APPENDIX A
RECLAMATION PLAN

INTRODUCTION

Anadarko Petroleum Corporation (Anadarko); Chandler and Associates, LLC (Chandler); and Texaco Exploration and Production, Inc. (Texaco) propose to explore and develop natural gas reserves in two separate areas northeast and southwest of Price, Utah totaling about 111,520 acres. The Bureau of Land Management (BLM) has prepared an Environmental Impact Statement (EIS) for the proposed project and this Reclamation Plan, which is included as an appendix to the EIS, provides specific information regarding the reclamation and abandonment of facilities at the end of the Ferron Natural Gas Project's productive life. Detailed descriptions of the proposed action and alternatives, the potential environmental consequences, and proposed mitigation and monitoring measures are provided in the EIS.

Final decommissioning, reclamation, and abandonment of the Ferron Natural Gas Project's facilities would occur at the end of the facilities' economic life. The Companies would reclaim and revegetate each of its facilities (well pads, roads, and central production facilities) according to accepted procedures. Although subject to revision following appropriate standards, general reclamation procedures are described next. These procedures would be finalized for each facility individually during the APD process.

Reclamation of Facilities

Reclamation of individual facilities would involve three primary components. They are backfilling and grading, redistributing soils, and installing structures to control erosion. Each of these components is outlined below.

Backfilling and Grading

Following decommissioning and the removal of the individual facility's surface equipment, reclamation would begin with backfilling, if necessary, and grading of the site to approximate original contours. Specifically:

- Reclamation would start immediately upon completion of construction, unless prevented by weather conditions. Disturbed areas would be restored to approximately the original contour.

- All pits would be reclaimed to a natural condition similar to the rest of the reclaimed area and must be restored to a safe and stable condition.

- Pipelines would be cleaned by filling with water or nitrogen and pigging to remove the water or nitrogen and then abandoned in place to avoid renewed surface disturbance.

- Reclamation and abandonment of pipelines and flowlines would require backfilling original cuts, reducing and grading cut and fill slopes to conform to the adjacent terrain, replacement of surface soil materials, water barring, and revegetation.

- Reclamation of well sites would include recontouring to reestablish natural-appearing contours, where desirable and practical.

- In general, the Companies would leave well pads and roads on federal lands roughed up somewhat to facilitate the capture of water from precipitation.

- After well plugging and abandonment, roads constructed by the operator not required for the landowner's transportation system would be closed. Reclamation may include ripping, scarifying, water barring, and barricading. Stockpiled soil, debris, and fill materials would be replaced on the roadbed.

- Water bars would be constructed on road grades or slopes, if required by BLM. Spacing of water breaks depends on slope and type of soils present. For most soil types, the following spacings would be used:

Slope	**Spacing**
2 percent	200 feet
2–4 percent	100 feet
4–5 percent	75 feet
>5 percent	50 feet

- Temporary erosion control measures such as mulch, jute netting, or other appropriate methods would be used on unstable soils, steep slopes, and wetland areas to prevent erosion and sedimentation until vegetation becomes established.

- Dry holes, depleted producers, and disposal wells would be abandoned according to Onshore Oil and gas Order No. 2.

- Subsurface power lines would be abandoned in place. Aboveground powerlines would be dismantled and removed.

- Access roads would be reclaimed unless the landowner and/or land manager wishes to keep any roads and accept responsibility for future road maintenance.

All disturbed areas would be subject to final grading, but would remain in rough condition to help ensure the stability of topsoil after its redistribution. Leaving the graded surface in a roughened condition would also improve moisture permeability between the soil/spoil interface. Compacted areas, such as roads, would be ripped to a depth of 4 to 12 inches.

Redistribution of Soils

After the site has been backfilled (if necessary) and regraded, topsoils and subsoils that were stripped and stockpiled before the initial construction would be redistributed across the disturbance. The timing of this redistribution would depend on completion of backfilling and grading. It would be advantageous for redistribution to occur before the fall or spring seeding windows.

Before the stockpiled topsoil and subsoil are redistributed, representative samples would be analyzed to identify their physical and chemical characteristics. These characteristics would be used to identify any amendments that may be applied to soils to facilitate the establishment of the vegetative cover.

Topsoil and subsoil would be removed from stockpiles using dozers. Subsoil, if available would be spread evenly over disturbance using dozers working along the contour, when practical. This would be followed by redistribution of topsoil over the subsoil using the same technique and equipment.

Steep slopes may preclude redistribution along the contour in some areas. In these situations, topsoil would be graded to ensure a uniform and stable thickness consistent with reclamation and revegetation requirements. Before seeding, topsoil would be chisel-plowed to alleviate compaction and promote water infiltration.

In general, all topsoil and usable subsoil stripped and stockpiled for each facility would be redistributed evenly across that facility. In the unlikely event that a significant surplus of soil has been stockpiled in a specific location, it would be used to supplement supplies at one or more other sites where topsoils or subsoils are deficient. Additional usable soil may be recovered from areas where mapping shows that less soil or no soil is available. Recovery of this additional soil during stripping would increase the thickness of the respread.

Revegetation

Site-specific revegetation procedures for each facility would be developed by the Companies in coordination with the BLM (Price Field Office), UDWR, and UDOGM. Revegetation procedures and plans would meet applicable requirements outlined in the Surface Operating Standards for Oil and Gas Exploration and Development (BLM and Forest Service 1989), the Environmental Assessment Supplement on Cumulative Impacts on Oil and Gas Categories, Price River Resource Area (BLM 1984a) and the Solid Minerals Reclamation Handbook H–3042–1 (BLM 1992).

All disturbed sites would be reclaimed and revegetated according to 43 CFR Part 3160. The overall goal of reclamation is to establish a diverse, effective, and permanent vegetation cover of the same seasonal variety and utility as the vegetation native to the affected area, and capable of supporting the planned post-well site land uses on disturbed areas. The prompt establishment of a protective plant cover and recovery of productivity levels compatible with the proposed post-well site land uses would be accomplished by implementing the reclamation plan described herein.

The BLM Price Field Office's revegetation goals for the Project Area are as follows:

- Stabilize areas of soil disturbance through erosion and sedimentation control.
- Reestablish a self-sustaining vegetative cover that is within the ecological potential of the area to meet long-term management objectives.
- Restore watershed, wildlife, livestock, recreational and aesthetic values to pre-existing conditions.

The revegetation plan has been designed to meet short- and long-term reclamation goals by: 1) controlling erosion and sedimentation, 2) reestablishing a vegetative cover that is ecologically comparable to native pre-disturbance conditions, and 3) restoring livestock grazing, wildlife, watershed, and aesthetic values to meet pre-operation land use objectives.

Revegetation would occur after final grading and redistribution of subsoil and topsoil activities have taken place. Revegetation communities representative of the native plant communities that existed before the disturbance occurred would be established.

Revegetation would occur in a series of steps. These steps would be:

- Disturbed areas would be revegetated after the site has been satisfactorily prepared. Site preparation may include ripping, contour furrowing, terracing, reduction of steep cut and fill slopes, water barring, or other procedures.

- On all cut slopes, seeding would extend from the bottom of the ditch to the top of the cut slope. On embankment slopes, the seeding would extend from the roadway to the toe of the slope. Seeding all borrow pit areas and all sidecast slopes in areas of full bench construction also would be seeded.

- Seedbed preparation would be conducted immediately after grading, topsoiling, and subsoiling.

- Seeding and/or planting would be repeated until satisfactory revegetation (to pre-disturbance conditions) is accomplished, as determined by the BLM or other landowner. Mulching, fertilizing (if specifically required — in general the BLM would not require the application of fertilizer), fencing or other practices may be required.

- Seeding would be coordinated with other reclamation activities to occur as soon after seedbed preparation as possible and within 90 days of soil redistribution. Interim revegetation of sites to be stabilized before permanent revegetation, such as sediment control structures or topsoil stockpiles, would be conducted as soon after construction as possible.

- Disturbances would be seeded using the appropriate revegetation mixture. Seeding would occur from October 1 to November 15 and from February 1 to March 31.

- Broadcast-seeded areas would be chained, harrowed, cultipacked, dozer-tracked, or raked, as needed, to firm the seedbed and cover seed.

- Certified weed-free hay or straw mulch would be evenly spread over and crimped into the seeded area at rates dependent on seeding method and slope, as needed.

- Revegetated areas would be grazed by livestock at an approved level during the reclamation liability period.

Seedbed Preparation

Seedbed preparation would be conducted immediately after grading, subsoiling, and topsoiling, and if conducted, fertilizer application. On level to gentle slopes, the seedbed would be disked and harrowed along the contour to breakup large clods. On steeper slopes, rocky sites, or on areas too narrow to negotiate equipment, the soil surface would be left in a roughened condition. An irregular seedbed would provide microsites for plant germination and reduce soil movement on steeper slopes.

Alternative techniques include the use of barriers, check dams, erosion stops, matting, and roughened surfaces. These treatments can be implemented with various kinds of straw or hay bales, nettings, and mattings to effectively reduce overland flow. If gullies deeper than 9-inches should form, the gullies would be blocked with one of the above-mentioned treatments and given the opportunity to stabilize naturally, through the growth of vegetation.

Disk/Chisel Plowing

Before seeding, which would be initiated as soon as practical and within 90 days of final grading, topsoiled sites would be ripped or chisel-plowed to alleviate compaction and promote water infiltration. Chisel-plowing is a highly effective means of temporary stabilization prior to vegetation establishment.

Seeding Methods

Drill seeding would be used on most of the disturbed well site areas. This technique results in proper depth placement of seed and promotes good contact between seed and soil. Drill seeding would be done along the contour wherever the surface is not level.

Broadcast seeding would be employed on rocky areas, on steeper slopes, and on small disturbances. Seed would be broadcast using a manually-operated, cyclone-type, bucket spreader; a mechanical blower; or hydroseeder. Seed would be frequently mixed to discourage settling. Where practical, broadcast seeded areas would be chained, harrowed, or cultipacked to cover the seed. Where slope conditions allow, broadcast seeded areas would be dozer-tracked perpendicular to the slope. On small, isolated, or inaccessible sites, hand raking would be used to cover seed and ensure good soil-to-seed contact.

If hydroseeding is used, seed, fertilizer (if used), and mulch at a rate of approximately 250 pounds/acre would be sprayed in one application. Where hydromulching is used, a second application would spray additional mulch and a tackifier at the manufacturer's recommended application rate.

Timing of Seeding

Revegetation would occur after final grading and redistribution of subsoil and topsoil activities have taken place. Seeding would be coordinated with other reclamation activities to occur as soon after seedbed preparation as possible and within 90 days of soil replacement. Fall seeding (September to November) is recommended based on local soil moisture conditions, germination requirements of selected species, and adaptation of seed to soil temperature. Spring seeding (March to May) would be practiced if areas are ready for revegetation and access is possible. Mixed seedings, one seeding to plant cool season plants in early fall and one seeding to plant warm season plants in spring, would be timed to avoid competition between species and avoid seed distribution problems. Interim revegetation of sites (i.e., on the topsoil storage piles to be stabilized before permanent revegetation) would be conducted as soon after construction as possible.

Mulching

Mulching aids in the control of erosion, retention of soil moisture, and addition of supplemental organic material to the soil. Mulch would be evenly distributed over the seeded area at rates dependent on seeding method and slope. Certified weed-free straw or grass hay mulch would be applied at a rate of 1 to 2 tons/acre on drill seeded areas and at least 1.5 tons/acre on steeper slopes of greater than 10 percent. Mulch would be anchored into the seedbed using a mulch crimper or disk, tackifier, or netting. If used, hydromulch would be applied at a rate of at least 1.0 tons/acre. A tackifier would be used on hydromulched areas in the fall and on areas requiring prompt stabilization. A temporary cover crop of a suitable annual grain, such as annual rye, may be seeded to control erosion until a permanent cover can be established.

Reclamation of Roads

Road locations and design criteria are developed to implement the goals of transportation planning. New road construction, or reconstruction, by the operator would be performed to BLM standards consistent with the needs of the users and spelled out in the Surface Operating Standards for Oil and Gas Exploration and Development (BLM and Forest Service 1989). The BLM has designated and defined three classes of roads that may be constructed: Resource, Local, and Collector.

At the request of the landowner, roads would be retained as permanent structures or reclaimed. Roads would be reduced to the designated running surface width and the adjacent roadbed would be ripped, topsoil replaced, and the site revegetated following the cessation of operations. Natural drainage patterns would be restored, all installed crossings would be removed, roadbeds would be ripped and any cut and fills would be blended to conform to existing topography before topsoil replacement and seeding. Light use access roads that predate the well site operation would be left in their existing condition.

Seed Mixtures

The Companies would use seed mixes adapted to different geomorphic and environmental settings to restore vegetation communities. These mixes may be adjusted for site-specific conditions. The general mixes and the vegetation types to which they apply are:

Seed mixtures have been developed for general land types throughout the Project Area. They are based on erosion control, forage production, elevation, soils, vegetation communities and average annual precipitation zones. The mixtures show the plant species and the pounds per acre of pure live seed (PLS) to be planted.

The following seed mixture would be planted along service road borrow ditches, around the edge of drill pads with a production well, and surrounding other production and maintenance facilities. The purpose for this seeding is to provide a "green strip" buffer to minimize fire hazards and prevent invasion and establishment of noxious weeds in areas that will receive continued disturbance for the life of these areas.

Table A–1

Common Plant Name	Scientific Name	Pounds per acre (PLS)*
Forage kochia	*Kochia prostrata*	2
Wyoming big sagebrush	*Artemisia tridentata wyomingensis* var. Gordon Creek	1
Douglas low rabbitbrush	*Chrysothamnus viscidiflorus*	1
	TOTAL	**4**

The following seed mixtures are for areas that would receive final reclamation. Areas would be planted to protect them from soil erosion and to restore forage production.

Table A–2

Common Plant Name	Scientific Name	Pounds per acre (PLS)[1]
Salt Desert Areas		
Grasses		
Indian ricegrass	*Stipa hymenoides*	2
Squirreltail	*Elymus elymoides*	2
Galleta	*Hilaria jamesii*	2
Forbs		
Lewis flax	*Linum perenne lewisii*	1
Palmer penstemon	*Penstemon palmerii*	1
Gooseberryleaf globemallow	*Sphaeralcea grossulariifolia*	0.5
Shrubs		
Forage kochia	*Kochia prostrata*	2
Rubber rabbitbrush	*Chrysothamnus nauseosus*	1
Fourwing saltbush	*Atriplex canescens*	2
Winterfat	*Krascheninnikovia (Eurotia) lanata*	2
	TOTAL	**15.5**
Sagebrush/Grass Areas		
Grasses		
Indian ricegrass	*Stipa hymenoides*	2
Squirreltail	*Elymus elymoides*	2
Thickspike wheatgrass	*Elymus lanceolatus*	1
Crested wheatgrass	*Agropyron desertorum*	2
Forbs		
Lewis flax	*Linum perenne lewisii*	1
Palmer penstemon	*Penstemon palmerii*	1
Small burnet	*Sanguisorba minor*	1
Shrubs		
Forage kochia	*Kochia prostrata*	2
Whitestem rabbitbrush	*Chrysothamnus nauseosus albicaulis*	1
Fourwing saltbush	*Atriplex canescens*	2
	TOTAL	**15**

Table A–2 (continued)

Common Plant Name	Scientific Name	Pounds per acre (PLS)[1]
Pinyon-Juniper Areas		
Grasses		
Thickspike wheatgrass	*Elymus lanceolatus*	1.5
Intermediate wheatgrass	*Elytrigia intermedia*	1.5
Squirreltail	*Elymus elymoides*	2
Crested wheatgrass	*Agropyron desertorum*	2
Forbs		
Lewis flax	*Linum perenne lewisii*	1
Palmer penstemon	*Penstemon palmerii*	1
Shrubs		
Forage kochia	*Kochia prostrata*	2
Fourwing saltbush	*Atriplex canescens*	2
Wyoming big sagebrush	*Arternesia tridentata wyomingensis* var. Gordon Creek	1
Antelope bitterbrush	*Purshia tridentata*	1
	TOTAL	**15**
Mountain Brush Areas		
Grasses		
Sheep fescue	*Festuca ovina*	2
Smooth brome	*Bromus inermis*	2
Slender wheatgrass	*Elymus trachycaulus*	2
Intermediate wheatgrass	*Elytrigia intermedia*	1.5
Russian wildrye	*Psathyrostachys juncea*	1
Forbs		
Lewis flax	*Limum perenne lewisii*	1
Rocky Mt. penstemon	*Pensternon strictus*	1
Sainfoin	*Onobrychis viciifolia*	0.5
Shrubs		
Forage kochia	*Kochia prostrata*	2
Wyoming big sagebrush	*Artemesia tridentata wyomingensis* var. Gordon Creek	0.5
Antelope bitterbrush	*Purshia tridentata*	1
Mountain big sagebrush	*Artemisia tridentata* var. *vaseyana*	0.5
True Mt. mahogany	*Cercocarpus montanus*	1
	TOTAL	**16**

Table A–2 (continued)

Common Plant Name	Scientific Name	Pounds per acre (PLS)[1]
Riparian Areas		
Grasses and Grasslike		
Reed canarygrass	*Phalaris arundinacea*	2
Streambank wheatgrass	*Elymus lanceolatus riparium*	4
Nebraska sedge[2]	*Carex nebrascensis*	
Baltic rush[2]	*Juncus balticus*	
Shrubs		
Coyote willow[2]	*Salix exigua*	
Skunkbush sumac	*Rhus trilobata* var. *trilobata*	2
Trees		
Narrowleaf cottonwood[2]	*Populus angustifolia*	
	TOTAL	**8**

Notes:
1. Seeding rate is listed as pounds per acre of pure live seed (PLS) drilled. Rate is increased by 50 percent if broadcast seeded.
   Formula: pure live seed (PLS) = % seed purity x % seed germination.
2. Sedge and rush root mass plugs, willow cuttings and cottonwood bare stock plantings would be done the spring, within one month after high water flows, when the riparian water table and soil moisture would ensure planting success.

Rate of plantings per linear feet of disturbed stream bank is as follows: sedge and rush root mass plugs, one 4-inch diameter plug per 5 linear feet; willows, one cutting per linear foot; and cottonwood stock, one cluster planting of 7 trees per 25 linear feet. Individual cottonwood stock, within a planting cluster would be spaced two feet apart. The willows and cottonwoods would be planted adjacent to the stream bank in moist soil, yet above the normal water line.

Shrub seed sources would be from the states of Colorado or Utah and from areas above elevations of 4,000 feet above sea level. Seed from these sources would provide more winter tolerant plants, thus, increasing over-winter survival rates.