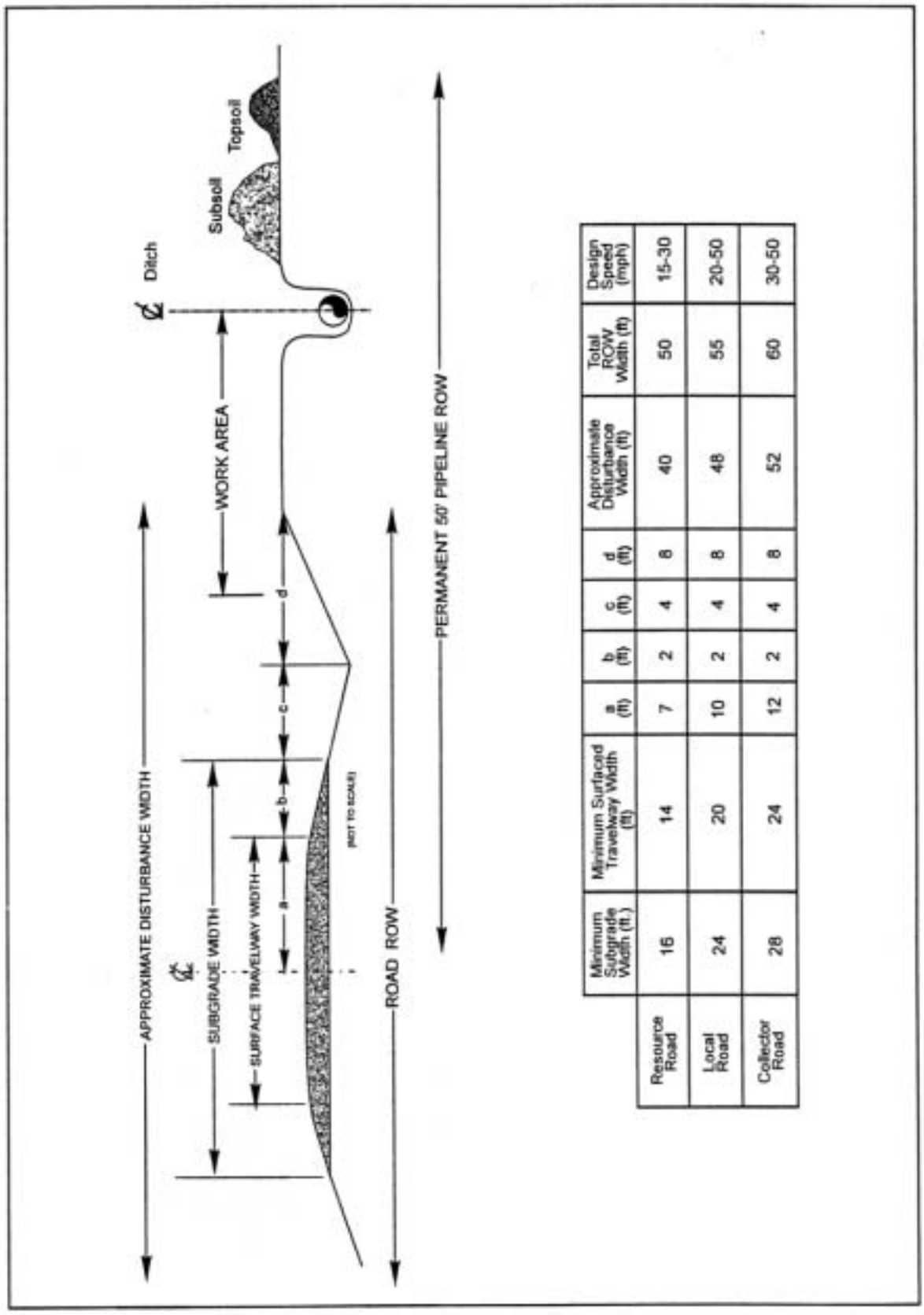


Figure 2-7. Typical Schematic of Pipeline Installation.



	Minimum Subgrade Width (ft.)	Minimum Surfaced Travelway Width (ft)	a (ft)	b (ft)	c (ft)	d (ft)	Approximate Disturbance Width (ft)	Total ROW Width (ft)	Design Speed (mph)
Resource Road	16	14	7	2	4	8	40	50	15-30
Local Road	24	20	10	2	4	8	48	55	20-50
Collector Road	28	24	12	2	4	8	52	60	30-50

Figure 2-8. Typical Roadway Cross-section with Pipeline Installation Alongside the Road.

Surface casing would be set at the start of drilling operations to prevent gas, oil, condensate, or water from migrating from formation to formation, to isolate producing zones, to isolate and protect surface formations and to attach pressure control equipment. Setting and cementing of production casing provides separation and isolation from abnormally pressured zones, usable water zones, and other mineral deposits. The well casing would be perforated in the productive interval to allow the flow of hydrocarbons to the surface. Approximately 10,000 barrels of water may be required in the completing and testing operations per well. Most completions use a string of tubing that is inserted in the casing to the top of the perforated productive zone to allow gas, condensate, and water to flow to the surface where it is collected, measured, and contained. Completion operations typically last up to 60 days for deep tests.

2.5.2.5.2 Production Operations

Production operations would occur on a year-round basis, occasionally limited by weather, maintenance, workover operations, and ground and site conditions. Production operations would require use and maintenance of access roads within the project area on a year-round basis. Construction of power lines to well sites is not anticipated. Current production operations in the DFPA do not require electrical power for compressors and other production facilities.

Typical gravel road maintenance would occur during the summer and early fall months. Winter maintenance would include blading of snow from the access road as necessary, with the blade kept above the ground surface.

Each individual natural gas production site for a single-well would be approximately 1.43 acres (250 feet by 250 feet) as shown in Figure 2-9. Typical completed (cased) well bore diagrams for Lance, Fox Hills, Lewis, and Almond Formation vertical wells are shown in Figure 2-10, Figure 2-11, Figure 2-12, and Figure 2-13 respectively.

Cut and fill slopes associated with each production well site would be reclaimed as prescribed in the APD/ROW. Each producing well would be serviced by its own production facility, unless consolidation of production facilities for closely spaced wells is technically and economically feasible. All wells would be manually operated, requiring daily site visits by a service vehicle.

Casing prevents drill hole cave-in and aquifer mixing, confines production to the well bore, and provides a means of controlling pressure to facilitate installation of surface and subsurface well equipment. A typical cased well bore consists of conductor pipe, surface casing, and production casing. Surface casing is set deep enough and cemented to the surface to protect freshwater aquifers. Surface casing is set at the start of drilling operations. Setting production casing and cementing it in place is designed to prevent gas, oil, condensate, or water from migrating from formation to formation and to isolate producing zones. Most completions in the project area use a string of tubing that is inserted in the casing to the top of the perforated productive zone to allow gas, condensate, and water to flow to the surface where it is collected, measured, and contained.

2.5.2.6 Production Estimates

The following are expected natural gas production performance estimations for the DFPA. Estimates are based on existing production within the DFPA and projections on future production based on the Proposed Action.

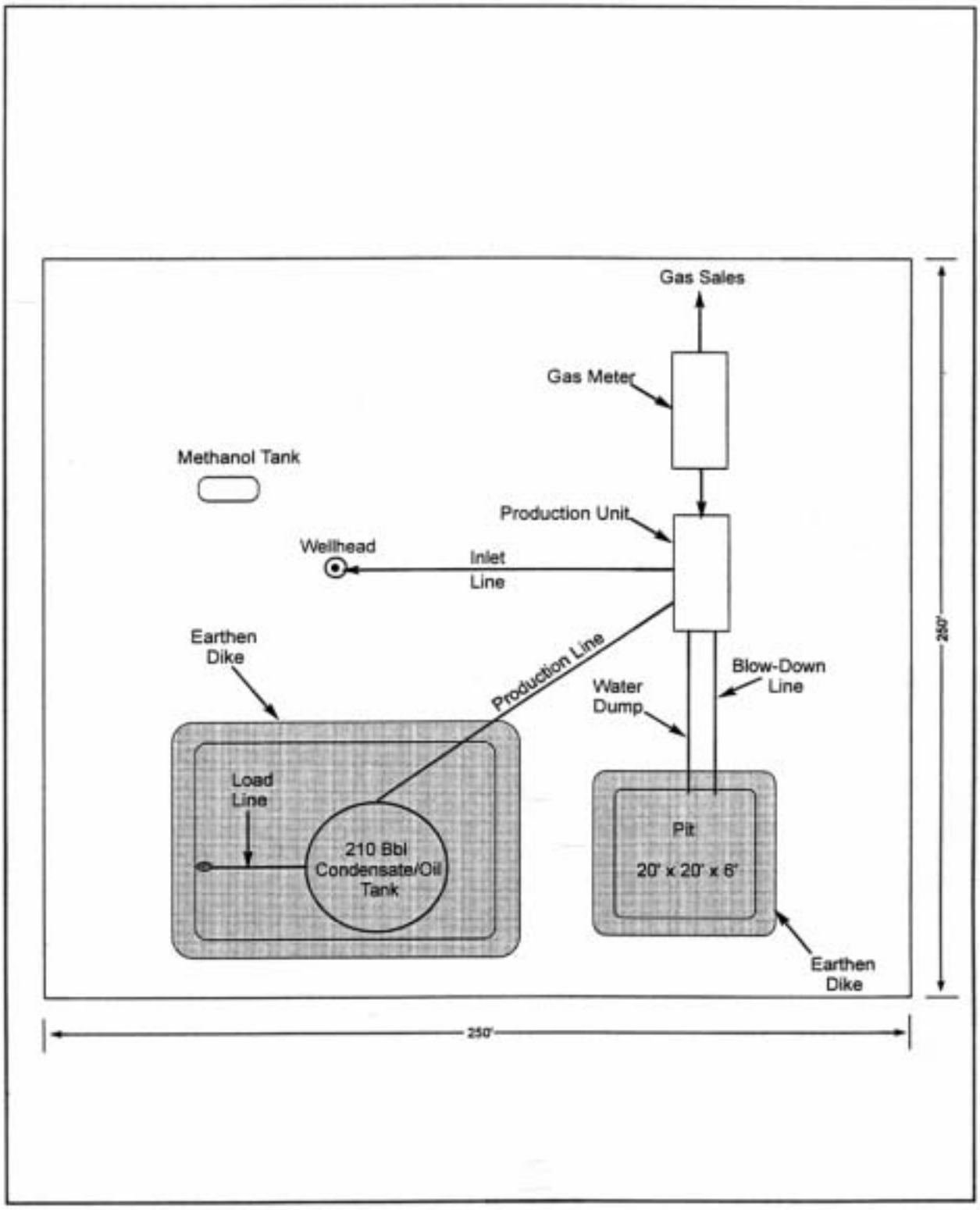


Figure 2-9. Production Facilities Installed at a Production Well Site - Lance/Fox Hills/Lewis and Almond Formations.

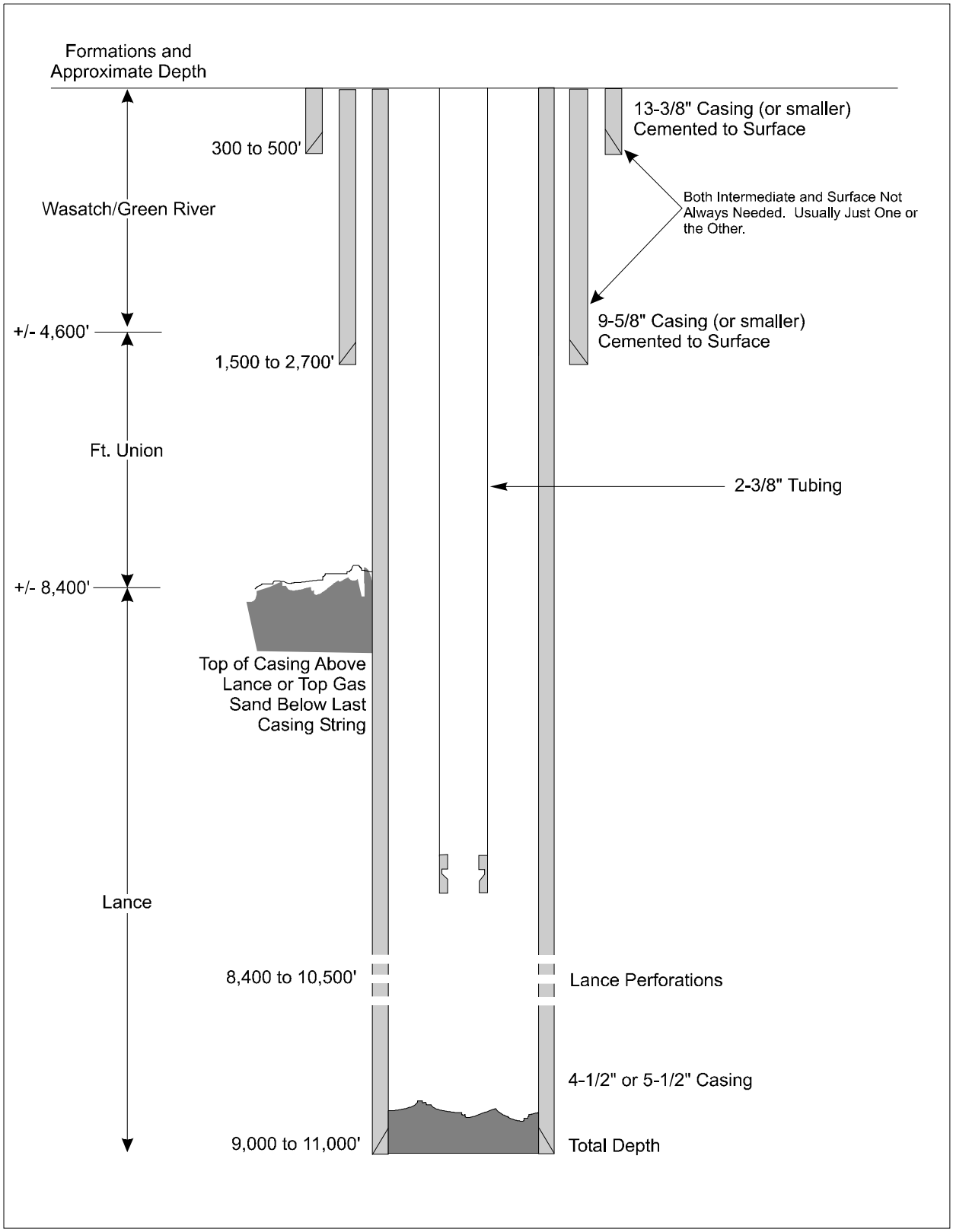


Figure 2-10. Typical Completed Wellbore Diagram for a Vertical Well - Lance Formation.

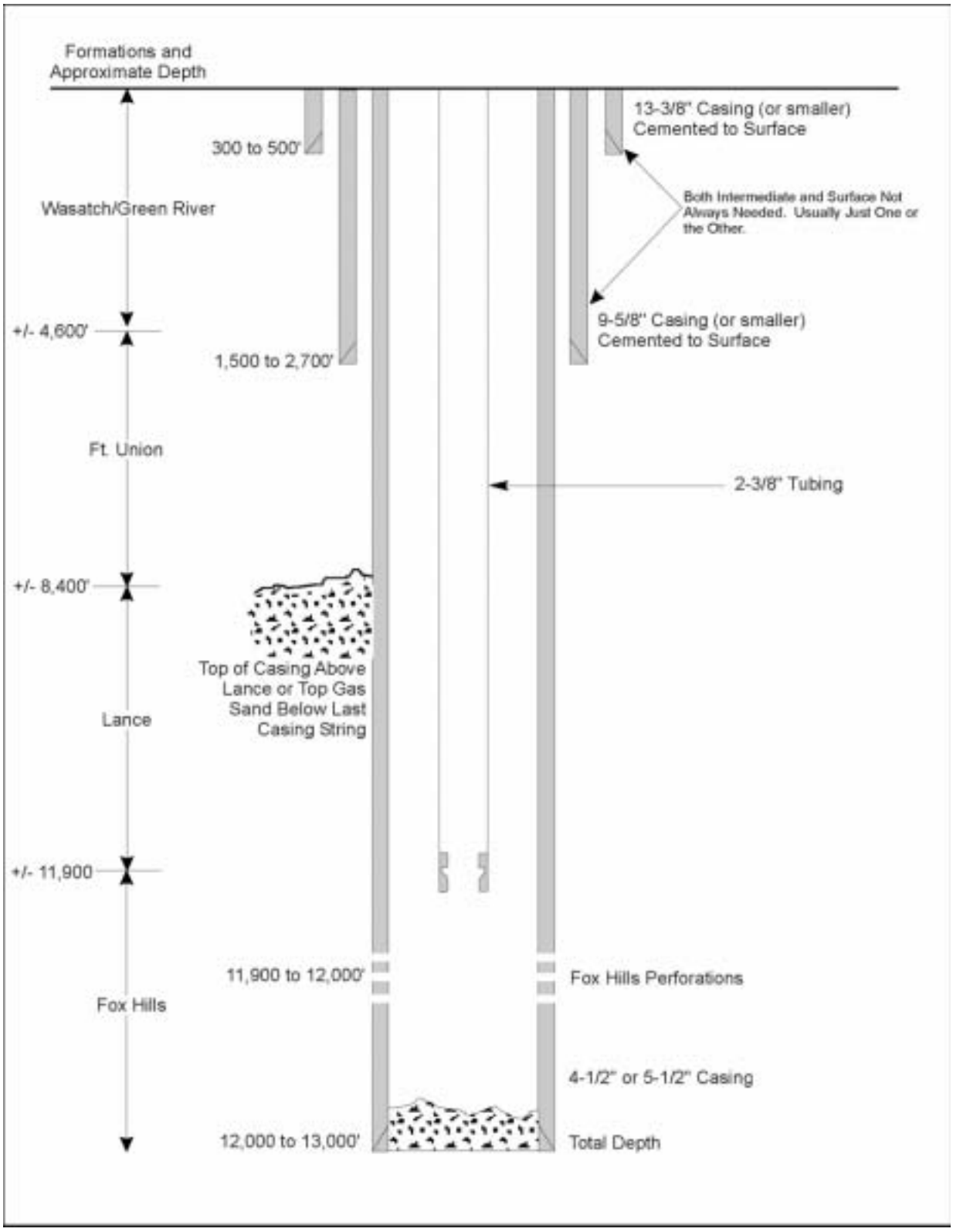


Figure 2-11. Typical Completed Wellbore Diagram for a Vertical Well - Fox Hills Formation.

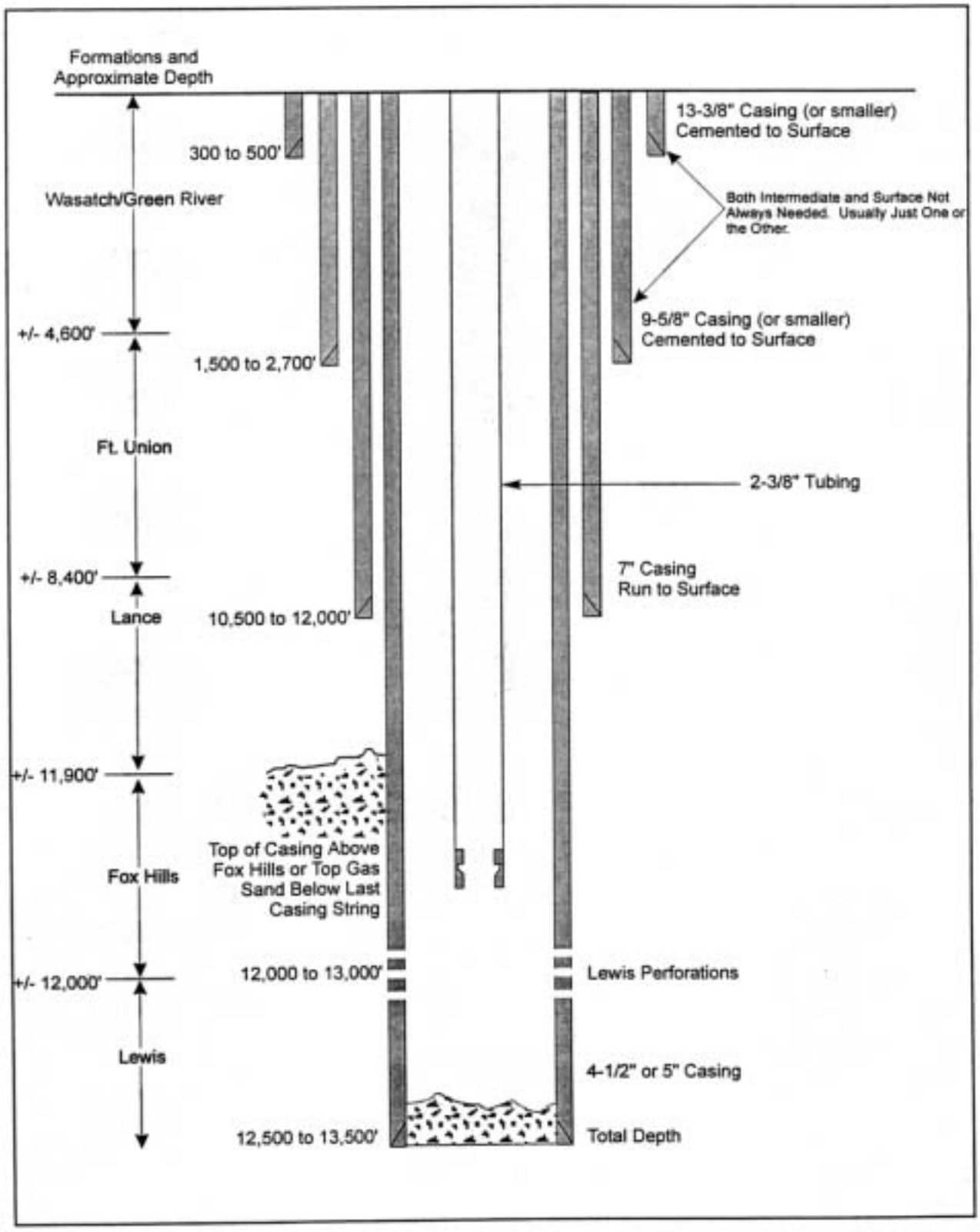


Figure 2-12. Typical Completed Wellbore Diagram for a Vertical Well - Lewis Formation.

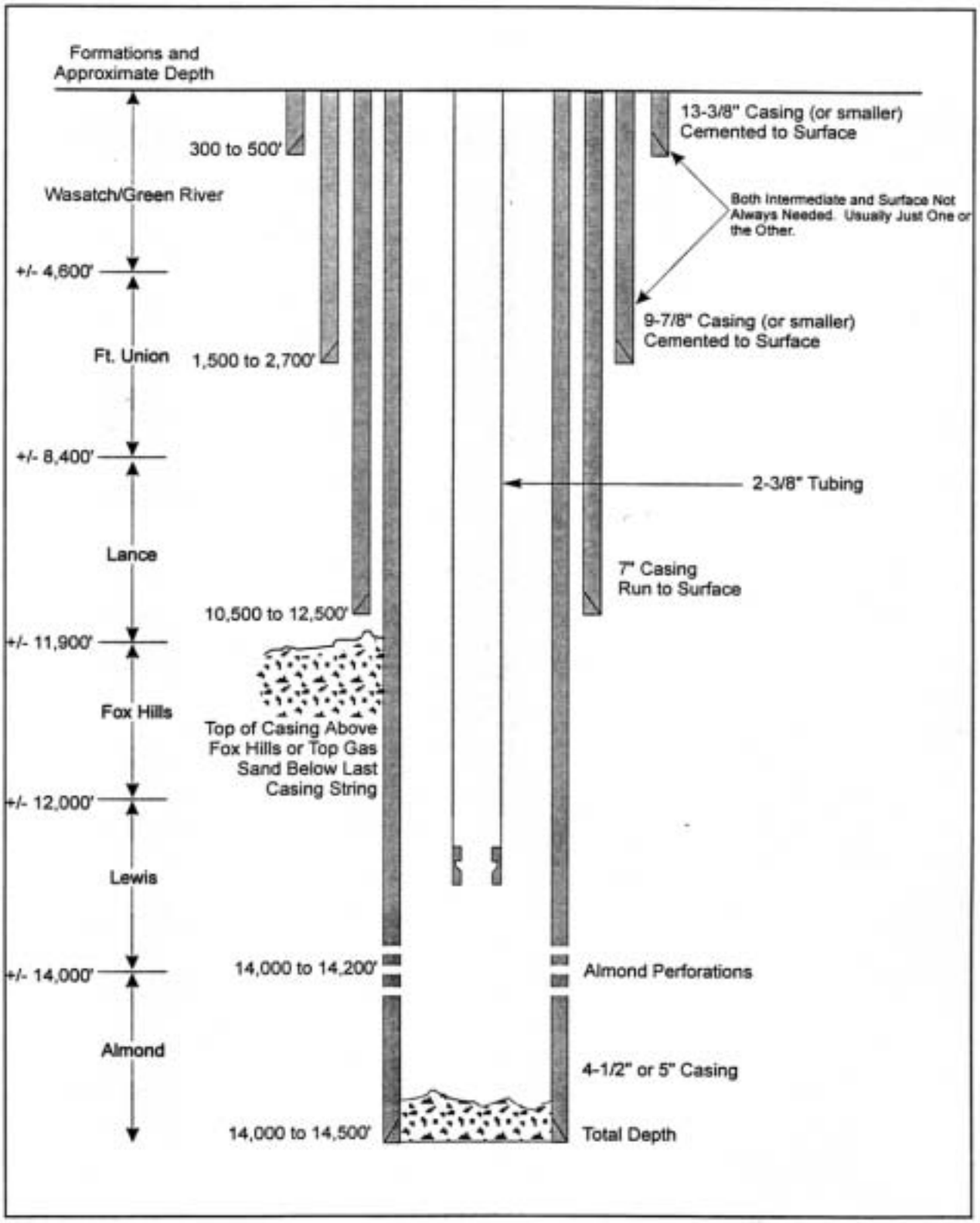


Figure 2-13. Typical Completed Wellbore Diagram for a Vertical Well - Almond Formation.

- Original gas in-place: 12,000 billion cubic feet (BCF)
- Cumulative Production: 136 BCF
- Remaining recoverable reserves: 1,375 BCF

2.5.2.7 Estimated Employment Requirements

The estimated numbers of persons employed in various phases of the pre-drilling, construction, drilling, completion/testing and producing well services including pipeline construction are shown in Table 2-3. It should be noted that many of the personnel employed on different phases of the project are not employed full-time on an annual basis but are employed for shorter periods of time during which their skill or craft is required. In most cases, the length of time for each activity is indicated in addition to the expected time on-site for the different activities involved in field development. Employment numbers for vendors, BLM personnel, and some contractors are not included in these estimates. Note that because some personnel are assigned to multiple wells and some share vehicles, these estimates are not strictly comparable with those in Table 2-2.

2.5.2.8 Ancillary Facilities

The DFPA Operators and pipeline companies would construct ancillary facilities as necessary to meet production needs. Such facilities would include, but not be limited to (1) produced water disposal equipment, (2) individual well site compression, (3) individual well site liquids (hydrocarbon liquids) recovery units, (4) electrical power lines, (5) gas metering stations, (6) pipeline pigging facilities, (7) field storage buildings, and (8) cathodic protection facilities. The number and exact location of such ancillary facilities is not known at this time, but most would be installed within the boundaries of existing disturbances. For those facilities which would not be in existing disturbed areas, the Operators estimate that approximately 97 acres of new disturbance would occur.

2.5.2.9 Geophysical Operations

No additional geophysical operations are currently planned by the operators in the DFPA, but are possible in the future. If proposed, the effects would be analyzed in a separate analysis.

2.5.2.10 Site Restoration and Abandonment

The Operators propose to completely reclaim all disturbed areas not required for production activities including: (1) pipeline ROW, (2) portion of road ROW not required in the function of the road, and (3) the portion of the drill pad not required during production. Reclamation would generally include: (1) complete cleanup of the disturbed areas (drill sites, access roads, etc.); (2) restoration of the disturbed areas to the approximate ground contour that existed prior to construction; (3) ripping of disturbed areas to a depth of 12 to 18 inches; (4) replacement of topsoil over all disturbed areas; (5) seeding of reclaimed areas with the seed mixture prescribed in the Surface Use Plan or POD for the Proposed Action, and (6) fertilizing, if considered necessary by the BLM authorized officer.

Specific reclamation recommendations for use with the natural gas drilling and production operations within the project area are described in Appendix C. The final set of reclamation measures to be applied would be developed in the APD or ROW grant by each operator in consultation with the BLM and would be specific to each site and the conditions at that site.

Table 2-3. Workforce Categories, Numbers, Duration, and Commute Information

Employment Category	Employment	Duration
Pre-Approval & Permitting		**(Variable)**
Company personnel	2	Variable
Permitting contractor	1	Variable
Surveyors	2	Once/well
Resource specialists	Variable	Variable
Drilling		**(About 55 days/well)**
Road/drill site construction	3/well	5-7 days/well
Gravel haul	Variable	1-2 days/well
Rig transport & setup	15/well	4 days/well
Drilling engineer	1/well	
Rig Supervisor	1/well	Visits well weekly
Drilling foreman	2/well	55 days/well
Drilling Crew	2 crews of 5 each/well	55/days/well
Mud logger	1/well	40 days/well
Mud engineer	1/well	visits well once/week
Completion/Testing		**(About 20 days/well)**
Completion rig crew	2 crews of 4 /well	30 days/well
Casing crew	5/well	2 days/well
Cementing crew	4/well	2 days/well
Well testers	2/well	15 days/well
Perforators	2/well	2 days/well
Frac crew	2 crews of 15/well	2 days/well
Completion service	2/well	As needed
Field Development		**(Variable)**
Gathering system construction	12/mile	4 days/mile
Compressor station const.	12/station	7 days/station
Gas processing plant const.	24/plant	21 days
Tool pusher	1/well	55 days/well
Well service	2/well	As needed
Production (employment for field)		**(Life of Field)**
Production foreman	1	Life of field
Pumper	1	Life of field
Hauler	1	Life of field
Workover/maintenance	Variable (contractors)	As needed for life of field
Reclamation		**(As Needed)**
Reclamation crew	3	7 days/well

As indicated previously, many disturbances would be reclaimed. Disturbances associated with drill sites would thereby be reduced by reclaiming cut, fill, and soil stockpiling areas. The size of the remaining well pad would be 1.43 acres after reclamation. This would represent an approximate reduction of 1,108 acres of surface disturbance for all new well sites. All cross-country pipeline ROW's would be reclaimed representing an approximate reduction of 542 acres of disturbed area.

2.5.2.11 Project-Wide Mitigation Measures

Following are mitigation measures and agency required procedures on public lands to avoid or mitigate resource or other land use impacts. These measures would be applied on privately owned surface and State of Wyoming lands unless otherwise specified by the involved private and/or the State surface owners. An exception to a mitigation measure and/or design feature may be approved on public land on a case-by-case basis when deemed appropriate by the BLM. An exception would be approved only after a thorough, site-specific analysis determined that the resource or land use for which the measure was put in place is not present or would not be significantly impacted.

2.5.2.11.1 Preconstruction Planning and Design Measures

- The Operators and the BLM would make on-site ID inspections of each proposed and staked facility site (e.g., well sites), new access road, access road reconstruction, and pipeline alignment projects so that site-specific recommendations and mitigation measures can be developed.

- New road construction and maintenance of existing roads in the DFPA would be accomplished in accordance with BLM Manual 9113 standards unless private landowners or the State of Wyoming specify otherwise.

- The Operators would prepare and submit an APD for each drill site on federal leases to the BLM for approval prior to initiation of construction. Also prior to construction, the operators or their contractors would submit a Sundry Notice and/or ROW application for each pipeline and access road segment on federal leases. The APD would include a Surface Use Plan that would show the layout of the drill pad over the existing topography, dimensions of the pad, volumes and cross sections of cut and fill, location and dimensions of reserve pit, and access road egress and ingress. The APD, Sundry Notice, and/or ROW application plan would also itemize project administration, time frame, and responsible parties. In addition, a reclamation plan would be developed by the operators for each facility in consultation with the BLM.

- The Operators would slope-stake construction activities when required by the BLM (e.g., steep and/or unstable slopes) and receive approval from the BLM prior to start of construction.

2.5.2.11.2 Resource-Specific Requirements

The Operators propose to implement the following resource-specific mitigation measures and agency requirements:

Geology/Minerals/Paleontology

Paleontological resource values would be protected through the following mitigation measures:

- All areas of proposed ground disturbance within the MVMA would be surveyed by a qualified paleontologist prior to disturbance. Any mitigation measures proposed as a result of the survey would be developed in consultation with the BLM regional paleontologist.

- Outside of the MVMA, paleontologic detailed surveys would be conducted on areas of proposed ground disturbance underlain by the Washakie Formation and spot check survey would be conducted on areas of proposed ground disturbance underlain by the Browns Park Formation, Laney Member of the Green River Formation and Cathedral Bluffs Member of the Wasatch Formation. These areas are delineated in the paleontology report (EVG 2001) submitted to the BLM. Any mitigation measures proposed as a result of surveys would be evaluated by the BLM regional paleontologist for applicability.

- If paleontologic resources are discovered anywhere in the area anytime during construction, construction activities in the vicinity of the discovery would cease and BLM personnel would be notified immediately. Work would not resume until a qualified paleontologist has evaluated the discovery.

- Surface disturbing activities would be managed to avoid slopes greater than 25% and highly erosive areas.

Climate and Air Quality

- The Operators would not burn garbage or refuse at the drill sites or other facilities.

- When an air quality, soil loss, or safety problem is identified as a result of fugitive dust, immediate abatement would be initiated. The BLM would approve the procedure (e.g., application of water and magnesium chloride) for dust abatement at facility construction sites as well as locations for use and application rates. Water, if approved for this purpose, must be obtained by the Operator from State-approved source(s).

Soils

- Reduce the area of disturbance to the absolute minimum necessary for construction and production operations while providing for the safety of personnel. The operators would restrict off-road vehicle activity.

- Where feasible, buried pipelines would be located immediately adjacent to roads to avoid creating separate areas of disturbance and in order to reduce the total area of disturbance.

- The operators would avoid using frozen or saturated soils as construction material.

- The operators would minimize construction activities in areas of steep slopes and other sensitive soils, and apply special slope stabilizing structures if construction cannot be avoided in these areas.

- Design cutslopes in a manner that would allow retention of topsoil, surface treatment such as mulch, and subsequent revegetation.

- Selectively strip and salvage topsoil or the best suitable medium for plant growth from all disturbed areas to a depth of 12 inches, more if available, on all well pads.

- Where possible, minimize disturbance to vegetated cuts and fills on existing roads that are improved.

- Install runoff and erosion control measures such as water bars, berms, and interceptor ditches if required, as prescribed in Appendix C.

- Install culverts for ephemeral and intermittent drainage crossings. Design all drainage crossing structures to carry the 50-year discharge event, or as otherwise directed by the BLM.

- Implement minor routing variations during access road layout to avoid steep slopes adjacent to ephemeral or intermittent drainage channels. Maintain a 100-foot wide buffer strip of natural vegetation where possible (not including wetland vegetation) between all construction activities and ephemeral and intermittent drainage channels.

- Include adequate drainage control devices and measures in the road design (e.g., road berms and drainage ditches, diversion ditches, cross drains, culverts, out-sloping, and energy dissipators) at sufficient intervals and intensities to adequately control and direct surface runoff above, below, and within the road environment to avoid erosive concentrated flows. In conjunction with surface runoff or drainage control measures, use erosion control devices and measures such as temporary barriers, ditch blocks, erosion stops, mattes, mulches, and vegetative covers. Implement a revegetation program as soon as possible to re-establish the soil protection afforded by a vegetal cover.

- Upon completion of construction activities, restore topography to near pre-existing contours at the well sites, along access roads and pipelines, and other facilities sites. Replace up to 12 inches of topsoil or suitable plant growth material over all disturbed surfaces, and apply fertilizer as required, seed (specified in a reclamation plan), and mulch.

Water Resources

- The vast majority of the stream channels that occur within the DFPA are ephemeral (i.e., carry water only in direct response to snow melt or precipitation events). Streams receive little or no support from groundwater discharge to sustain flow and the few springs at higher elevations only sustain intermittent stream flow for short distances downstream. Operators should limit construction of drainage crossings to no-flow periods or low-flow periods.

- Minimize the area of disturbance within drainage channel environments.

- Prohibit construction of well sites, access roads, and pipelines within 500 feet of surface water and/or riparian areas. Exceptions to this would be granted by the BLM based on an environmental analysis and site-specific mitigation plans.

- Minor routing variations during access road layout would be implemented to avoid steep slopes adjacent to drainage channels. A 100-foot wide buffer strip of natural vegetation where possible (not including wetland vegetation) would be maintained between all

construction activities and drainage channels.

- Culverts would be installed for all drainage crossings. All drainage crossing structures would be designed to carry a 50-year discharge event, or as otherwise directed by the BLM.

- Design channel crossings to minimize changes in channel geometry and subsequent changes in flow hydraulics.

- Maintain vegetation barriers occurring between construction activities and channels.

- Construction activities would be minimized in areas of steep slopes, and special slope stabilizing structures would be applied if construction can not be avoided in these areas.

- Runoff and erosion control measures would be installed such as water bars, berms, and interceptor ditches as required.

- Adequate drainage control devices and measures would be included in the road design (e.g., road berms and drainage ditches, diversion ditches, cross drains, culverts, out-sloping, and energy dissipators) at sufficient intervals and intensities to adequately control and direct surface runoff above, below, and within the road environment to avoid erosion concentrated flows. Erosion control devices would also be used in conjunction with the surface runoff and drainage control devices, such as temporary barriers, ditch blocks, erosion stops, mattes, mulches, and vegetative covers. A revegetation program would be implemented as soon as possible to re-establish the soil protection afforded by a vegetal cover.

- Design and construct interception ditches, sediment traps, water bars, and revegetation and soil stabilization measures if required.

- Construct channel crossings for buried pipelines such that the pipe is buried a minimum of four feet below the channel bottom.

- Regrade disturbed channel beds to the original geometric configuration with the same or very similar bed material.

- Upon completion of construction activities, the topography would be restored to near pre-existing contours at the well sites, along access roads, pipelines, and other facilities sites. Up to 12 inches of topsoil or suitable plant growth material would be replaced over all disturbed surfaces. Fertilizer, seed (specified in a reclamation plan), and mulch would be applied as required.

- The project must comply with RMP management directives that relate to protection of water resources identified in Section 4.4.2 These regulations require avoidance of stream channels to the maximum practicable extent. Where total avoidance is not practicable, then minimization of impacts to streams must be implemented. Where streams cannot be avoided, the Operators would be required to show the BLM AO why such resources cannot be totally avoided and how impacts would be minimized during the APD process.

- Case wells during drilling, and case and cement all wells in accordance with On-Shore Order No. 2 to protect accessible high quality aquifers. High quality aquifers are aquifers with known water quality of 10,000 ppm TDS or less. Include well casing and welding of

sufficient integrity to contain all fluids under high pressure during drilling and well completion. All wells would be cemented in compliance with specifications contained in the APD.

- Reserve pits would be constructed so that a minimum of one-half of the total depth is below the original ground surface on the lowest point within the pit.

- In non-critical areas, and when a fresh water based mud system is being used, the Operators propose to use an unlined earthen reserve pit. Earthen reserve pits would be used only after evaluation of the pit location for distance to surface waters, depth to useable ground water, soil type and permeability, and after evaluation of the fluids which would likely be retained in the pit. If deemed necessary during the individual well site APD review, the reserve pit would be lined with an impermeable liner to prevent seepage. Bentonite or impermeable lining would be used where appropriate as defined during APD review. The synthetic liner would be at least 12 mils (12,000ths of an inch) thick, reinforced with a bursting strength of 174 x 175 pounds per inch (ASTMD 75719), resistant to decay from sunlight and hydrocarbons and compatible with the drilling fluids to be retained.

- Maintain 2 feet of freeboard on all reserve pits to ensure the reserve pits are not in danger of overflowing. Shut down drilling operations until the problem is corrected if leakage is found outside the pit.

- Remove any hydrocarbons floating on the surface of the reserve pit as soon as possible after drilling operations are complete.

- Extract hydrostatic test water used in conjunction with pipeline testing and all water used during construction activities from sources with sufficient quantities and through appropriation permits approved by the State of Wyoming.

- Hydrostatic test water will be reused where possible and/or discharged in a controlled manner onto an energy dissipator. The water is to be discharged onto undisturbed land that has vegetative cover, if possible, or into an established drainage channel. Prior to discharge, treat or filter the water to reduce pollutant levels or to settle out suspended particles if necessary. If discharged into an established drainage channel, the rate of discharge would not exceed the capacity of the channel to safely convey the increased flow. Coordinate all discharge to test water with the SEO and the BLM.

- Discharge all concentrated water flows within access road ROW's onto or through an energy dissipator structure (e.g., riprapped aprons and discharge points) and discharge into undisturbed vegetation.

- Develop and implement a PPP for storm water runoff at drill sites as required per WDEQ storm water NPDES permit requirements.

- The Operators must coordinate with the COE to determine the specific CWA Section 404 Permit requirements and conditions (including the potential requirement of compensatory

mitigation) for each facility that occurs in Waters of the U.S. to prevent the occurrence of significant impact to such waters.

- Exercise stringent precautions against pipeline breaks and other potential accidental discharges of toxic chemicals into adjacent streams. If liquid petroleum products storage capacity exceeds criteria contained in 40 CFR Part 112, an SPCC plan would be developed in accordance with 40 CFR Part 112.

- The project must comply with all aspects of the CWA. An NPDES permit would be required for the project. The permit would require the Operators to develop a surface runoff, erosion, and sedimentation control plan, oil spill containment and contingency plan, as well as other environmental protection plans to ensure that the opportunity of probability of water pollution is minimized.

Fisheries

- If any water depletion to the Colorado River System is anticipated, formal consultation with the FWS will be undertaken and a Biological Opinion obtained to offset possible downstream impacts on Threatened and Endangered fish species.

Vegetation and Wetlands

- Seed and stabilize disturbed areas with mixtures and treatment guidelines prescribed in the approved APD/ROW.

- Evaluate all project facility sites for occurrence and distribution of waters of the U.S., special aquatic sites, and jurisdictional wetlands. All project facilities would be located out of these sensitive areas. If complete avoidance is not possible, minimize impacts through modification and relocations. Coordinate activities that involve dredge or fill into wetlands with the COE.

- Conduct site-specific surveys for federally listed threatened and endangered (T&E), candidate and proposed plant species, and BLM Wyoming State Director sensitive species prior to any surface disturbance in areas determined by the BLM to contain potential habitat for such species. If such plant species or their habitat are found during the surveys, adjustments to the location of project facilities would be made to avoid the plant species and/or their habitat. Copies of these surveys would be provided to the BLM.

Invasive/Non-Native Species

- Incorporate invasive/noxious weed management strategies into the preconstruction planning and design process for all surface disturbance activities including road, pipeline, well pad and ancillary facility construction.

- Stabilize disturbed areas and reestablish vegetation on all bare ground using mixtures and treatment guidelines prescribed in the approved APD/ROW as soon as practical to minimize weed spread.

- File noxious weed monitoring forms with the BLM and implement, if necessary, a weed control and eradication program.
- On BLM lands, an approved Pesticide Use Proposal would be obtained before the application of herbicides or other pesticides for the control of noxious weeds.

Range Resources and Other Land Uses

- The Operators would coordinate with the affected livestock operators to ensure that livestock control structures remain functional during drilling and production operations.

- Replace damaged livestock control structures as soon as possible with structures constructed to BLM standards.

- In the event a pipeline trench three-quarters of a mile or more in length is left open over night, plugs will be installed at one-quarter mile intervals to allow livestock and wildlife, which may have fallen into the trench, to escape.

Wildlife

- No disturbance would occur in habitats designated as crucial big game winter range between November 15 and April 30.

- Within big game crucial winter ranges, disturbances would be placed so that specific important vegetation types, as identified by the BLM, would be avoided where possible.

- During reclamation, establish a variety of forage species that are useful to resident herbivores by specifying the seed mixes in the approved APD/ROW.

- No surface disturbance would be allowed within 1/4 mile of greater sage-grouse leks unless they are considered historic (have not been used in the past 7-10 years).

- No surface disturbance will occur within two miles of an active or known greater sage-grouse lek between March 1 and June 30.

- No surface disturbance would be allowed within identified patches of greater sage-grouse severe winter relief habitat.

- No disturbance would be allowed during the critical nesting season (Feb 1 - July 31, depending on species) within 1 mile of an active nest of listed or sensitive raptor species, and 3/4 - ½ mile (depending upon species or line of sight) of an active nest of other raptor species. The nature of the restrictions and the protection radius would vary according to the raptor species involved and would be determined by the BLM.

- In the event of a “taking” of a raptor nest, all appropriate permits would be acquired.

- Where construction within potential mountain plover habitat is scheduled to occur between April 10 and July 10, mountain plover surveys would be conducted according to current FWS guidelines.

- Well pads and disturbances would be placed outside of potential mountain plover habitat where feasible.

- Should mountain plovers or mountain plover nests be found within 200 m of a proposed well or disturbance area, construction activities would be postponed until at least 1 week post hatching, and the site would be monitored during the following nesting season to determine whether or not the plovers return.

- Additional stipulations may be required if known occupied mountain plover habitat areas are to be disturbed.

- If disturbance of prairie dog colonies located within complexes that contain potential black-footed ferret habitat (Biggins et al. 1989) can not be avoided, black-footed ferret surveys would be conducted according to FWS guidelines (USDI-FWS 1989).

- Well pads and disturbances would be placed outside of (50 m) prairie dog colonies where feasible.

- Should black-footed ferrets be documented in a prairie dog complex located within the project area, impact to the species or its habitat would be completely avoided, and all previously authorized project-related activities on-going in the prairie dog complex would be suspended immediately.

- The BLM and operators would conduct educational outreach to employees regarding the nature, hosts, and symptoms of canine distemper, and its effects on black-footed ferrets, focusing attention on why employees should not have pets on work sites during or after hours.

- All suspected observations of black-footed ferrets, their sign, or carcasses on the DFPA, however obtained, would be promptly (within 24 hours) reported to the BLM and FWS.

- Operators would Prohibit unnecessary off-site activities of operational personnel in the vicinity of the drill sites.

- Project employees would be informed of applicable wildlife laws and penalties associated with unlawful take and harassment of wildlife.

- Regular drivers would undergo training describing the types of wildlife in the area that are susceptible to vehicular collisions, the circumstances under which such collisions are likely to occur, and the measures that can be employed to minimize them. Reduced speed limits would be implemented to reduce potential for vehicle-wildlife collisions.

- Carcasses of road-killed animals and birds would be removed from access roads, shoulders, and the ROW's to minimize bald eagle exposure to vehicles.

- To protect migratory birds and wildlife in general, all reserve pits and other pits and areas that contain potentially hazardous materials would be fenced and netted, in accordance with BLM requirements.

Recreation

- Minimize conflicts between project vehicles and equipment and recreation traffic by posting appropriate warning signs, implementing operator safety training, and requiring drivers of project vehicles to adhere to low speed limits.

Visual Resources

- Utilize existing topography to screen roads, pipeline corridors, drill rigs, well heads, and production facilities from view.

- Paint well and central facilities site structures with flat colors that blend with the adjacent surrounding undisturbed terrain, except for structures that require safety coloration in accordance with Occupational Safety and Health Administration (OSHA) requirements. The color selected for this project is Carlsbad Canyon.

Cultural Resources

- If a site is considered eligible for, or is already on the National Register of Historic Places (NRHP), avoidance is the preferred method for mitigating adverse effects to that property.

- Mitigation of adverse effects to cultural/historical properties that cannot be avoided would be accomplished by the preparation of a cultural resources mitigation plan.

- If cultural resources are discovered at any time during construction, all construction activities would cease and BLM personnel would be immediately notified. Work would not resume until a Notice to Proceed is issued by the BLM.

Socioeconomics

- Implement hiring policies that would encourage the use of local or regional workers who would not have to relocate to the area.

- Coordinate project activities with ranching operations to minimize conflicts involving livestock movement or other ranch operations. This would include scheduling of project activities to minimize potential disturbance of large-scale livestock movements. Establish effective and frequent communication with affected ranchers to monitor and correct problems and coordinate scheduling.

Health and Safety

- Sanitation facilities installed on the drill sites and any resident camp site locations would be approved by the WDEQ.

- To minimize undue exposure to hazardous situations, require measures that would preclude the public from entering hazardous areas and place warning signs alerting the public of truck traffic.

- At all construction and operations locations, require all trash, waste and unused materials to be promptly stored in appropriate containers, and all containers, drums, pallets, etc. to be secured to prevent them from blowing off-site.

- Haul all garbage and rubbish from the drill site to a State-approved sanitary landfill for

disposal. Collect and store any garbage or refuse materials on location prior to transport in closed containers.

- During construction and upon commencement of production operations, the operators would have a chemical or hazardous substance inventory for all such items that may be at the site. The operators would institute a Hazard Communication Program for its employees and would require subcontractor programs in accordance with OSHA 29 CFR 1910.1200. These programs are designed to educate and protect the employees and subcontractors with respect to any chemicals or hazardous substances that may be present in the work place. It would be required that as every chemical or hazardous material is brought on location, a Material Safety Data Sheet (MSDS) would accompany that material and would become part of the file kept at the field office as required by 29 CFR 1910.1200. All employees would receive the proper training in storage, handling, and disposal of hazardous substances.

- SPCC Plans would be written and implemented as necessary in accordance with 40 CFR Part 112 to prevent discharge into navigable waters of the United States.

- Immediately upon discovery of any leaks, ruptures, spills or releases, notify the BLM (per Hazardous Substances Spill Plan for NTL-3A incidents) and appropriate local, state and other federal agencies, and conduct containment and clean-up activities as required by appropriate local, state and federal regulations.

- Chemical and hazardous materials would be inventoried and reported in accordance with the Superfund Amendments and Reauthorization Act (SARA) Title III. 40 CFR Part 335, if quantities exceeding 10,000 pounds or the threshold planning quantity (TPQ) are to be produced or stored in association with the Proposed Action. The appropriate Section 311 and 312 forms would be submitted at the required times to the State and County Emergency Management Coordinators and the local fire departments.

- Waste oils and hazardous wastes, as defined by the Resource Conservation and Recovery Act (RCRA), would be transported and/or disposed of in accordance with all applicable federal, state, and local regulations.

  The Operators plan to design operations to severely limit or eliminate the need for Extremely Hazardous substances. The operators also plan to avoid the creation of hazardous wastes as defined by RCRA wherever possible.

  Appendix D (Hazardous Substance Management Plan) provides a summary of the hazardous chemicals that may be on a drilling or production site with examples of representative chemicals and associated physical and health hazards. At this time it is impossible to determine if these items would be stored in sufficient quantities to require reporting under SARA Title II, and in some cases, the items may not be on site at all. However, all items would become part of the Hazard Communications Plan where required, and employee training would be completed as required.

- During site reclamation, remove and properly dispose of all fluids from pits, drums, tanks, compressors and other sources.

Noise

- Muffle and maintain all motorized equipment according to manufacturers' specifications.

2.6 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

The Council on Environmental Quality regulations implementing NEPA require BLM to rigorously explore and objectively evaluate all reasonable alternatives and to briefly explain the reasons for any alternatives that are eliminated from detailed study (40 CFR 1502.14(a)). Two alternatives were considered but dropped from study for the reasons described below.

2.6.1 Expanded Wilderness Alternative

The RFO and RSFO received a proposal entitled “A Citizens’ Wilderness Inventory of Adobe Town” (Citizens’ Proposal) in August, 2001. The Citizens’ Proposal requested that the BLM consider additional lands surrounding the Adobe Town WSA for wilderness status. All lands contained in the Citizens’ Proposal are contiguous to the existing Adobe Town WSA. Lands contained in the Citizens’ Proposal include public lands in both the RFO and RSFO that are within the DFPA.

An alternative was considered to analyze the Citizens’ Proposal to evaluate lands surrounding the Adobe Town WSA for wilderness status. This alternative was eliminated from further consideration and detailed study because the proposal would be more appropriately addressed within the context of the BLM’s land use plan review process. In addition, to delay the Desolation Flats Natural Gas Field Development Project, or require that the proponents complete land use planning analysis of the Citizens’ Proposal would not be appropriate within the context of a project-specific EIS.

The lands identified in the Citizens’ Proposal for consideration as wilderness were originally included in a review of public lands conducted by the BLM in 1980. These lands were found not to contain the wilderness qualities necessary for consideration as wilderness and were eliminated from further analysis.

The information provided in the ‘Citizens’ Proposal’ was evaluated by RFO and RSFO in late 2001. Certain public lands outlined in the Citizens’ Proposal, including those lands within the DFPA, were found to contain sufficient human intrusions to preclude wilderness characteristics and have been eliminated from further consideration. Other public lands included in the Citizens’ Proposal may have wilderness characteristics. The RFO will evaluate the Citizens’ Proposal through the RMP revision process currently underway for the Great Divide RMP (USDI-BLM 1987, 1988a, 1990a). The RSFO will evaluate the Citizens’ Proposal through a planning review and document the review using an appropriate NEPA document.

The ongoing oil and gas development within the Citizens’ Proposal is consistent with the RFO Great Divide ROD and Approved RMP (USDI-BLM 1990a), and the RSFO ROD and Green River RMP (USDI-BLM 1997). Oil and gas development is also consistent with the Mulligan Draw Gas Field Project ROD (USDI-BLM 1992b) that covers a portion of the DFPA. Prior to completion of the Great Divide RMP revision process, any application for development received by the RFO within that portion of the Citizens’ Proposal found by the BLM to contain wilderness values, would be considered through a site-specific NEPA analysis. If proposed development activities were found to impair wilderness values, the application would be denied until completion of the Great Divide RMP revision. Any application received by the RSFO would be considered through the planning review process and possible plan amendment.

2.6.2 Directional Drilling

The DFPA Operators feel that in certain circumstances, where the need arises to vacate the drilling of a vertical well, a directional (i.e., directional, horizontal, diagonal) well could be utilized for resource protection. This approach is outlined in the Proposed Action and Alternative A where a portion of the wells proposed for drilling may be directionally drilled. Circumstances that may result in directional drilling within the DFPA would include but not be limited to: adverse topographical features; a high density of cultural/historical material that would require in-depth testing and excavation; Historical Trail viewshed considerations; and avoiding habitats of threatened, endangered, or other sensitive species. These circumstances would arise at the APD stage, and economic evaluation for those particular instances would be conducted at that time to determine whether or not a directional well would be utilized.

Union Pacific Resources Company (UPRC) drilled 17 diagonal wells from central pad sites in the Wamsutter Field from 1994 to 1999. The Wamsutter Field is located north of the DFPA (Figure 1-6). Drilling conditions previously experienced within the DFPA are similar to those encountered in the Wamsutter Field. The vertical displacement or directional reach of these wells ranged from 250 feet to 2,450 feet with deviations ranging from 15 degrees to 32 degrees. The first two wells were drilled with build and hold configurations where the wellbores were deviated at a 20 to 30-degree angle as they penetrated the reservoir. Significant completion problems were experienced with this configuration so the well plans were changed to a build - hold and drop (S-shaped) configuration with the wellbore being vertical as it penetrated the reservoir. Fracture stimulation is the most important component of completing a successful well, therefore, any imposed stresses that would reduce the fracture effectiveness are unacceptable. No completion problems were experienced with the S-shaped wellbores, therefore, this configuration was accepted as the preferred method of directionally drilling in the Wamsutter Field.

In view of the opportunity that some percentage of the wells proposed by the operators would be directionally drilled, an alternative was considered that required that all wells be drilled from multi-well pads. The following discussion provides support why the directional drilling only alternative was eliminated from detailed study.

Experience in the Wamsutter Field

The application of directional drilling is geologically and mechanically limited. In most cases of multiple gas zones, the hole must be vertical when it penetrates the zones. When more than one hole per pad is drilled, the tanks necessary to handle the volume of production must be adjusted and therefore may be larger or there may need to be more tanks on one location to satisfy the multiple wells from one pad. The dehydrator and separator size will also increase. Multiple wells per pad do not translate into a direct reduction in surface disturbance.

Economics

The purpose of directional drilling wells in the Wamsutter Field was to evaluate the potential cost savings between drilling 4 wells from one location versus drilling 4 separate locations. This objective was not met as the total cost to drill, complete, and equip a 4-well-pad location was typically 15 to 20 percent higher than 4 separate locations. Unfortunately, directional drilling does not increase the reserves associated with the well. Therefore, at the existing gas price the economics of the project were not feasible, and the concept was abandoned. Reserve estimates in the Wamsutter Field are relatively minute in comparison to the world class reservoirs of the Gulf Coast or North Sea where directional drilling is routine; however, such increases in the cost to recover these reserves results in unfavorable economics.

The additional cost to directionally drill a well is a function of the vertical distance between the surface location and the proposed bottom hole location. The longer the vertical distance, the greater the need for directional steering equipment. This inherently slows down the penetration rate. The wells directionally drilled by UPRC typically took 30 to 40 percent longer to drill than vertical wells of similar depths. Additional costs associated with these services include directional steering equipment and personnel, higher quality mud systems, more drill bits, and more rig days.

The potential loss of natural gas for the nation's energy needs is higher with directional drilling due to the rising cost impact on the reserves potentially left in the ground. As the costs accelerate, the exploration and drilling budgets get stretched. Fewer wells are drilled, less seismic work is done, and much less gas is found and produced. In some cases, the gas may not be recovered because the cost of drilling directional wells would render the project uneconomic, which would in-turn render the lease uneconomic.

Technical Limits

Current technologies, along with large reserves, make it possible in some parts of the world to drill to a bottom hole location several miles from the surface location. With the right drilling rig, drill pipe, casing programs, mud systems, and directional steering equipment this can be achieved in other areas. However, in the Wamsutter Field, and natural gas producing areas near Wamsutter Field (including the DFPA), there are mechanical limits associated with the standard drilling equipment available.

The average vertical displacement of the UPRC's 17 directionally-drilled wells in the Wamsutter Field is 1,425 feet. Torque and drag calculations, based on the same rig equipment capabilities and the same casing program, indicate that the maximum attainable vertical displacement before reaching the mechanical limits of the drill pipe is 6,200 feet. The maximum deviation in this case would be 50 degrees. Even if the well could be drilled it would be highly uneconomical at current reserve estimates and gas prices because the additional drilling costs would be higher than normal.

2.7 COMPARISON OF ENVIRONMENTAL IMPACTS OF FIELD DEVELOPMENT ALTERNATIVES

2.7.1 Comparison of Field Development Alternatives

A summary of impacts for the Proposed Action, Alternative A, and the No Action Alternative, analyzed in this EIS is provided in Table 2-4. A detailed analysis of project impacts and mitigation measures is presented in Chapter 4.

Table 2-4. Comparative Impact Summary.

RESOURCE ELEMENT	PROPOSED ACTION	ALTERNATIVE	
		A	B-No Action
General			
Proposed Disturbance (acres)			
Ancillary Facilities	97.0	161.0	0
Well Sites	1440.0	2,220.0	312.0
Pipelines	758.0	1,166.0	164.0
New & Upgraded Roads	2624.0	4,035.0	567.0
Disturbance - Project Area (acres) before reclamation after reclamation	 4,923.0 2,139.0	 7,582.0 3,300.0	 1043.0 441.0
Range Resources	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP	YES	YES	YES
AUM's Lost Following Reclamation	170.0	266.0	36.0
Air Quality	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP's and FLPMA	Yes	Yes	Yes
Compliance with State and National Ambient Air Quality Standards	Yes	Yes	Yes
Hazardous Air Pollutant Concentrations	NSI	NSI	NSI
Direct Visibility Impacts to Sensitive Areas (0.5 delta-deciview threshold)	NSI	NSI	NSI
Transportation	**NSI**	**NSI**	**NSI**
Compliance with RMP	YES	YES	YES
Traffic Volume (ADT relative to 2000 data) I-80 WYO 789 CO 13	Increase of ADT: <1% 2-3% (summer 4-6%) 2%	Increase of ADT: <1% 3-4% (summer 6-8%) 3%	Increase of ADT: <1% 1-2% (summer 2-3%) 1%
Minerals/Paleontology	**NSI w/ mitigation**	**NSI w/mitigation**	**NSI w/mitigation**
Compliance with RMP's	YES	YES	YES
Disturbance to Fossil Resources	NSI if avoided	NSI if avoided	NSI if avoided
Soils	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP's	YES	YES	YES
Total Surface Disturbance within the Project Area within the CIA Area	 0.9 percent 1.6 percent	 1.4 percent 2.1 percent	 0.2 percent 1.3 percent
Erosion: Year 1 (tons/year) w/ Effective Erosion Control	9,711	14,951	Less than Proposed Action
Additional Erosion: Year 5 (tons/year) w/ Effective Erosion Control	1,999	3,077	Less than Proposed Action

RESOURCE ELEMENT	PROPOSED ACTION	ALTERNATIVE	
		A	B-No Action
Compliance with EO 11987 (reclamation)	YES	YES	YES
Water Resources	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP's	YES	YES	YES
Compliance with CWA and State Water Quality Standards	YES	YES	YES
Groundwater Quality Degradation Potential	Improbable	Improbable	Improbable
Fisheries	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP	YES	YES	YES
Vegetation & Wetlands	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP	YES	YES	YES
Compliance with Section 404 of the CWA, EO 11990 (wetlands)	YES	YES	YES
Special Status Plants	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Wildlife	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP's, FWS, and WGFD objectives and stipulations	YES	YES	YES
Big Game Crucial Winter Range	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation
Greater Sage-grouse Leks, Nesting & Severe Winter Relief Habitats	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation
Raptor Nesting Habitat	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation
Special Status Wildlife & Fish			
Compliance with RMP's and FWS: Animals and Fish	YES	YES	YES
Potential Disturbance to FWS Listed & Proposed Wildlife Species			
Black-Footed Ferret	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation
Canada Lynx	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation
Bald Eagle	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation
Mountain Plover	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation
Potential Disturbance to Special Status Fish	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation

RESOURCE ELEMENT	PROPOSED ACTION	ALTERNATIVE	
		A	B-No Action
Visual Resources	**Potential SI**	**Potential SI**	**Potential SI**
Compliance with RMP's	Conditional	Conditional	Conditional
Compliance with BLM VRM Class	Conditional Potential long-term SI in MVMA NSI in Class III VRM areas	Conditional Potential long-term SI in MVMA NSI in Class III VRM areas	Conditional Potential long-term SI in MVMA NSI in Class III VRM areas
Noise	**NSI**	**NSI**	**NSI**
Compliance with RMP	No standards specified	No standards specified	No standards specified
Construction and Traffic Noise	Moderate	Higher than Proposed Action	Lower than Proposed Action
Recreation/Wilderness	**Potential SI**	**Potential SI**	**Potential SI**
Compliance with RMP's	YES	YES	YES
Quality of Recreation/Wilderness Experience	Mostly Moderate Impact SI in MVMA (23 sq/mi)	Higher than Proposed Action	Lower than Proposed Action
Displacement of Recreation/Wilderness Activities	Moderate Impact	Higher than Proposed Action	Low Impact
Socioeconomics	**NSI, Positive**	**NSI, Positive**	**NSI**
Compliance with RMP	No standards specified	No standards specified	No standards specified
Employment Rate	Increase	Higher than Proposed Action	Lower than Proposed Action
Tax & Royalty Revenue over 40 years (Ad valorem, federal mineral royalty, WY severance tax, and sales & use tax)	$550,000,000	$846,000,000	Lower than Proposed Action
Cultural Resources	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP's	YES	YES	YES
Compliance with the NRHP[2] guidelines	YES	YES	YES
Sites Eligible for the NRHP in the DFPA	216	Same as Proposed Action	Same as Proposed Action
Impacts to Known or Anticipated Cultural Resources	NSI if avoided	NSI if avoided	NSI if avoided
Health & Safety	**NSI w/mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP's	YES	YES	YES
Risk to the Public	Moderate to Low	Higher than Proposed Action	Lower than Proposed Action

Abbreviations:

ADT - Average daily traffic
AUM - Animal Unit Month
CIA - Cumulative Impacts Analysis
CWA - Clean Water Act
EO - Executive Order
FWS - Fish and Wildlife Service
NSI - No significant impacts
RMP - Resource Management Plan
SI - Significant impacts
VRM - Visual Resource Management
WGFD - Wyoming Game and Fish Department
w/ - with