APPENDIX D REASONABLE FORESEEABLE DEVELOPMENT SCENARIO

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D REASONABLE FORESEEABLE DEVELOPMENT SCENARIO

SUMMARY

This appendix summarizes the level of development activity and associated ground disturbance that is projected to result from various alternative oil and gas leasing scenarios for Los Padres National Forest (LPNF). The forecast gives the amount and scale of reasonably foreseeable development (RFD) activities. The types and character of activities are described in Appendix C. Forecast numbers have been incorporated into the Bureau of Land Management (BLM) regional Reasonable and Foreseeable Development Scenario to which this document is appended. This portion of the BLM South-Central Planning Region RFD gives a general idea of where on LPNF these development activities might occur, but does not predict any specific locations for development. The information is provided to support the LPNF forest-wide oil and gas leasing environmental analysis as well as future lease sales, in coordination with the Bakersfield Field Office of the BLM. The projections assist the BLM and Forest Service (FS) in identifying and assessing reasonable leasing alternatives and in estimating and evaluating the resulting environmental effects.

Information here is based on a more detailed technical report (Bain 1993, located in the Los Padres Oil & Gas Leasing project files). Bain's report explains the methodology and analysis, and includes the data used to develop the conclusions presented here.

LPNF covers over 1.78 million acres in the Coast and Transverse mountain ranges of Southern California. 766,867 acres, or 43% of LPNF is potentially available for leasing. The remaining 57% is withdrawn from mineral entry and would not be available. LPNF includes, or is adjacent to, six upper Tertiary sedimentary basins that have produced significant quantities of oil and gas. Bain's report outlines the potential for oil and gas occurrence on LPNF. It categorizes potential in four classes: high, medium, low and no known potential. Low and no known potential classes have been combined in this summary. Several areas on the margins of LPNF over and near the sedimentary basins have high potential for oil and gas occurrence.

Development activity projections are based on several factors. These include geologic potential for occurrence, legal availability of lands for mineral development, past and current exploration and development, and economic trends. The following projections are estimates or forecasts of potential activity and would not be considered as predictions.

Over the next 10-15 years, the maximum projected activity includes 151 wells (17 dry, 122 production, and 12 injection). Often, a single well pad can accommodate several wells. These 151 wells would require 25 separate well pads. The development would require about 19 miles of new road and about 17 miles of new pipeline construction. Total area disturbed would be

about 163 acres. Operators would reclaim pipelines and portions of well pads within one to three years of initial disturbance. Therefore, long-term surface disturbance would amount to about 70 acres. This activity would produce about 84 million barrels of oil.

INTRODUCTION

This appendix has three main sections, beginning with Section II:

Section II describes the **potential for oil and gas occurrence** and summarizes geologic information used to map the potential occurrence of oil and gas resources on LPNF. Occurrence does not equate to development, because it does not include technological or economic factors. Section III estimates the **maximum development potential**. Development activity is projected for the next 10-15 years (assuming leasing of all legally available Forest lands). The projection is based on current knowledge of geology, past development, current technology, economic trends, and other factors. The projection is known as a "reasonably foreseeable development" (RFD) scenario, part of a six-county regional RFD, prepared by the BLM, with the cooperation of the FS. As a forecast of post-leasing activity, the RFD provides a measure to estimate the scope and scale of the potential consequences of leasing. The RFD is not intended to be a site-specific prediction or proposal. The RFD is required by FS implementing regulations (36 CFR 228 Subpart E) for the 1987 Federal Onshore Oil and Gas Leasing Reform Act.

Lastly, Section IV presents reasonably foreseeable development projected for the **alternative leasing scenarios** considered in detail for LPNF.

In terms of land management planning and allocation, the projections are constrained only by Congressional mandates (Federal laws and regulations governing oil and gas analysis, mineral withdrawals, and Wilderness designations). Wilderness areas and mineral withdrawals remain legally unavailable for leasing, so no development is projected for those areas, regardless of potential for occurrence.

Determining Potential for Oil & Gas Occurrence

Potential for Oil & Gas Occurrence, Section II, separates LPNF into three classes of potential occurrence -- high, medium, and low/none known. Geologic factors and knowledge gained from past exploration and development have been examined. Brief descriptions of stratigraphy and structure (ages or layers of geologic formations and their physical interrelationships due to earth movements) have been included. Stratigraphy and structure are important elements in determining potential for hydrocarbon source and reservoir rocks, seals, and traps necessary for the formation of accumulations of oil and gas. The occurrence section also summarizes information on oils seeps, impregnated outcrops, exploration and production to date, and U.S. Geological Survey oil and gas play assessments. *Potential for occurrence does NOT equate to potential for economically recoverable reserves.*

Projecting Oil & Gas Development Activity

Section III, "Maximum Development Potential," uses the geologic interpretation in Section II, “Potential for Oil & Gas Occurrence,” and other information to forecast development activity

within LPNF. Additional factors that have been considered include existing land allocations (withdrawn and closed lands), economic trends, access, and technology.

POTENTIAL FOR OIL & GAS OCCURRENCE

LPNF includes lands in three U.S. Geological Survey assessment provinces (Ventura, Santa Maria, and Central Coastal Basins). LPNF has several areas with geological conditions resulting in high potential for oil and gas occurrence (see Figure D-1). Most of these are on the margins of the southern portion of LPNF. The northern portion of LPNF has little or no potential for oil and gas occurrence.

Geology

LPNF includes two mountainous regions of the California coast. The mountains from Paso Robles southeast to Ventura (the Santa Lucia, La Panza, Santa Ynez, San Rafael, and Sierra Madre Ranges) form the main region. A smaller northern region contains the Santa Lucia Mountains between Big Sur and San Simeon. Intensely folded, fractured, and faulted bedrock underlies LPNF. Surface exposures of Precambrian crystalline rocks (gneiss and schist) are common in the Santa Lucia and La Panza ranges (northern part of LPNF). Crystalline rock is also common in the Mount Pinos-Frazier Mountain area (eastern end of LPNF). Much of the rest of LPNF is underlain by Tertiary sedimentary rocks (sandstone, shale, and conglomerate).

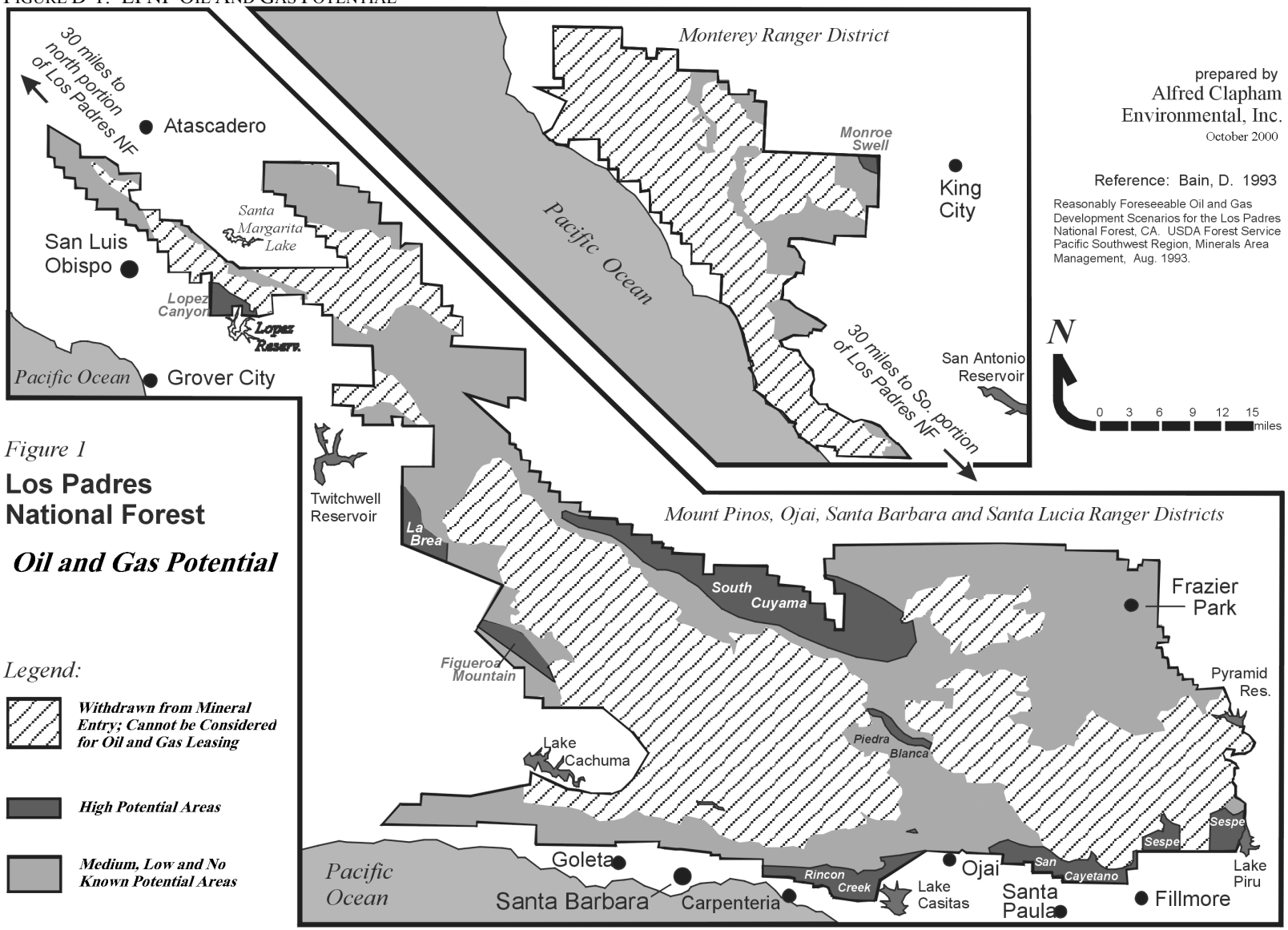
Several major faults cross LPNF. The Santa Ynez, Big Pine, and Munson Creek faults, along the southern edge of LPNF, exhibit the east-west structural trend of the Transverse Ranges. The remaining faults (including the San Andreas, San Gabriel, Ozena, and Rinconada) strike northwest-southeast, sub parallel to the coastline.

Five major oil-producing sedimentary basins with thick Tertiary deposits surround and extend into the fringes of LPNF. These basins are the Salinas, Cuyama, and San Joaquin to the north, Ventura to the south, and Santa Maria to the west. A nearly complete sequence of Jurassic through Recent rocks occur in the following four groups:

(1) Crystalline - granitic rocks along the San Andreas and San Gabriel Faults, volcanic flows at various places within and adjoining LPNF, and the Jurassic Franciscan and Knoxville Formations found on the western portion of LPNF.

(2) Cretaceous - hard shale of the Jollo or Espada Formation; and hard sandstone, conglomerate, and shale of the Carrie Creek Formation (primarily in the Santa Lucia and La Panza Mountains); and unnamed formations.

FIGURE D-1: LPNF OIL AND GAS POTENTIAL



(3) Paleogene - Tertiary strata older than the Miocene found throughout LPNF -- mainly hard sandstone and shale, including the nonmarine Sespe and Simmler Formations, and marine formations such as the Juncal, Matilija, Cozy Dell, and Coldwater.

(4) Neogene - Miocene and Pliocene strata, marine deposits except in the Cuyama Basin outside LPNF.

Neogene rocks have produced 91% of the oil and gas from the Ventura, Santa Maria, and Cuyama Basins. Older rocks have produced only in the Ventura Basin (Frizzell and Claypool 1983). Neogene sediments in LPNF include some of the world's most prolific hydrocarbon source rocks such as the Monterey Formation. Other source rocks in LPNF may include Paleogene formations, particularly in the southeast corner of LPNF. The Cretaceous sandstones in the southern portion of LPNF may contain possible source beds.

Reservoir rocks must be porous and permeable enough to form a network with the capacity to hold hydrocarbons. Permeable sandstones and fractured shales occur in the Neogene group, including the Monterey, Point Sal, Vaqueros, Santa Margarita, Branch Canyon, and Modelo Formations. In some areas, Paleogene sandstones (Sespe, Coldwater, Cozy Dell) form good reservoirs. Upper Cretaceous formations elsewhere in the Ventura Basin have produced oil, but the Cretaceous sandstones on LPNF have low porosity and permeability.

Traps, which hold hydrocarbons in a reservoir, fall generally between two extremes: stratigraphic or structural. Stratigraphic traps form when a nonporous portion of a formation (such as shale) seals off a porous portion (such as a sand body). Through deposition, a widespread seal may form huge traps if an impermeable layer of sediment (such as salt or mud) is laid down on or inverted over a porous horizon. Erosion at the surface with subaerial alteration of the reservoir rock may result in a thin seal creating subtle stratigraphic traps as the rock formation becomes reburied. Structural traps result from deformations caused during folding and faulting of the earth. Fractured reservoirs, such as those common in LPNF, exhibit aspects of both structural and stratigraphic traps.

Indications of Oil & Gas On and Near LPNF

Shows of Oil in Seeps and Outcrops

Oil seeps occur abundantly in Paleogene bedrock in the southwest part of LPNF. In and around the Sespe oil field and Sespe Creek, oil seeps come from the highly fractured non-marine red beds of the Sespe Formation (Oligocene) and the white marine sandstones of the Coldwater Formation (Eocene). These seeps are within the upper plate of the San Cayetano Thrust Fault in the eastern part of the Ventura Basin. Other Paleogene oil seeps are found in the Cozy Dell shales (Eocene) on top of Pine Mountain near Reyes Peak, south of the Big Pine Fault, and in Brubaker Canyon in the southern end of the Cuyama Basin, north of Big Pine Fault. Some oil seeps are also found in Monterey shales of the eastern Santa Maria Basin near Zaca Lake.

Exploration and Production to Date

More than 600 wells have been drilled on LPNF. Of those, 170 were wildcat wells (drilled outside established oil fields) in the southern portion of LPNF, south of San Luis Obispo. Most of those with hydrocarbon shows were along LPNF margins, in Tertiary strata of the surrounding oil-producing basins. Table D-1 gives reported oil shows for those exploratory wells.

TABLE D-1: OIL SHOWS IN EXPLORATION WELLS WITHIN LPNF

Wildcat Wells	***Percentage with Shows of oil***	***Percentage with No Shows***	***No Report Available***
170	26%	34%	40%

An additional 25 exploratory wells were drilled within the northern portion of LPNF (north of San Luis Obispo). Of those, 19 were in high-potential areas and had modest to no oil and gas shows. The six remaining wells were outside high-potential areas and had no hydrocarbon shows. Table D-2 shows locations of six developed fields in three basins, in or near LPNF. Huasna and Sisquoc Ranch Fields are on trend with LPNF but have produced no oil from lands within LPNF.

TABLE D-2: OIL-PRODUCING BASINS AND FIELDS (WITHIN OR NEAR LPNF)

Basin	***Field***	***Discovery Year***	***Production*** *(thousand bbl)*	***Current Status***
Ventura	*Sespe*	*1887*	*47,000*	*Producing*
	Timber Canyon	*1946*	*7,000*	*Producing*
	Silverthread (Ojai)	*1946*	*34,000*	*Producing*
	Canton Creek	*1957*	*33*	*Abandoned*
Santa Maria	*Lopez Canyon*	*1963*	*3*	*Abandoned*
	Huasna	*1928*	*32*	*Shut-in*
	Sisquoc Ranch	*1980*	*6*	*Abandoned*
Cuyama	*Cuyama South*	*1949*	*222,000*	*Producing*

Oil and Gas Occurrence Potential

Figure D-1 is a generalized map showing hydrocarbon occurrence potential on lands within LPNF. The map shows three classes of potential, defined by the USGS and stated in the body of the South-Central Planning Region text. Note that for forecasting purposes in southern California, the main body of this appendix considers “medium”, "low" and "no potential" to be essentially the same, as little in these areas would be likely to capture industry's interest. Neogene strata hold the highest potential for oil on LPNF, particularly in the southern portion.

South of San Luis Obispo, potential is medium to low in the interior of LPNF, but high at several locations along LPNF perimeter. Near the Sespe Oil Field, Paleogene strata have high potential but in most areas of LPNF, Paleogene strata offer medium to low potential for occurrence of hydrocarbons. Cretaceous sandstones are characterized as having low porosity and permeability and have low potential for occurrence. Areas with crystalline rocks have no known potential for occurrence here.

The potential for oil and gas occurrence in the portion of LPNF north of San Luis Obispo is limited. Figure D-1 shows one small high-potential area on the edge of LPNF, west of King City. This area has a relatively thick sequence of Neogene rocks. Thinner sequences of Neogene (Miocene to present) rock are mapped as medium potential in the northern portion of LPNF. Low-potential areas here represent low-permeability Cretaceous and Paleogene strata. Much of this northern portion has crystalline rocks with no known potential for oil and gas occurrence.

High-Potential Areas

Figure D-1 shows nine areas with high-potential for occurrence within three producing provinces. Eight are in the southern portion of LPNF, and all but one are on LPNF perimeter. All three provinces have high-potential areas.

Ventura Basin Province:

The four high-potential areas are Piedra Blanca, Rincon Creek, San Cayetano, and Sespe.

The **Piedra Blanca Area** is the only high-potential area in the interior of LPNF. This is a long, narrow area stretching east from State Highway 33 along Pine Mountain to where Sespe Creek turns south. The easternmost three-quarters of this area is within the Sespe Wilderness. The Piedra Blanca Area does not adjoin nor lie on trend with any producing field. However, this area does have both Paleogene and Neogene formations, which have produced major quantities of petroleum elsewhere in the Ventura Basin, and in the Cuyama Basin. Sandstones of the Coldwater, Cozy Dell, Sespe, and Vaqueros Formations may prove to be reservoirs. Structural traps may occur where anticlines or upturned beds are closed updip against major faults. Stratigraphic traps may be present. Objective depths range from 3,000 to 10,000 feet. Estimated recoverable resources range from 0 to 48.1 million barrels of oil, with a low mean value (0.08 risk factor) of 1.2 million recoverable barrels.

The **Rincon Creek Area** lies south of a line running east from Toro Canyon near Montecito to State Highway 33 between Matilija Reservoir and Ojai. The nearby Ojai Field is a major producer. Coldwater sandstones are folded into large structural traps along the Arroyo Parida and Chismahoo Faults. Objective depths range from 2,500 to 10,000 feet. Estimated recoverable resources range from 0 to 16.3 million barrels of oil, with a low mean value (0.08 risk factor) of 0.4 million recoverable barrels.

The **San Cayetano Area** lies south of a line running east from Ojai to San Cayetano Mountain.

This area includes or adjoins portions of the Ojai and Timber Canyon fields. Potential primary reservoirs here include the Monterey, Santa Margarita, and Pico Formations. Secondary objectives in the western part of this area include Coldwater, Sespe, and Vaqueros sandstones. Traps here are mainly structural, with some stratigraphic elements. Intersecting fault traps and faulted, plunging anticlines are present. Fractured-shale reservoirs may be present on flanks of folds and along faults. The documented lenticular nature of some deep-marine sandstones (particularly the Monterey) enhances structural trapping potential. Objective depths range from 3,000 to 15,000 feet. Estimated recoverable resources range from 0 to 242.3 million barrels of oil, with a mean value (0.03 risk factor) of 24.1 million recoverable barrels (Bain 1993, Timber Canyon, Silverthread #1, and Silverthread #2 accumulations).

The **Sespe Area** lies southeast of a line running north from San Cayetano Mountain to Topatopa Peak, then east to Whitaker Peak (above Lake Piru). It includes the hanging-wall block of the San Cayetano Fault. This area includes portions of the Sespe and Canton Creek Fields. Potential primary reservoirs in the western part of this area include Coldwater sandstones, fractured sandstone and conglomerate in the Sespe Formation, and Vaqueros sandstone. In the eastern part of the area, primary objectives are Modelo Formation (Monterey equivalent) sandstones. Traps here are stratigraphic, structural, and combination. In the eastern part of this area, complex structures along the trend of the Agua Blanca Fault, combined with the lenticular nature of Modelo sandstones, provide excellent trapping potential. Objective depths range from 2,000 to 10,000 feet. Estimated recoverable resources range from 0 to 630.5 million barrels of oil, with a mean value of 29.2 (0.36 risk factor) plus 1.0 (0.08 risk factor) million recoverable barrels (Bain 1993, Sespe #1 and Agua Blanca accumulations).

Santa Maria Basin Province:

Three high-potential occurrence areas have been identified in the Santa Maria Basin -- Lopez Canyon, La Brea Canyon, and Figueroa Mountain.

The **Lopez Canyon Area** is northeast of Arroyo Grande, just north of Lopez Reservoir and surrounds the abandoned Lopez Canyon Field. The Lopez Canyon Field produced oil from fractured shales and sandstones of the Point Sal and Vaqueros Formations. Fractured reservoirs commonly develop in high-stress areas along folds and faults. Traps would form where the sandstone/shale reservoir rocks intersect faulted southeast-plunging anticlines or at the fractured intersections of principal stress directions. Pinch-out stratigraphic traps would be anticipated to occur along the flanks of the same anticlinal crests. Objective depths range from 1,500 to 5,000 feet. Estimated recoverable resources range from 0 to 11.6 million barrels of oil, with a low mean value (0.08 risk factor) of 0.35 million recoverable barrels.

The **La Brea Canyon Area** is southeast of Santa Maria, in the corner of LPNF around Tepusquet Peak and lies on trend with the shut-in Huasna Field. Point Sal sandstones form the primary target reservoir. Monterey shales provide prolific source and fractured reservoir rocks in the area. Traps are expected to be primarily structural with stratigraphic components. Objective depths range from 1,000 to 5,000 feet. Estimated recoverable resources range from 0 to 28.6 million barrels of oil, with a low mean value (0.08 risk factor) of 0.8 million recoverable

barrels.

The **Figueroa Mountain Area** is northeast of Solvang, between Cachuma Creek and Lookout Mountain, on trend with the abandoned Sisquoc Ranch Field. Like La Brea Canyon, Point Sal sandstones form the target horizon. Much of the Monterey is exposed at the surface, but nearby buried portions may serve as source rocks. Traps are expected to be primarily structural with stratigraphic components. Objective depths range from 1,000 to 5,000 feet. Estimated recoverable resources range from 0 to 7.7 million barrels of oil, with a low mean value (0.08 risk factor) of 0.3 million recoverable barrels.

Central Coastal Basins Province:

The two areas of high potential are South Cuyama and Monroe Swell.

The **South Cuyama Area** includes LPNF margins along the Cuyama River, from about Bates Canyon southeast to Cuyama Peak and Moro Hill, then curving north and northwest to Ballinger Campground. It is on trend with the producing fields in the Cuyama Valley outside LPNF, including the adjacent Cuyama South Field. Vaqueros sandstones are the primary reservoir horizon. Branch Canyon, Santa Maria, and marine Eocene sandstones are secondary objective reservoirs. Traps are expected to be primarily structural, including intersecting faults, upturned reservoirs beneath thrust faults, and anticlinal closure. Trapping may include stratigraphic components, especially in the Branch Canyon sandstones. Objective depths range from 3,000 to 10,000 feet. Estimated recoverable resources range from 0 to 210.8 million barrels of oil, with a mean value (0.25 risk factor) of 26.8 million recoverable barrels.

The **Monroe Swell Area** is a small corner of LPNF due west of King City and southwest of the Monroe Swell Field, on the southwest flank of the Salinas Basin. A high-potential classification is based on proven shows of oil and gas in wells drilled nearby, known source rock, the thermal history of the area, and the presence of reservoir-quality rocks. Forestlands in the area are limited at 640 acres. Because no commercial success has occurred in the area, and a historical lack of oil industry interest, potential may be high but the probability of success is believed to be low. No volume of recoverable reserves has been estimated for the Monroe Swell Area

Medium-Potential Areas

Much of the LPNF interior south of San Luis Obispo has medium potential for oil and gas occurrence. Most LPNF portions of the Ventura and Cuyama Basins are rated medium, if not high. Paleogene source beds and traps would be likely to occur near the Sespe, San Cayetano, and South Cuyama high-potential areas. Paleogene traps are often anticlines, although combination and stratigraphic traps may occur.

Paleogene strata may contain large structures with fractured reservoir rocks (as in the Sespe Field). In the Santa Clara Trough (southeast margin of LPNF), potential reservoirs may prove to be too deep to have favorable porosity and permeability. The large block of medium potential areas extends north to a point east of the Lopez Canyon Area and forms the northern edge of the Neogene strata connected to the Cuyama Basin. The northern end of the area is the northern

extent of the prolific oil-producing Sespe Formation.

The Ventura Basin medium-potential and low-potential lands together have an estimated 0 to 14.0 million barrels of recoverable resources. The mean estimate for this area is 6.0 million barrels.

North of San Luis Obispo, there are three areas of medium potential on LPNF. The Lopez Canyon Area has an associated medium-potential area just to the northwest. Monterey source rocks are anticipated to underlie the Lopez Canyon Area but traps with reservoir-quality rocks may be missing. The Neogene section thins rapidly, decreasing potential, reservoir quality and size. A larger medium-potential area extends west and northwest from the Monroe Swell Area. This area is characterized by a thinning Neogene section onlapping the edges of crystalline basement rocks of the Salinas Basin. Good source rocks are likely to exist, but either reservoir-quality rocks or traps may be absent. The third northern medium-potential area is in the San Antonio River vicinity immediately northwest of the Hunter Liggett Military Reservation. Both Paleogene and Neogene strata occur, as do Monterey source rocks and fractured reservoirs. No hydrocarbon shows have been documented.

Low/No Potential Areas

The oldest near subsurface rocks consist primarily of Cretaceous marine sandstone, silty claystone, and conglomerate with low potential for oil and gas. North of San Luis Obispo, the early Cretaceous Jollo or Espada formations consist primarily of hard shale, up to 6,000 feet thick. The late Cretaceous Carrie Creek Formation contains up to 16,000 feet of hard sandstone, conglomerate, and shale. Overlying the Cretaceous, the bulk of the Paleogene section in the north end of LPNF is marine strata, only distinguishable from the underlying Cretaceous by the contained fauna. The Paleogene rocks are predominantly hard sandstone and shale. The upper part of the Paleogene section is the non-marine Sespe Formation. Hard Cretaceous and Paleogene rocks with low porosity and permeability have limited reservoir potential and are not believed to contain good source rocks. Two upper Cretaceous fields are known to produce oil elsewhere in the Ventura Basin. Similar upper Cretaceous rocks in the Sacramento Basin have produced large quantities of gas. 0ccurrence potential in these areas of LPNF, particularly in the Ventura Basin, can not be completely discounted.

Areas of crystalline basement rocks are mapped as no-potential for oil and gas occurrence. The Rinconada Fault separates the crystalline rocks into two main provinces. Pre-Tertiary granitic and metamorphic rocks occur north of the Fault. Southwest of the Rinconada Fault are Franciscan and related Mesozoic rocks. The crystalline rocks have been subjected to intense tectonic forces including high heat and pressures. If thrust over source beds, the crystalline rocks would have a low potential for accumulations of hydrocarbons along fractures.

Conclusions - Oil Occurrence Potential

The northern portion of LPNF (north of San Luis Obispo) has little potential for oil and gas occurrence. Most of the area is mapped as no-potential due to crystalline rock outcrops. One

small (640-acre Monroe Swell) area near King City is rated as high potential. Several small areas in this northern part of LPNF are mapped as low to medium potential. Neogene oil seeps occur in the southern part of Huasna Basin. Potential for oil and gas occurrence is much higher in the portion of LPNF south of San Luis Obispo. There, eight areas have demonstrated geologic conditions to support designation as high potential for oil and gas occurrence. All but the Piedra Blanca Area are near the perimeter of LPNF. The interior of this southern part of LPNF generally has medium potential, with interspersed blocks designated as none or low potential.

MAXIMUM DEVELOPMENT POTENTIAL

Geologic Potential and Legally Unavailable Forest Lands

High potential areas for oil and gas occurrence are concentrated on the margins of the southern part of LPNF. Much of the interior of the southern part of LPNF has medium to low potential. Large tracts of LPNF are shown on Figure D-1 as Wilderness or with other withdrawal designations and remain unavailable for oil and gas leasing. Other withdrawn areas include the Santa Ynez watershed north of Santa Barbara and the coastal zone along the Big Sur coast. No oil-related activities are projected for withdrawn areas.

History of Exploration and Development Activity

Over 600 wells have been drilled on LPNF, with 170 of those being wildcat wells. Many of those wells were drilled between 1922 and 1966. Since that time, industry has made great strides in drilling technology, particularly in difficult areas such as the Ventura Basin. Although economics would affect immediate drilling activity, improved interpretation of the existing subsurface data and cost cutting measures in the drill and complete phase of operations can be expected to lead to industry interest in leasing and exploration in portions of LPNF. Production for 2000 from leases on National Forest System lands was 334,000 barrels of oil and 563 million cubic feet of gas from 22 leases. Four fields produce on or near LPNF.

Sespe Oil Field

The Sespe Field lies approximately four miles north of Filmore, on the east plunge of a four-mile-wide anticlinal fold of Tertiary sediment. One of the oldest fields in California, Sespe was discovered in 1887. By 1900, when LPNF was two years old, 37 wells had been drilled. At the end of 1993, 277 active wells were producing 853 thousand barrels of oil annually, with a cumulative of 43 million barrels of oil and 53 billion cubic feet of gas. The productive limits of the six producing zones (the Rincon, Vaqueros, Upper Sespe, Middle Sespe, Basal Sespe, and Coldwater) have not been fully explored. Reasons include environmental impacts, high drill and complete costs, and a steep average per well decline curve. The Sespe Condor Sanctuary and the Sespe Wilderness surround this oil field on three sides. No Surface Occupancy or Use is stipulated within the condor sanctuary.

Cuyama South Oil Field

Discovered in 1948, the Cuyama South Field is located in the south-central part of the Cuyama Valley, one and one-half miles southwest of the town of New Cuyama. The field is a closed,

asymmetrical, faulted anticline, three and one-half miles long and one and one-half mile wide, and occupying more than 2,800 acres. The primary oil-bearing horizon is the Dibblee Zone, a 200- to 520-feet-thick sand. The Dibblee is characterized as a massive, friable, fine- to medium-grained, permeable sandstone, interbedded with shale breaks of up to 50 feet in thickness. South Cuyama Field has been unitized since 1953, with production through 1993 of 220 million barrels of oil and 229 billion cubic feet of gas. In 1993, 118 active wells produced 427,000 barrels of oil and 1.8 billion cubic feet of gas, including approximately 45,000 barrels of oil from three Forest leases on 120 acres. The field is expected to produce for another 30 years.

Silverthread Area of Ojai Field

The Ojai Field was discovered in 1866 about eight miles east of the city of Ojai. The first producing zone was the oil-bearing Saugus Formation. The Silverthread Area marks the easternmost production of the Ojai Field and includes 90 active wells. First found to be productive in 1971, the lower Monihan sands of the Monterey Formation have contributed more than 90% of total production. Cumulative production from the Silverthread Area through 1993 was 16 million barrels of oil and 28 billion cubic feet of gas (CDOGGR, 1993). The Silverthread Area is expected to produce for 15 more years.

Timber Canyon Oil Field

The Timber Canyon Oil Field was discovered in 1889 and covers about 340 productive acres. Oil production from the Pico Formation peaked in the 1950s. Thirty-two active wells (1993) continue to produce from the north flank of the Santa Clara Valley syncline, four miles northeast of the city of Santa Paula. Topography is rugged and mountainous, reflecting the complex geologic history of the Ventura Basin. Three Pico sands (the A, B, and C sands) have produced 6.8 million barrels of oil from five, steeply dipping fault blocks. Daily production averages 200 barrels of oil and 6 barrels of water per well with a field-wide remaining lifetime of 15 years. Six development wells were drilled in 1988-89. In a geologically complex area such as this, the possibility of a new pool discovery continues to exist.

Recent Drilling Activity

Table D-4 shows the number of exploratory wells (wildcat, extension, and new pool) drilled on LPNF from 1978 to 1992. There has been no drilling on Forest leases since 1991. Drilling activity was higher in the 1980's than in the '70s or '90s. This was due mainly to economic factors related to the Middle East oil crisis of the mid-1970's and the resulting mid-term rise in oil prices.

Estimated Recoverable Resources

Together with extensive public geologic data for high-potential areas of LPNF, Bain (1993) used the USGS play assessment method to estimate recoverable oil and gas resources. The method is a reservoir-engineering model, using computer programs called FASPU (Fast Appraisal for Petroleum-Universal) and FASPAG, and analytic-probabilistic methodology as explained in

Crovelli and Balay (1990). Bain applied this method to 12 potential accumulations in eight high-potential areas (see Table D-5).

Table D-3 shows typical exploratory well success raters in and around LPNF.

TABLE D-3: SUCCESS RATE FOR EXPLORATORY DRILLING ADJACENT TO AND INCLUDING LPNF

Area	***Total Number of Exploratory Wells***	***Number of New Fields***	***Success Rate*** *(one successful well per total wells drilled)*	***Projected Future Probability of Success***
Cuyama Basin	*200**	*6*	*1:30*	
Ventura Basin	*300*	*25*	*1:12*	
Forest-wide	*170*	*4*	*1:45*	*1:15-20*

** this number is an estimate since data does not separate new pool discovery wells from extension and wildcat wells*

For the relatively unexplored medium- and low-potential areas of the Ventura Basin, Bain used a second method to estimate recoverable resources. The USGS in 1989 estimated that 60 million undiscovered barrels of oil are under Federal lands in the Ventura Basin. Based on relative area, Bain estimated that 10%, or 6 million barrels, of that USGS estimate might lie under medium and low potential areas of LPNF. Table D-5 shows the resulting estimates of recoverable resources for LPNF.

TABLE D-4: EXPLORATORY DRILLING IN LPNF

Year - Exploratory Wells	***Year - Exploratory Wells***	***Year - Exploratory Wells***
1978 - 1	*1983 - 8*	*1988 - 13*
1979 - 0	*1984 -11*	*1989 - 4*
1980 - 1	*1985 - 14*	*1990 - 1*
1981 - 0	*1986 - 0*	*1991 -1*
1982 - 7	*1987 - 4*	*1992 and 1993 - 0*

Ventura Basin Province

Bain forecasts development of seven accumulations in four high-potential areas of the Ventura Basin -- Piedra Blanca, Rincon Creek, Timber Canyon 1, Silverthread 1, and Silverthread 2 (San Cayetano Area); Sespe 1 and Agua Blanca (Sespe Area). He also forecasts development in an unspecified area within the medium- and low-potential areas of the Ventura Basin. Total mean recoverable estimates are 61.9 million barrels of oil.

Santa Maria Basin Province

Bain forecasts development of three accumulations in the three high potential areas of the Santa Maria Basin: Lopez Canyon, La Brea Canyon, and Figueroa Mtn. Total mean recoverable estimate here is 1.4 million barrels of oil. No development is forecast for the medium- or low-potential areas in this basin. See Table D-5. Medium- and low-potential portions of the Neogene play in this province are within the Santa Lucia and Machesna Mountain Wildernesses, and are therefore unavailable for development. The medium-potential areas near the Lopez Canyon Area have uncertain (thin Neogene section) reservoir strata and traps offering little chance of discovery of commercial quantities of hydrocarbons, given available information.

Central Coastal Basins Province

Only two accumulations in the South Cuyama high-potential area are forecast for development. Total mean estimated resources are 26.8 million barrels of oil. See Table D-5. No development is forecasted for the medium- or low-potential portions of the Neogene play in this province. Some medium- and low-potential areas here are within the Ventana Wilderness, and are therefore unavailable for development. Forestlands represent a very small portion of this play.

The thinness of the Neogene section in the vicinity of the Monroe Swell area and the marginal production of nearby non-Forest wells, make discovery of commercial quantities unlikely on LPNF . Although 640 acres of Forestland is classed as high-potential in the Monroe Swell area, no production is forecast.

Surface Disturbance of Projected Activity

The key issues that determine the exact surface disturbance required for a specific development are terrain, surface versus subsurface well location, complexity in size of the geologic structure, and accuracy and quality of surface and subsurface information. Since each of these issues is site-specific, the surface impact would vary from site to site. Type and number of facilities at any given site also depend on proximity of past or concurrent developments. For example, in developed areas, road and pipeline infrastructure may largely be in place. Several wells can be placed on one pad. Adjacent pads may share treatment and storage facilities.

The number of wells required to develop each of the forecast accumulations was based on production data typical of fields in southern California. Approximately 10% of the wells would be injectors. Acres of surface disturbance are calculated from the following five assumptions, which are derived from analysis of past exploration and development activities.

1) *Initially, 3 acres would be disturbed per well pad, including temporary production facilities.*
2) *As many as 5 to 8 wells can be drilled from one pad at a maximum of 4.5 acres. Four acres of initial disturbance is considered reasonable for a 6-well pad, and 3 acres for a 2 to 5-well pad. After drilling operations cease, only 1 acre of ground disturbance would remain after reclamation of the initial construction activities.*

3) *Typical access road width would be 10 to 16 feet, for 1 to 5 miles of length.*
4) *A typical central facility would occupy no more than 270 feet by 170 feet, or 1 acre.*
5) *A typical pipeline, laid adjacent to the access road, would disturb a corridor 10 feet wide.*

BLM Standard Lease Terms apply with no special stipulations (refer to description of the Alternative 2 leasing scenario, page D-22).

TABLE D-5: SUMMARY OF AREAS FORECAST FOR EXPLORATION AND DEVELOPMENT

Basin	***Area***	***Occurrence Potential***	***Producing Horizon***	***Objective depths*** *(thousands of feet)*	***Estimate of Recoverable Reserves*** *(millions of barrels of oil)*	
					High	*Mean*
Ventura	*Piedra Blanca*	*high*	*Coldwater, Cozy Dell, Sespe, Vaqueros*	*3-10*	*48.1*	*1.2*
	Rincon Creek	*high*	*Coldwater*	*2.5-10*	*16.3*	*0.4*
	San Cayetano	*high*	*Monterey, Santa Margarita, Pico, Coldwater, Sespe, Vaqueros*	*3-15*	*242.3*	*24.1*
	Sespe	*high*	*Coldwater, Sespe, Vaqueros, Modelo*	*2-10*	*630.5*	*30.2*
	Rest of Basin	*Med /low*	*Paleogene and Cretaceous*		*14.0*	*6.0*
Santa Maria	*Lopez Canyon*	*high*	*Point Sal, Vaqueros*	*1.5-5*	*11.6*	*0.35*
	La Brea Canyon	*high*	*Point Sal, Monterey*	*1-5*	*28.6*	*0.8*
	Figueroa Mountain	*high*		*1-5*	*7.7*	*0.3*
Cuyama	*South Cuyama*	*high*	*Vaqueros, Branch Canyon, Santa Maria, Eocene*	*3-10*	*210.8*	*26.8*

Table D-6 shows the resulting number of wells (dry holes, production wells, and injection wells), surface disturbance (well pads, road and pipeline miles, short-term acres affected, long-term acres affected), and estimated crude oil production for each area for which a high potential forecast was prepared. The medium/low potential area in the Ventura basin is considered too speculative to be considered reasonably foreseeable.

Conclusions – Maximum Activity Forecast (= Alternative 2 leasing scenario)

Peripheral areas in the southern portion of LPNF have high potential for development. There is

less likelihood of significant development on the available lands in the interior of LPNF, south of San Luis Obispo. No development would be forecast for the northern portion of LPNF. Based on available information, the reasonably foreseeable post-leasing exploration and development activity includes 151 wells on 25 well pads. Associated surface disturbance includes 19 miles of road, 17 miles of pipeline, 163.3 acres of short-term ground disturbance, and 70.1 acres of long-term surface occupancy.

TABLE D-6: SUMMARY OF PROJECTED DEVELOPMENT ACTIVITIES

Area	***County***	***Wells (dry, production, & injection)***	***Surface Disturbance from…***			***Surface Disturbance***		***Mean Oil Production***
			well pad (ac.)	*road (miles)*	*pipe (miles)*	*short-term (acres)*	*long-term (acres)*	*(millions of barrels)*
Piedra Blanca	*Ventura*	*1/6/1=8*	*1*	*5*	*5*	*22.0*	*12.0*	*1.2*
San Cayetano	*Ventura*	*4/32/3=39*	*6*	*4*	*4*	*38.4*	*16.0*	*24.1*
Sespe	*Ventura*	*5/40/4=49*	*7*	*2*	*1*	*35.2*	*12.1*	*30.2*
Rincon Creek	*Ventura and Santa Barbara*	*1/2/0=3*	*1*	*1*	*0*	*6.0*	*3.0*	*0.4*
South Cuyama	*Ventura and Santa Barbara*	*2/35/4=41*	*6*	*3*	*3*	*35.3*	*14.0*	*26.8*
La Brea Canyon	*Santa Barbara*	*1/4/0=5*	*1*	*1*	*1*	*8.1*	*4.0*	*0.8*
Figueroa Mtn.	*Santa Barbara*	*1/1/0=2*	*1*	*1*	*1*	*6.1*	*3.0*	*0.3*
Lopez Canyon	*San Luis Obispo*	*1/1/0=2*	*1*	*1*	*1*	*6.1*	*3.0*	*0.3*
Monroe Swell	*Monterey**	*1/1/0=2*	*1*	*1*	*1*	*6.1*	*3.0*	*0*
TOTAL	*17/122/12=151*		*25*	*19*	*17*	*163.3*	*70.1*	*84.1*

- *The Monroe Swell Area is grouped together with Lopez Canyon in Bain's RFD document.*

DEVELOPMENT POTENTIAL FOR ALTERNATIVE LEASING SCENARIOS

The RFD estimate above relates to Alternative 2. Consultant petroleum geologist Thomas Hopps, of Rancho Energy Consultants, modified this Alternative 2 RFD scenario for the other alternative leasing scenarios based on the proposed lease stipulations for each alternative, his extensive knowledge of the area and professional judgment. For each alternative, the number of wells, the amount of surface disturbance and the volume of oil expected to be produced is estimated for each of the nine High Oil and Gas Potential Areas.

Methodology Utilized

For each of the High Oil and Gas Potential Areas (HOGPAs), the geology was mapped and typical plays were identified. It is important to note that these particular plays may not hold up under further investigation and/or exploration nor do they necessarily represent all of the plays in any given area. They do, however, provide a basis for calculating or estimating related information germane to this analysis. From these typical plays (geologic interpretations), recoverable oil volumes were calculated and compared with historical results of similar accumulations.

Each play was then analyzed under three different risk scenarios; 100% chance of success (one discovery for each well drilled), 50% chance of success (one discovery for each two wells drilled) and a maximum risk case ranging from 8% chance of success (one discovery for each 12.25 wells drilled) to 36% chance of success (one discovery for each 2.8 wells drilled). Each risk scenario considered three probabilities that at least the estimated volume of oil and gas would be recovered. For each scenario there is a 95% chance that a minimum volume (typically none) of hydrocarbons will be discovered, a 5% chance that the maximum volume will be discovered and a mean chance that an intermediate volume of hydrocarbons will be discovered. The volumes in Alternative 2 (Table 1-3) represent the "maximum risk", "mean chance" estimate for each area.

By combining the volumetric estimates of Alternative 2 with the areal distribution of the resource, it is possible to estimate the number of wells needed to deplete each reservoir. The combination of this information, in turn, facilitates estimating the amount, type and duration of related surface disturbance.

Bain (1993) estimated that for Alternative 2, dry holes vary from 5% to 50% and injectors vary from 0% to 12.5% of the total number of wells in any given area. These estimates are based on his production modeling which indicated initial production rates of 250 BOPD/well, 10% annual decline, economic limit of 25 BOPD, the number of dry holes from statistics of nearby fields, 23 year well life, cumulative production of 750 MBO/well in Cuyama, San Cayetano and Sespe areas and 200 MBO/well in all other areas, and a low chance of exploratory success as described above. Wells producing less than the modeled cumulative production are considered dry holes. Stipulations and other lease terms imposed on alternatives 1, 3, 4, 4a, 5, and 5a may reduce the volumes of oil available for development in each area and the attendant economic viability of water floods and possibly other enhanced oil recovery methods. Accordingly, cumulative production per well is substantially reduced in most areas for these alternatives.

The amount of surface disturbance in each area is a function of the number of drill sites (well pads) required and the amount of new road and pipeline construction. Bain (1993) estimated that initially, 3 acres per drill site would be required. During the development phase, up to 5-8 wells could be drilled from one drill site with the size increasing to 4.5 acres. Only 1-1.5 acres would remain after drilling operations cease and reclamation of no longer needed acreage is complete. A typical access road would occupy 1.2-1.9 acres per mile (10-16 ft wide), a typical pipeline

would occupy 0.4-1.2 acres per mile (3-10 ft wide) and a typical central production facility would occupy no more than one acre.

Access (roads and pipelines) to most of these areas is available on existing roads. However, some new road construction is anticipated across existing LPNF leases, LPNF lands that are not presently leased, or private lands. Where practical, pipelines would occupy a narrow corridor along the side of a road. New pad construction would be subject to the same conditions as new road construction on existing leases, LPNF lands or private lands.

RFD Results For Each Alternative

Introduction

A separate analysis of the RFD activities that would occur has been performed for each alternative. This analysis estimates the number of new well pads, the number and type of new wells expected, the additional miles of roads and pipelines, the resultant amount of surface acres disturbed initially and after rehabilitation of initial construction activity and the mean number of barrels of oil equivalent (BOE) expected to result from production of oil and natural gas. For the purpose of calculations, six thousand cubic feet (MCF) of gas equals one barrel of crude oil.

(NOTE: The BOE estimates given below differ from the numbers previously given in Section III and Table D-6 of this appendix in that the following numbers reflect production from both oil and natural gas whereas the preceding numbers reflect oil production only.)

The projections for each of these alternatives range from 17 new producing wells and 7.3 acres of long-term disturbance for the extraction of 6.5 million BOE (Alternative 1) to 122 new producing wells and 70.1 acres of long term disturbance for the extraction of 90.2 million BOE (Alternative 2). Intermediate between these alternatives are alternatives 3, 4, 4a, 5, and 5a.

In remote areas (Piedra Blanca, Rincon Creek, La Brea Canyon, Figueroa Mountain, Lopez Canyon and Monroe Swell), the relatively small oil accumulations that are anticipated would not justify power line or pipeline construction over any long distances. As a result, these areas, if developed, would likely be forced to operate on natural gas engines with produced oil being shipped via truck.

Alternative 1 - No Action, No New Leasing

Under this alternative, exploration, development and extraction of oil and gas in existing leases would continue. However, no additional LPNF lands would be leased for exploration or development of oil and gas resources. Non-producing leases would be terminated on their expiration date. Only current lease stipulations and advisory notices would apply to these existing leased lands. Additional oil and gas leases in LPNF could only be obtained on non-Forest lands. If such development occurred, it would be subject to the rules and regulations of the state and local governmental agency with jurisdiction.

Table D-7 indicates that Alternative 1 forecasts new wells in three of the nine High Oil and Gas Potential Areas. These three areas are part of producing fields; the other six areas do not include any current oil and gas leases. In the San Cayetano and Sespe areas, it is anticipated that all of the new wells would be drilled from existing drill sites. Accordingly, the projected development would not result in surface disturbance, although it would increase traffic during the drilling and completion phase. At South Cuyama, it is estimated that the additional wells would require two new drill pads, which in turn would require up to one mile of access road and one mile of pipeline to tie the new wells into existing facilities.

The seventeen new producing wells are expected to produce up to 6.5 million barrels of BOE.

TABLE D-7: RFD FOR ALTERNATIVE 1: NO ACTION - NO NEW LEASES

High Oil & Gas Potential Areas	**Number of New Wells Estimated**				**Additional Amount of Surface Disturbance Estimated**			**Additional Acres of Surface Disturbance Estimated**		**Mean Oil Expected**
	Dry	*Produce*	*Inject*	*Total*	*# of Pads*	*Roads (miles)*	*Pipelines (miles)*	*Initial (acres)*	*After Rehab.*	*Millions of BOE*
Piedra Blanca	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
San Cayetano	0	1	0	1	0	0.0	0.0	0.0	0.0	0.1
Sespe	1	4	0	5	0	0.0	0.0	0.0	0.0	0.4
Rincon Creek	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
South Cuyama	2	12	2	16	2	1.0	1.0	8.3	7.3	6.0
La Brea Canyon	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Figueroa	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Lopez Canyon	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Monroe Swell	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Non-HOGPA	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Total	**3**	**17**	**2**	**22**	**2**	**1.0**	**1.0**	**8.3**	**7.3**	**6.5**

** From existing leases*

Alternative 2 - Emphasize Oil and Gas Development

Alternative 2 is the maximum development scenario. It would allow oil and gas leasing in all areas of LPNF that are not designated Wilderness or otherwise withdrawn from mineral entry. For Alternative 2, regulation of oil and gas lease development and operations would be only through application and oversight of BLM's Standard Lease Terms with advisory information notices provided by LPNF. No additional lease stipulations are included in this alternative.

Section 6 of BLM's Standard Lease Terms provides that the "lessee shall conduct operations in a manner that minimizes adverse impacts… [and] shall take reasonable measures deemed necessary by lessor to accomplish the intent of this section." Under current practice, this has been interpreted to allow for moving a proposed activity up to 200 meters or postponing a current activity up to 60 days within any year.

Projections summarized in Table D-8 forecast new wells in each of the nine High Oil and Gas Potential Areas. A sufficient number of new well pads are anticipated to accommodate each of the new wells, including producers, injectors and dry holes. However, as a practical matter, some of the new wells in producing fields of the San Cayetano, Sespe and South Cuyama areas would be drilled from existing drill sites.

TABLE D-8: RFD FOR ALTERNATIVE 2 - EMPHASIZE OIL AND GAS DEVELOPMENT

High Oil & Gas Potential Areas	**Number of New Wells Estimated**				**Additional Amount of Surface Disturbance Estimated**			**Additional Acres of Surface Disturbance Estimated**		**Mean Oil Expected**
	Dry	*Produce*	*Inject*	*Total*	*# of Pads*	*Roads (miles)*	*Pipelines (miles)*	*Initial (acres)*	*After Rehab.*	*Millions of BOE*
Piedra Blanca	1	6	1	8	1	5.0	5.0	22.0	12.0	1.3
San Cayetano	4	32	3	39	6	4.0	4.0	38.4	16.0	26.7
Sespe	5	40	4	49	7	2.0	1.0	35.2	12.1	32.1
Rincon Creek	1	2	0	3	1	1.0	0.0	6.0	3.0	0.4
South Cuyama	2	35	4	41	6	3.0	3.0	35.3	14.0	28.3
La Brea Canyon	1	4	0	5	1	1.0	1.0	8.1	4.0	0.8
Figueroa	1	1	0	2	1	1.0	1.0	6.1	3.0	0.3
Lopez Canyon	1	1	0	2	1	1.0	1.0	6.1	3.0	0.3
Monroe Swell	1	1	0	2	1	1.0	1.0	6.1	3.0	0.0
Non-HOGPA	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Total	**17**	**122**	**12**	**151**	**25**	**19.0**	**17.0**	**163.3**	**70.1**	**90.2**

New roads and pipelines are anticipated to be needed for each of the new well pads. In most of the areas, existing roads would help keep new road construction to a minimum. In producing fields, existing pipelines reduce the amount of new pipeline construction that would be needed. The remoteness of the Piedra Blanca area, on the other hand, would require greater lengths of new road and possibly pipeline construction. The conditions affecting new road and pipeline construction are factored into the estimates in Table D-8.

The 122 new producing wells are expected to produce up to 90.2 BOE.

Alternative 3 - Meet Forest Plan Direction

Alternative 3 allows oil and gas leasing consistent with the standard requirements and guidelines set forth in the LPNF Plan to afford protection to the environment and surface resources. Impact mitigation measures, which afford protection beyond, that offered by provisions of BLM's Standard Lease Terms are incorporated to comply with policies, standards, and direction given in

the LPNF Plan. These mitigation measures are in the form of special lease stipulations. The stipulations are needed in areas of surface resource sensitivity to assure compliance with the LPNF Plan.

Adding the stipulations needed to bring Alternative 2 into compliance with the LPNF Plan developed alternative 3. As a result, much of the acreage within each of the nine High Oil and Gas Potential Areas would become subject to conditions of Limited Surface Use (LSU) or No Surface Occupancy (NSO). While both of these conditions limit the amount of acreage accessible to drilling, and restrict the amount and types of activities that may take place, they do not totally preclude drilling in most cases.

Projections summarized in Table D-9 forecast new wells in seven of the nine High Oil and Gas Potential Areas. In producing fields of the San Cayetano, Sespe and South Cuyama areas, it is expected that some of the wells would be drilled from existing drill sites and would utilize existing roads, pipelines and facilities to the maximum extent possible. However, a limited amount of new road construction is anticipated in each of these areas and additional pipeline construction is anticipated in both the Sespe and South Cuyama areas. Most of this construction would occur on existing oil and gas leases; at San Cayetano some drilling is anticipated from private lands adjoining LPNF.

TABLE D-9: RFD FOR ALTERNATIVE 3 – MEET FOREST PLAN DIRECTION

High Oil & Gas Potential Areas	**Number of New Wells Estimated**				**Additional Amount of Surface Disturbance Estimated**			**Additional Acres of Surface Disturbance Estimated**		**Mean Oil Expected**
	Dry	*Produce*	*Inject*	*Total*	*# of Pads*	*Roads (miles)*	*Pipelines (miles)*	*Initial (acres)*	*After Rehab.*	*Millions of BOE*
Piedra Blanca	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
San Cavetano	2	4	0	6	1	0.1	0.0	3.0	3.0	0.5
Sespe	3	10	1	14	3	1.0	1.0	14.5	8.5	2.5
Rincon Creek	1	1	0	2	1	0.0	0.0	3.0	3.0	0.1
South Cuyama	2	30	3	35	5	2.0	2.0	21.5	14.0	18.0
La Brea Canyon	0	2	1	3	1	0.0	0.0	3.0	3.0	0.1
Figueroa	0	1	0	1	0	0.0	0.0	0.0	0.0	0.1
Lopez Canyon	1	1	0	2	0	0.0	0.0	0.0	0.0	0.1
Monroe Swell	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Non-HOGPA	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Total	**9**	**49**	**5**	**63**	**11**	**3.1**	**3.0**	**45.0**	**31.5**	**21.4**

Much of the remaining area is subject to NSO conditions. In Rincon Creek and La Brea Canyon areas, however, small parcels of land subject to Standard Lease Terms (SLT) or LSU occur along existing roads. Many of these parcels are large enough individually to accommodate a drill site and they could be so used to test and develop oil and gas within these two areas. Although the Figueroa Mountain and Lopez Canyon areas also contain small parcels of land subject to SLT or LSU conditions, these parcels are not favorably located for drill sites. However, sufficient

distribution of private lands within LPNF occurs to accommodate drill sites and permit testing and development of each of these areas. In all four of the above-discussed areas, lease stipulations would preclude any new road or pipeline construction on Forestlands. (Even if construction permits could be obtained, it is doubtful that pipeline construction would be economically viable in these remote areas.) Consequently, any oil produced from these areas would be shipped via truck; produced gas would be used in lease operations, flared or re-injected into the reservoir.

No new wells are anticipated in either the Piedra Blanca or Monroe Swell areas. While each of these areas contain a few small parcels of land subject to SLT or LSU conditions, these parcels are inaccessible by any existing road and the remainder of the areas are NSO. At Piedra Blanca, one parcel of accessible private land is not favorably located to permit testing of any projected accumulation of oil or gas. Much of the acreage within the Monroe Swell area is privately owned. Shallow target depths and rugged terrain, however, precludes the viability of directionally drilling beneath the LPNF from these private lands.

The 49 new producing wells are expected to produce up to 21.4 BOE.

Alternative 4 - Emphasize Surface Resources

The scenario for Alternative 4 is to give more emphasis to surface resources by applying additional lease stipulations to Alternative 3. The objective of Alternative 4 is to further protect and where feasible, enhance surface resources. Alternative 4 was developed by analyzing the impacts of Alternative 3 and adding additional lease stipulations to those of Alternative 3.

Table D-10 shows the projections for Alternative 4.

TABLE D-10: RFD FOR ALTERNATIVE 4 - EMPHASIZE SURFACE RESOURCES

High Oil & Gas Potential Areas	**Number of New Wells Estimated**				**Additional Amount of Surface Disturbance Estimated**			**Additional Acres of Surface Disturbance Estimated**		**Mean Oil Expected**
	Dry	*Produce*	*Inject*	*Total*	*# of Pads*	*Roads (miles)*	*Pipelines (miles)*	*Initial (acres)*	*After Rehab.*	*Millions of BOE*
Piedra Blanca	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
San Cavetano	2	4	0	6	1	0.1	0.0	3.0	3.0	0.5
Sespe	3	10	1	14	3	1.0	1.0	14.5	8.5	2.5
Rincon Creek	1	1	0	2	1	0.0	0.0	3.0	3.0	0.1
South Cuyama	2	24	2	28	4	2.0	2.0	19.5	14.0	14.0
La Brea Canyon	0	2	1	3	1	0.0	0.0	3.0	3.0	0.1
Figueroa Mountain	0	1	0	1	0	0.0	0.0	0.0	0.0	0.1
Lopez Canyon	1	1	0	2	0	0.0	0.0	0.0	0.0	0.1
Monroe Swell	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Non-HOGPA Area	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Total	**9**	**43**	**4**	**56**	**10**	**3.1**	**3.0**	**43.0**	**31.5**	**17.4**

In the South Cuyama area, reductions in the amount of SLT and LSU acreage results in the loss of one drill site that would have been allowed under Alternative 3. This in turn results in a reduction of seven total wells, no change in long term disturbance and a loss of four million barrels of expected oil production as compared to Alternative 3.

The 43 new producing wells forecast for Alternative 4 are expected to produce up to 17.4 BOE.

Alternative 5 - Combination of Alternatives 3 and 4

Land situated in the HOGPA areas offered for lease under Alternative 5 would be leased under the Alternative 3 terms with the addition of Alternative 4 biological lease terms. The non-HOGPA area would be leased under the terms of Alternative 4. The intent is to reduce oil and gas exploration and development activities where the potential is lower and/or the environmental sensitivity is higher. This combination alternative offers the protection of Alternative 3 mitigating stipulations, as a minimum, where the oil and gas potential is high; and, where the potential is high and biological sensitivity is high, Alternative 4 biological stipulations are also applied. Where the oil and gas potential is not high, the additional mitigating stipulations of Alternative 4 are added.

Alternative 5 would offer less land for lease. BLM staff reviewed alternatives 1 through 4 and commented that some of the NSO lands in alternatives 3 and 4 may not be accessible and that it is BLM policy not to offer land for lease that can't be reasonably accessed. Oil and gas underlying land leased with no surface occupancy (NSO) stipulations are sometimes accessed by slant (directional) drilling from drill pads located on land outside the NSO area. The assumed limit of current technology for slant drilling is ½ mile on LPNF. Consequently, land more than ½ mile within NSO areas or more than ½ mile from accessible private land within NSO areas is not offered for lease in alternative 5.

RFD projections for Alternative 5 are the same as Alternative 3, and are shown in Table D-9. Oil and gas development is only reasonably foreseeable, and production is projected only in the HOGPA areas. The stipulations for Alternative 5 within HOGPA's are the same as Alternative 3 except for biological terms. The difference in biological terms between Alternatives 3 and 4 do not affect the RFD projections. Consequently, the RFD projections for Alternatives 5 and 3 are the same.

Alternatives 4a and 5a – Roadless Area Emphasis

Alternatives 4a and 5a were added to give emphasis to the inventoried roadless areas (IRA's) of LPNF and provide consistency with the Roadless Area Conservation Rule issued on January 12, 2001. As their names imply, these alternatives build upon alternatives 4 and 5. In both

alternatives, the IRA's are given the protection of the No Surface Occupancy (NSO) stipulation. In Alternative 5, all NSO areas that could not be accessed by slant drilling under the NSO area from outside the NSO area are not leased. Consequently, any land more than ½ mile within an IRA or more than ½ mile from an accessible island of private land within an IRA is not offered for lease in Alternative 5a.

The RFD projections for alternatives 4a and 5a are the same. Tables D-11 shows the RFD projection for Alternatives 4a and 5a. The RFD for Alternatives 4a and 5a assume access to the South Cuyama HOGPA from adjacent private lands for almost all of the 14 million barrels projected. This access is speculative but felt to be reasonably foreseeable given the history of similar slant drilling access to National Forest System land on LPNF. Slant drilling from adjacent private land accesses oil and gas resources from leases situated under the Sespe Wilderness.

TABLE D-11: RFD FOR ALTERNATIVE 4A AND 5A - EMPHASIZE SURFACE RESOURCES

High Oil & Gas Potential Areas	**Number of New Wells Estimated**				**Additional Amount Surface Disturbance Estimated**			**Additional Acres of Surface Disturbance Estimated**		**Additional Mean Oil Expected**
	Dry	*Produce*	*Inject*	*Total*	*# of Pads*	*Roads (miles)*	*Pipelines (miles)*	*Initial*	*After Rehab*	*Millions of BOE*
Piedra Blanca	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
San Cayetano	2	4	0	6	1	0.0	0.0	3.0	3.0	0.5
Sespe	3	10	1	14	3	1.0	1.0	14.5	8.5	2.5
Rincon Creek	1	1	0	2	1	0.0	0.0	3.0	3.0	0.1
South Cuyama	1	4	0	5	1	0.0	1.0	3.0	3.0	14.0
La Brea Canyon	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Figueroa Mountain	0	1	0	1	0	0.0	0.0	0.0	0.0	0.1
Lopez Canyon	1	1	0	2	0	0.0	0.0	0.0	0.0	0.1
Monroe Swell	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Non-HOGPA Area	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0
Total	**8**	**21**	**1**	**30**	**6**	**1.0**	**2.0**	**23.5**	**17.5**	**17.3**

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