PETROLEUM POTENTIAL MAP OF MESOZOIC AND CENOZOIC ROCKS IN ROADLESS AREAS AND THE SANTA LUCIA WILDERNESS IN THE LOS PADRES NATIONAL FOREST, SOUTHWESTERN CALIFORNIA

By

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STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a study of organic geochemistry and reservoir rock characteristics as an index of the petroleum potential of the Santa Lucia Wilderness Area and the Sespe-Frazier, Garcia Mountain, Black Mountain, La Panza, Machesna Mountain, Los Machos Hills, Big Rocks, Stanley Mountain, Miranda Pine, Horseshoe Springs, Tepusquet Peak, La Brea, Spoor Canyon, Fox Mountain, Diablo, Matilija, Dry Lakes, Sawmill-Badlands, Cuyama, Antimony, Quatal and Little Pine Roadless Areas in the Los Padres National Forest, Kern, Los Angeles, San Luis Obispo, Santa Barbara, and Ventura Counties, California. The Santa Lucia Wilderness was established by Public Law 95-237, in 1978. The twenty-two roadless areas were classified as further planning areas during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979, as amended.

INTRODUCTION

This report summarizes the results of a reconnaissance evaluation of the capacity of source and reservoir rocks in the Santa Lucia Wilderness and Sespe-Frazier, Garcia Mountain, Black Mountain, La Panza, Machesna Mountain, Los Machos Hills, Big Rocks, Stanley Mountain, Miranda Pine, Horseshoe Springs Tepusquet Peak, La Brea, Spoor Canyon, Fox Mountain, Diablo, Matilija, Dry Lakes, Sawmill-Badlands, Cuyama, Antimony, Quatal and Little Pine Roadless Areas, in the Los Padres National Forest, Kern, Los Angeles, San Luis Obispo, Santa Barbara, and Ventura Counties, California (fig. 1) to generate and store large amounts of hydrocarbons. For purposes of this report the individual areas will be referred to collectively as the study area. The roadless areas individually range from about 2 to 523 mi^2 (table 1 on fig. 1, map sheet) and the study area totals some 1336 mi^2.

Our evaluation of the organic geochemistry of the sedimentary rocks in the study area began in 1980 and complements concurrent evaluation of mines and prospects undertaken by the U.S. Bureau of Mines and geological, geochemical, and geophysical evaluations in progress by the U.S. Geological Survey.

Exploitation of petroleum resources began in southern California with the prehistoric mining of tar seeps. The first wells near the study area were drilled in the Sespe Creek area in 1887. The Sespe oil field has produced more than 24 million barrel of oil and 22 billion cubic feet of gas since it's discovery. It currently yields 96 percent of the hydrocarbon production from within the boundaries of the Los Padres National Forest, which totaled approximately 700,000 barrels of oil and 900 million cubic feet of gas in 1981 (H. Record, written commun., 1982).

General setting

The study area is located between the oil and gas producing Santa Maria, Cuyama, San Joaquin, and Ventura basins. These basins have produced more than 12 billion barrels of oil plus gas as "barrels of oil equivalents" (BOE; one BOE equals 6,000 cubic feet of gas) through 1974 (Taylor, 1976, fig. 2). Most of the study area is south of the San Andreas fault, and cumulative production for the three basins south of that fault (Santa Maria, Cuyama, and Ventura) totals 3.7 billion barrels of oil plus BOE gas. Miocene and younger rocks produce 91 percent of the oil and gas from these three basins and only the Ventura basin has produced from older rocks (one and nine percent from Eocene and Oligocene rocks, respectively) (Taylor, 1976, table 2). Bailey (1947, p. 1913-1935) argues convincingly that the oil from the nonmarine, mostly Oligocene, Sespe Formation was derived from underlying Eocene shales. Furthermore, although isolated oil seeps and stains exist in Eocene rocks (H. Record, oral commun., 1983), commercially recovered "Eocene" oil in the study area has been found only where the Sespe Formation has not yet been eroded (such as at the Sespe field). Although Mesozoic rocks in the Sacramento basin have produced nearly a billion BOE gas, relatively little gas has yet been produced from pre-Tertiary rocks in the three basins south of the San Andreas fault.

Although more than 222 wildcat wells have been drilled in or near the study area, and together have penetrated all geologic units in the study area (map and table 3), a cursory examination of any map of oil fields in California shows a paucity of oil fields in the southern Coast and western Transverse Ranges; the fields that are present are on the flanks of these upland areas. This evaluation addresses itself to the question of why little commercial oil or gas have been found in the study area.

Previous work

Although reservoirs near the area have produced for nearly a hundred years, little has been published on the organic geochemistry of local source rocks. In their reconnaissance study of Upper Cretaceous rocks, Howell and Claypool (1977, p. 85-90) state that those rocks have poor source and reservoir capability. Link and Smith (1982, p. 191-197) conclude that the mostly nonmarine rocks in the Miocene and Pliocene Ridge Basin at the eastern edge of the map area contain few source beds (shaley lake bed deposits) with generally immature kerogens. Frederikson (1983) presents data on the thermal alteration of organic matter from rocks in and near the study area.

Link and Welton (1982, p. 1514-1534) discuss the early compaction, cementation, and diagenesis in the Matilija Sandstone, which they conclude results in that unit being a poor reservoir target. Helmold (1980) and Helmold and Van de Kamp (1983) address the diagenesis and thermal history of Paleogene rocks in the Santa Ynez Mountains.

Many maps, articles, and unpublished theses which have contributed to our understanding of the geology of the study area are cited in Frizzell and Vedder (1983).

Location and accessibility

The study area is in the Los Padres National Forest in the southern part of the Coast Ranges and western part of the Transverse Ranges of California. It forms an elongate curve between U.S. Highway 101 on the west and Interstate 5 on the east. California State Highways 33, 58, and 166 provide paved access to numerous paved and unpaved roads that generally allow access to within a quarter mile of the borders of the various roadless areas. Trails provide access into many parts of most roadless areas.

Topography and vegetation

The study area is mostly characterized by steep walled canyons and sharp ridges. Mountain top elevations are variable: 2,868 feet at Lopez Mountain in the Santa Lucia Wilderness; 8,831 feet at Mt. Pinos in the Sawmill-Badlands Roadless Area. Although some summit ridges support forests of coniferous trees and riparian woodlands line some valley bottoms, impenetrable chaparral covers much of the vegetated portion of the study area. Mixtures of manzanita, buckbush, chamise and poison oak characterize the chaparral plant community in the study area and make off-trail traverses quite challenging and slow.

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GEOLOGY

Despite its large size much of the study area is underlain by similar types of rocks. Thick sequences of Mesozoic and Cenozoic sedimentary rocks, predominantly sandstone, siltstone, shale, and conglomerate, in addition to some siliceous shale and minor limestone, underlie most of the study area. These sedimentary rocks overlie crystalline basement rock composed of pre-Tertiary igneous intrusive and metamorphic rocks.

For present purposes, the exposed rocks have been grouped into three generalized units from a geologic map of the study area (Frizzell and Vedder, 1983): igneous and metamorphic rocks, pre-Neogene sedimentary rocks, and Neogene sedimentary rocks. Units severely summarized below are more fully described by Frizzell and Vedder (1983).

Igneous and metamorphic rocks

This unit consists predominantly of pre-Tertiary igneous or metamorphic rocks that crop out in the northeastern and northwestern parts of the study area. Metamorphic rocks include thin steeply dipping marble beds of unknown age, Precambrian biotite schist, and deformed Precambrian plutonic rocks. Igneous rocks include granitic rocks with 60 to 70 m.y. potassium-argon ages, remnants of Jurassic oceanic crust, and Miocene volcanic rocks.

These rocks will not produce oil or gas in their own right. Recent exploration models have resulted in drilling of similar rocks elsewhere, however, because of the possibility that they are above thrusts with oil and gas trapped below the thrusts.

Pre-Neogene sedimentary rocks

Most of the study area is underlain by pre-Neogene marine and non-marine sedimentary rocks composed of sandstone, shale, conglomerate, siltstone, and rare limestone in varying combinations and from diverse depositional environments of Mesozoic and Cenozoic age. Included are small areas underlain by the highly sheared and chaotically mixed Franciscan assemblage, which may be Late Jurassic or Cretaceous in age. Several large areas are underlain by predominantly argillaceous to sandy shale sequences of Late Jurassic and Early Cretaceous age. Late Cretaceous interbedded sandstone, shale, and conglomerate locally paraconformably overlie the older Cretaceous rocks or rest directly on crystalline basement. Thick Paleogene sequences contain transgressive and regressive sequences and are locally covered by Oligocene nonmarine redbeds, the uppermost rocks in the pre-Neogene unit.

Unlike those in the basement unit, some of the rocks in this unit could produce oil and gas if the proper combinations of source, maturity, reservoir, trap, and timing existed.

Neogene sedimentary rocks

Following deposition of the nonmarine redbeds, late Oligocene and early Miocene subsidence initiated transgressive marine deposition in nearshore, and, subsequently, in offshore environments. Subsidence continued in the middle Miocene, and pull-apart basins began to develop. These relatively restricted basins filled with fine-grained sediments from terrestrial sources and with organic remains of flora and fauna living in the water column. This deposition constitutes the sandstone, siltstone, shale, and conglomerate that are now asssigned to the Monterey Formation. In the area east of Sespe Creek approximate correlative rocks are assigned to the Modelo Formation (Kew, 1924; Anderson, 1960). While these marine rocks were being deposited, terrestrial rocks were also being deposited. The latter rocks, predominantly fanglomerates, sandstone, and lacustrine siltstone and claystones, occur mostly in the Cuyama Badlands, Lockwood Valley, and along the eastern boundary of the study area, the Ridge Basin area.

Neogene marine strata are the most important source for petroleum in California and are present in the study area and in nearby oil fields.

DRILLING SUCCESS

Oil and gas exploration began in the region in the 1860's and the first wells were drilled in the Sespe Creek area in 1887 (Kew, 1924, p. 121). The field development drilling success rate for the Sespe field is about 80 percent successful. This is similar to that for the Ventura basin and South Cuyama fields that are near the study area.

Table 2 shows the status of wells in the Ventura basin and South Cuyama fields (data from Munger, 1981). For purposes of the present analysis, uncompleted idle wells were combined with uncompleted abandoned wells (both dry), and completed producing, idle, and abandoned were all combined as successful completions. Uncompleted drilling or unassignable wells (66 wells) were not taken into account. About 1,596 wells have been drilled in these fields and 1,240 or 78 percent were completed successfully. This is much better than the overall success ratio for rank wildcat drilling in California which is 1:13 or about eight percent (H. Record, written commun., 1982). Wildcat drilling experience and oil and gas production in and near the study area, but outside known fields, have not been as successful as the success ratio for the state, however.

Table 3 presents data on wildcat wells drilled in and near the study area. Where possible, wells were assigned to dry or successful categories. Unassignable wells (4 wells) are not taken into account. Of the approximately 222 classifiable holes completed outside known oil and gas fields through 1981, about 214 were dry holes and less than 80,000 barrels of oil (Table 3) were produced from the eight producing wells, all of which are now abandoned or idle. If these holes are all considered wildcats, this yields a success ratio of about 1:28 or about four percent.

The wildcat wells were drilled mostly in Paleogene and Neogene rocks, but all sedimentary rock units represented in study area have been tested at one place or another.

PETROLEUM SOURCE ROCKS

One hundred and sixty-one samples of siltstone and shale were collected primarily from natural and artifical (road cuts) surface exposures and analyzed for oil-source capability and thermal maturity of the kerogen. Although samples were not collected randomly, an attempt was made to collect reasonably representative samples from all sedimentary rock units and from many fault bounded blocks. These data indicate poor capacity for petroleum generation from Mesozoic and Paleogene rocks and moderate capacity in Neogene source rocks.

Methods

The samples (table 4) were analyzed for total organic carbon content by chromic acid oxidation modified from Bush (1970) and for hydrocarbons by Rock-Eval I pyrolysis assay, a technique for estimating bitumen content and kerogen content, type, and thermal maturity using methods given by Espitalie and others (1977), Tissot and Welte (1978, p. 443-447), and Clementz and others (1979) and discussed by Waples (1981). Much of the following discussion parallels those in the above articles.

Results

The samples from pre-Noegene rocks contain lower than average overall organic matter (table 4) with 80 percent containing less than one percent organic carbon. Samples of Neogene rocks average about two percent. Average organic content for shales in worldwide basins is 0.9 percent and is 2.2 percent for recognized source rock from 19 producing basins (Tissot and Welte, 1978, p. 96). Table 5 shows average organic content by sample (stratigraphic) units and by subareas and demonstrates a low average organic content. Even if we assume that the organic content in the study area has been degraded by surficial chemical and biochemical processes (in the study area, subsurface samples for a given unit contain two times the average organic carbon than surface samples for the same unit contain), most pre-Neogene samples would still contain less than two percent total organic matter; Neogene samples would contain about 4 percent organic matter.

Total hydrocarbon yield or genetic potential, a semiquantitative value representing the original hydrocarbon-generating capacity of the rocks, should have a minimum value of 2 mg/g (or 2 kg/t) to be considered possible oil source rocks (Tissot and Welte, 1978). Here, too, values for Neogene rocks indicate source potential, while the values for pre-Neogene rocks are well below the 2 mg/g minimum value. The total hydrocarbon yield for Miocene rocks from the two subareas in which more than two samples of Miocene marine rocks were collected averages 10.6 and 14.1 mg/g (subareas I and VI, respectively) with an overall average of 12.1 mg/g (table 4). Among the pre-Neogene rocks that make up the bulk of the samples, on the other hand, only four samples contain more than 2 mg/g total hydrocarbon yield and the overall average is about 0.3 mg/g (1.2 mg/g average for the 19 subsurface samples).

Except for the Neogene samples, the data indicate that most of the organic matter present has little capacity to generate hydrocarbons either because of the original hydrogen-deficient composition of the organic matter or because the organic matter has already generated hydrocarbons. The synthetic van Krevelen diagram (fig. 2) indicates that terrestrial woody humic matter is the likely source of organic carbon in most pre-Neogene rocks. Large amounts of terrestrial plant matter have been previously noted locally in both Mesozoic and Paleogene sedimentary rocks (Dibblee, 1966, p. 14; Chipping, 1972, p. 37-39, respectively). While such material may yield some natural gas (and is the source for gas in the Sacramento Valley), most fossil terrestrial plants contain too little lipid material to constitute oil-generating kerogens.

The low pyrolytic hydrocarbon yield of organic matter in pre-Neogene rocks may be due to their already having generated hydrocarbons. Most temperatures of maximum pyrolysis yield for the pre-Miocene samples range from 425 to 475°C (subarea I temperatures are somewhat higher, ranging up to about 496°C, and subarea III temperatures are somewhat lower, ranging down to 410°C. See table 4). This range crosses the transition from the immature to the mature stage with respect to oil generation (about 435°C, Espitalie and others, 1977, and Clementz and others, 1979), and many temperatures of maximum pyrolysis yield are likely equivalent to the latest stages of hydrocarbon generation and the early stages of liquid hydrocarbon destruction (460°C). Samples with S_2 pyrolysis temperature maxima greater than 460°C and transformation ratios of 0.4 or above probably have greatly reduced S_2 hydrocarbon yields.

Temperatures of maximum pyrolysis yield for the Neogene marine rocks, in the 400 to 435°C range, are lower than those for the pre-Neogene rocks and indicate organic matter that is immature to mature with respect to the "conventional window" for oil generation, although oil has certainly been generated from similar rocks in similar settings.

RESERVOIR ROCK

Porosity and permeability data for 67 surface and subsurface samples of sandstone and siltstone in or near the study area are shown in table 6 and plotted in figure 3. The data indicate that most samples have low permeability and porosity (plot very close to the origin on a standard semilog porosity-permeability cross plot—outside the field of data from Ziegler and Spotts' (1978) well-known "best reservoir limit") and, thus, indicate poor reservoir capacity.

Helmold and Van de Kamp (1983) document a west-to-east reduction in both porosity and permeability in Paleogene sandstones from the vicinity of Point Conception to the Ojai area. They attribute this compaction and reduction in reservoir quality to increasing thickness of sediments (deeper burial) from west to east. Diagenetic factors may also affect reservoir capacity.

Laumontite, a mineral indicative of diagenetic changes in mineralogically immature rocks heated with pore waters at above-average geothermal gradients, has previously been reported in Paleogene rocks in the western Transverse Range (Madsen and Murata, 1970; Helmold, 1980) and in modern precipitates from Sespe Hot Springs 14 mi north of Fillmore (McCulloh and others, 1981). Pervasive laumontite crystallization north and south of the Santa Ynez fault, reported by McCulloh (1981), may preclude the occurrence of good reservoir capacities in affected rocks. McCulloh (written commun., 1982) has delineated areas affected by laumontite crystallization (see map). These include areas in which all suitable host rock contain laumontite and, more conservatively, areas inferred to be underlain by subsurface laumontite. Since high permeability, some porosity, and the absence, or near absence, of calcium carbonate are required for laumontite crystallization, not all rocks within designated areas contain laumontite (i.e., rocks that are too fine-grained, that are too calcareous, or that were subjected to pre-laumontite cementation or compaction).

STRUCTURE

Although some Miocene and younger rocks contain favorable organic matter, and although several areas are underlain by Miocene and younger rocks, integration of geologic maps with oil well and gravity data indicate that most localities in the study area underlain by these rocks are either relatively thin or contain sections that have been well dissected by erosion.

Miocene marine rocks, which are about 5,000 ft thick (Hall, 1982; Griscom, 1983), underlie the southwestern two-thirds of the Santa Lucia Wilderness near Lopez Mountain. A pre-Miocene high separates the vertically-dipping, closely-faulted, short-wavelength isoclinal folds there from the relatively open folds of the minimally petroleum-producing Huasna syncline 12 mi to the southeast where upper Oligocene to Pliocene rocks are about 15,000 ft thick (Hall and Corbato, 1967). Present-day canyons with as much as 1,600 ft of local relief have been sculpted in the Santa Lucia Wilderness. Structural complexity in the wilderness and an apparently thin local Neogene section probably reduce the capacity for generation and preservation of hydrocarbons there.

Similarly, while not as structurally complex as the sequence in the Santa Lucia Wilderness, Miocene rocks exposed at the surface in the Tepusquet Peak, La Brea, and Little Pine Roadless Areas are relatively thin and have generally been well-breached by erosion. Miocene rocks at the surface in the Fox Mountain Roadless Area are also relatively thin, but the area may offer deeper prospects.

As briefly described in the section on geology, many of the Miocene rocks were deposited in pull-apart basins. Thrust faults, formed in response to current tectonic regimes, are effectively closing many of these same basins. In the South Cuyama field (north of the Fox Mountain Roadless Area), most recently discussed by Schwing (1983), production is mostly from sands of the lower Miocene part of the Vaqueros Formation (Schwade, Carlson, and O'Flynn, 1958, p. 93-97). Similar lower Miocene rocks have been encountered by drilling through the south-dipping, low-angle South Cuyama fault. Additional lower Miocene rocks may be found further south, on the southern margin of a subthrust syncline, by drilling through Eocene and perhaps older rock to depths in excess of 10,000 ft. Gravity data (Griscom, 1983), however, do not support the presence of Miocene rocks in great thickness there, but the relatively dense pre-Miocene rocks of unknown thickness may adversely effect interpretation of the data as the area is one of relatively sparse control.

A bouguer gravity anomaly may indicate the presence of Miocene rocks below the Pine Mountain fault on the edge of the Sespe-Frazier Roadless Area (Griscom, 1983). If this interpretation is correct such rocks may be potential drilling targets, although a 9,500-ft well drilled 2-4 mi southeast of the anomaly did not penetrate the Pine Mountain fault or rocks older than Eocene.

An elongate east-west negative gravity anomaly in the southern part of the Sespe-Frazier Roadless Area (Griscom, 1983) may confirm the presence of Miocene and Pliocene rocks below the San Cayetano thrust (most recently discussed by Yeats, 1983, fig. 11) where oil producing horizons may be present. Drilling depths to the thrust should be less than 12,000 ft below sea level south of a zone approximated by line A-A' shown on the map (Griscom, 1983, after Nagle and Parker, 1971).

CONCLUSIONS

Organic geochemical data from pre-Neogene rocks indicate low amounts of organic matter and that the organic matter present is not the type that yields oil. Although under suitable conditions such organic matter may be a source of gas, only nominal amounts of oil and gas have been produced from these rocks in or near the study area. Porosity and permeability data indicate generally poor reservoir capacity.

Neogene marine rocks contain adequate quantities and suitable qualities of organic matter for the generation of oil and gas. While some of these rocks may be relatively immature, oil production records indicate that part of the Neogene sequence already has generated petroleum.

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Table 2.--Status of wells in the South Cuyama field and Ventura basin fields adjacent to study area (Munger, 1982)

Field	Uncompleted, drilling	Uncompleted, idle	Uncompleted, abandoned (dry)	Completed, producing	Completed, idle	Completed, abandoned	Unnassignable wells
	Total						
Sespe	16	9	75	240	25	76	8
Hopper Canyon	1	3	23	26	10	4	0
Timber Canyon	0	0	19	35	2	16	1
Santa Paula	2	1	52	48	0	73	2
Ojai	22	5	115	231	10	79	1
Fillmore (Abandoned)	2	0	13	2	0	58	0
Piru	0	3	13	18	6	13	0
Piru Creek	0	0	0	0	0	1	0
Temescal	0	0	11	17	0	1	5
South Cuyama	4	0	14	240	7	2	2
Total	47	21	335	857	60	323	19

Uncompleted (idle and abandoned) 356

Completed (producing, idle, and abandoned) 1240

Table 3.--Information on wildcat wells drilled in and near the study area

[Data from California Division of Oil and Gas, various dates; California Division of Oil and Gas, 1964; Hall, 1982]

Map[1] No.	Producer	Well name	Year drilled	Depth (feet)	Units drilled[2] (thickness or depth to top of unit)	Well status[3]	Cumulative production
1	Exline-Fischer and Quist	1	1917	300	Tnm	Abd., dry hole	---
2	a) Crest Oil Co.	Ryan 1	1951	1812	Tnm (0-1660); Oligocene (at bottom)	do.	---
	b) Dielectric Lab, Inc.	Courtney 1	1952	780	Tnm (total depth)	do.	---
3	a) Getty Oil Co.	Ida B One	--	--	Tnm (0-3250); KJs (3250-3550)	Abd., oil	Oil:2,000 bbls
	b) Getty Oil Co.	USL 9-35	1963	175	Tnm (at surface)	Abd., dry hole	---
	c) Getty Oil Co.	USL 9-16	1963	157	Tnm (at surface)	do.	---
	d) Getty Oil Co.	USL 9-18	1963	3098	Tnm (at surface)	do.	---
	e) Getty Oil Co.	USL 9-38	1963	162	Tnm (at surface)	do.	---
4	Getty Oil Co.	USL 18-15	1964	7437	Tnm (total depth)	do.	---
5	Time Pet. Co.	B-H-K 1	1963	4491	Tnm (0-3490); KJs (3490-4491)	do.	---
6	Gulf Oil Corp	Huasna Comm. 1	1943	3015	Tnm (total depth)	do.	---
7	Home Stake Production Co.	Tar Springs J3M	1969	3535	Tnm (total depth)	do.	---
8	a) "Tex" Harvey Oil Co.	Huasna 1	1940	4520	Tnm (0-4251)	do.	---
	b) "Tex" Harvey Oil Co.	Huasna 2	1941	7238	Tnm (total depth)	do.	---
	c) Occidental Pet. Co.	Glaser 1	1965	3991	Tnm (total depth)	do.	---
	d) Union Oil of Calif.	Huasna Chandler 1	1930	5627	Tnm (0-4835), Tnm?(4835-5539), KJf or Jo (5539-5627)	do.	---
9	a) Exxon	Tar Springs 3	1956	4506	Tnm (total depth)	do.	---
	b) H. F. Gibson	Tar Springs Ranch 1	1944	5440	Tnm (total depth)	do.	---
	c) Amerada Hess Corp.	Tar Springs Ranch 2	1945	1709	Tnm (total depth)	do.	---
10	The Superior Oil Co.	Tar Springs Ranch 1	1940	6500	Tnm (total depth)	do.	---
11	Union Oil of Calif.	Union-Hancock-Humble-Intex-Tar Springs 1	1955	5527	Tnm (total depth)	do.	---
12	a) N. S. Wilson	2	1930	4391	Tnm (0-3015), ? (3015-4391)	do.	---
	b) Steiger Oil Co.	Well No. 1	?	1100	Tnm (at surface)	do.	---
13	C. W. Colgrove	Cavanaugh 36-28	1955	1667	KJs (138-1667)	do.	---
14	a) Danciger Oil and Ref. Co.	Twitchell 1	1947	5626	Tnm (0-5235), KJs? (5235-5626)	do.	---
	b) Union Oil of Calif.	Rust 1	1929	4156	Tnm (0-?), KJs (?-4156)	do.	---
15	Lloyd Corp., LTD.	Rheem-Hotchkiss USL	1956	4276	Tnm (0-4145?), KJs (4145?-4276)	do.	---
16	Todd-Peck Syn.	Clarion 1	1918	1868	Tnm (total depth)	do.	---
17	a) XO Expl. Inc.	Williams 1	1973	2362	Tnm (total depth)	do.	---
	b) Pan Pet. Co. Inc.	J. D. Williams 1	1969	7967	Tnm (total depth)	do.	---
	c) H. W. Reynolds, Jr.	Pan Pet-Williams 1	1970	3075	Tnm (total depth)	do.	---
18	Getty Oil Co.	Stow 1	1918	1437	Tnm (total depth), (bottomed in sp?)	do.	---
19	Getty Oil Co.	Rancho Suey 1	1956	4307	Tnm (0-3738), Tpn (3738-4043), KJs (4043-4307)	do.	---
20	a) British Amer. Oil Prod. Co.	Br. Amer. Honolulu-Rancho Suey C-1	1952	4004	Tnm (total depth)	do.	---
	b) British Amer. Oil Prod. Co.	Br. Amer. Honolulu-Rancho Suey B-1	1952	4070	Tnm (total depth)	do.	---
	c) Norris Oil Co.	NL and F 1	1974	3055	Tnm (at surface)	do.	---
21	Navy Oil Co., Inc.	Rancho Suey 37-10	1959	2133	Tnm (0-1950), KJs (1950-2133)	do.	---
22	Getty Oil Co.	Rancho Suey Core Hole 1	1951	5022	Tnm (0-4530), KJs (4530-5022)	do.	---
23	a) C. W. Colgrove	Fleischer 85-27	1958	5781	Tnm (0-5400), KJs (5400-5781)	do.	---
	b) C. W. Colgrove	Fleischer 16-26	1959	2370	Tnm (at surface)	do.	---
	c) C. W. Colgrove	Fleischer 855-27	1961	1780	Tnm (at surface)	do.	---
24	Getty Oil Co.	Honolulu-Sunray-Sisquoc 1	1952	4616	Tnm (0-3648), KJs (3648-3992) Fault, Tnm (3992-4510), KJs (4510-4616)	do.	---
25	Union Oil of Calif.	Sisquoc 5	1943	1928	?(0-50), Tnm?(50-1884), KJs (1884-1928)	do.	---
26	Sun. Oil Co.	Sisquoc Ranch 1	1957	4824	Qs (0-60), Tnm (60-4824)	do.	---
27	Union Oil of Calif.	Sisquoc 2	1943	3121	Tnm (total depth)	do.	---
28	Sun. Oil Co.	Sisquoc Ranch 2	1957	2850	Tnm (at surface)	do.	---
29	Union Oil Co. of Calif.	Sisquoc 6	1946	6374	?	do.	---
30	Sun. Oil Co.	Sisquoc Ranch 3	1957	3785	Tnm (at surface)	do.	---
31	Getty Oil Co.	Efromson 1	1925	1218	Ti (at surface)	do.	---
32	Getty Oil Co.	Mills 1	1951	4845	Tnm (0-4660), KJs (4660-4830), Jo?(4830-4845)	do.	---

Table 3.--Information on wildcat wells drilled in and near the study area--Continued

Map[1] No.	Producer	Well name	Year drilled	Depth (feet)	Units drilled[2] (thickness or depth to top of unit)	Well status[3]	Cumulative production
33	Rothchild Oil Co.	US-1	1950	4396	Tnm (1830-4396)	Abd., dry hole	---
34	Anza Pacific	Wilshire USL-1	1952	9569	Tnm (4850-9569)	do.	---
35	a) ARCO	U. S. Herren 1	?	?	Tnn (total depth)	do.	---
	b) ARCO	U. S. Miller 1	?	?	Tnn (total depth)	Abd., oil	Oil:55,800 bbls
36	Reserve Oil Inc.	Humble-Lundstrom 48-2	1950	11,175	Tnm (4640-11,175)	Abd., dry hole	---
37	a) ARCO	J. G. James 1	1951	11,336	Tnm (3800-10,260 +), KJs (?-11,336)	do.	---
	b) Gulf Oil Corp.	Pickrell 21-16	1950	9315	Tnm (total depth)	do.	---
	c) George J. Greer	Bandini 51-17	1954	7020	Tnm (880-7020)	do.	---
	d) Douglas Oil Co. of Calif.	Cuyama 85-16	1950	6956	Tnm (total depth)	do.	---
38	ARCO	Lundstrom-Becher 1	1951	10,434	Tnm (3485-10,065), KJs (10,065-?)	do.	---
39	The Superior Oil Co.	Cuyama-Govt. 1	1952	10,053	Tnm (5915-10,053)	do.	---
40	The Superior Oil Co.	Cuyama-Govt. 2	1953	2921	KJs (2865-2921)	do.	---
41	Shell Oil Co.	Heller 22-23	1955	7545	Tnm (0-6985), KJs (6895)	do.	---
42	Kernland Oil Co.	Dougherty 12-24	1955	6094	Tnm (0-6002), KJs (6002)	do.	---
43	a) Getty Oil Co.	Honolulu-Humble-Dougherty 55	1951	6504	Tnm (4823-6068), KJs	do.	---
	b) Exxon	Federal-H. W. Dougherty 1	1953	6515	Tnm (4430-6103), KJs (6103-6515)	do.	---
	c) R. K. Cross	USL-CDFPT 86X	1965	5636	Tnm (at surface)	do.	---
44	a) R. K. Cross	Cuyama Properties 1	1967	5961	Tnm (at surface)	do.	---
	b) Texaco Inc.	Signal-Maxwell 1	1952	6565	Tnm (0-4450), KJs (4450-6565)	do.	---
	c) Occidental Pet. Corp.	Cross-USL 27X	1962	4855	Tnn (?) at surface	do.	---
	d) Chevron	Honolulu-Oceanic	1950	7647	Tnm (1215-3173), KJs (3173-7647)	do.	---
45	a) ARCO	Wegis Reyes A 1	1949	6043	?	do.	---
	b) ARCO	Wegis Reyes B 1	1949	7500	Tnm (0-7133), Tnn (7133-7390), KJs (7390-7500)	do.	---
	c) Mobil Oil Corp.	Mobil-Union-T. K. Sterling USL 83x-17	1960	6039	Tnm (total depth)	do.	---
46	Mariposa Pet. Co.	Federal 15-1	1977	6008	Tnn (total depth)	do.	---
47	a) Exxon	K. E. Norris 1	1951	11,508	?	do.	---
	b) O. K. Hearte	1	1940	2902	Miocene	do.	---
48	Gulf Oil Corp.	Humble-Honolulu 3-21	1956	4696	Tnm (700?-1148), KJs (2558-4693)	do.	---
49	Texaco Inc.	McCargar 1	1956	3694	Tnm (765-?), KJs (2500-3694)	do.	---
50	Exxon	E. N. Wegis, et. al. 1	1949	2501	Tnm (120-190), Tnn (190-1025), KJs (1025-2501)	do.	---
51	ARCO	Dixon A-1	1949	3382	Tnm (0-1150),Tnn (1750-2025) KJs (2025-2501)	do.	---
52	Bolsa Chica Oil Corp & Pacific Supply	1	1949	6817	Tnm (5370), KJs (6270-6817)	do.	---
53	Adams Drilling and Oil Co.	1	1917	2207	Tnn (at surface), Eocene at bottom	do.	---
54	a) Adams Drilling and Oil Co.	2	1920	785	Tnn (at surface)	do.	---
	b) Texaco, Inc.	Blue Diamond 1	1952	5875	Tnn (0-5732), weathered granitic basement (5732)	do.	---
55	ARCO	Gillbergh A-2	1951	3335	Tnn (0-3212), weathered granitic basement (3212)	do.	---
56	Texaco Inc.	Fulwilder	1951	3486	Tnm (total depth)	do.	---
57	San Marcos Oil Co.	Elliot 1	1927	3631	Tnm (0-3390), sp (3690-3631)	do.	---
58	Lewis W. Welch	Welch Janeway 1	1949	5933	Qs (0-1700); Tnm (1700-4490), KJs (4490-5933)	do.	---
59	a) Lewis W. Welch	Lazy R. G. 2	1949	6636	Tnm (0-4220), Tpn (4220-5400), Tks (5400-6106)	do.	---
	b) Fred M. Manning	Lazy R. G. 1	1948	4858	?	do.	---
60	Petroleum Explor. Co.	1	1928	3921	?	do.	---
61	Getty Oil Co.	Gibraltor-Dam 1	1933	2344	?	do.	---
62	Elmer B. Stone	1	1951	257	Tnn at surface, Miocene	do.	---
63	Arthur C. Fischer	Curyea 54	1951	974	Tnn (total depth)	do.	---
64	R. L. Parris and L. L. Curyea	Curyea 32	1952	584	Tnn (total depth)	do.	---

Table 3.--Information on wildcat wells drilled in and near the study area--Continued

Map[1] No.	Producer	Well name	Year drilled	Depth (feet)	Units drilled[2] (thickness or depth to top of unit)	Well status[3]	Cumulative production
65	Edco Oil Co.	Govt. 63	1965	2395	Tnn (total depth)	Abd., dry hole	---
66	ARCO	Gillbergh A-1	1951	3212 +	Tnn (0-3212), weathered granitic basement (3212)	do.	---
67	ARCO	Quatal Unit 1	1949	4010	Tnn (total depth)	do.	---
68	Sigmund Matejko	Explorer 1	1961	1220	Tnn (total depth)	do.	---
69	Thompson Devt. Co.	Thompson 1	1958	810	Tnn (total depth)	do.	---
70	ARCO	Apache Unit 1	1950	10,563	Tnn (at surface), Eocene at bottom	do.	---
71	Truman S. Stansbury	Brubaker 1	1962	3290	Tnn (0-800 +)	do.	---
72	ARCO	Adams U. S. 1	1951	5938	Eocene	do.	---
73	ARCO	Dixon B-1	1952	3150	Eocene	do.	---
74	ARCO	Apache Unit 2	1950	3404	Tnn (total depth)	do.	---
75	ARCO	Round Springs Unit 1	1949	4010	Tnn (0-3200), Eocene (3200-4010)	do.	---
76	C. W. Colgrove	Reyes 64-12	1950	4145	Qs (0-50), Tnn (50-2750), weathered granite (4095)	do.	---
77	Frank Collins, Jr.	USL 14-47	1963	5098	Tpm (total depth)	do.	---
78	a) E. S. Arnn	R-S 1	1959	955	Tpm (67-954)	do.	---
	b) Fred Thompson	M-T 1	1959	653	Tpm (31-653)	do.	---
	c) Fred Thompson and Stevens Oil Co.	D + B 1	1960	1501	Tpm (total depth)	do.	---
79	C. W. Colgrove	Wright 54-18	1949	4347	Qs (0-50), Tnn (50-3050+)	do.	---
80	Oxena Oil Co.	1	1925	3562	Tnn (total depth)	do.	---
81	The Superior Oil Co.	65-20	1950	5286	Qs (0-100), Tnn (100-3950), Tpn (3950-4800), pTg (4800-4286)	do.	---
82	C. W. Colgrove	Jamieson 11-7	1953	2852	Tnn (0-2600),weathered granitic basement (2600-2852)	do.	---
83	D. K. Partnership #4	Jamieson 54-7	1952	3214	Tpm (0-2455), weathered granitic basement (2455-3214)	do.	---
84	Marjorie A. Fields et. al.	Madarp 2	1967	4265	Tnn (total depth)	do.	---
85	Marjorie A. Fields et. al.	Madarp 1	1966	2323	Tnn (total depth)	do.	---
86	a) Lockwood Valley Oil Co.	1	1929	600	Miocene (600)	do.	---
	b) Gene Reid Drilling Co.	Dutton 1	1949	2198	Volcanic rocks (2120), Miocene (to bottom)	do.	---
87	Herschel L. Copelan, M. D.	Hyatt 1	1959	3016	Tmm (total depth)	do.	---
88	a) Wilson Peterson Oil Co.	Cuyama-Piru 1	1956	5220	Eocene (5220)	do.	---
	b) Louis H. Scott	Cuyama-Piru 1	1958	2522	Eocene (2007-4740)	do.	---
89	C. G. Perry Drilling Co.	Tarver-Volk 1	1950	3012	Tpm (at surface), Eocene (2776-3012)	do.	---
90	Tesoro Pet. Co.	USL 1-35	1967	8247	Tpm (total depth)	do.	---
91	Chevron	Hattie-Russell 1	1952	9748	Tpm (total depth)	do.	---
92	a) Jupiter Oil Co. LTD and Lyle A. Garner	Rains 1	1961	1830	Tpn (0-820), Tpm (820-1830)	do.	---
	b) Jupiter Oil Co. LTD and Lyle A. Garner	Rains 2	1961	1830	Tpn (0-580), Tpm (580-1830)	do.	---
93	Marathon Oil Co.	I.M.R. Govt. 1	1955	6677	Tpm (0-5600), KJs (5600-6677)	do.	---
94	L. E. Stokes	Schaper 1	1939	84	?	do.	---
95	a) Carpenteria Oil Co.	Carpenteria 1	?	1000?	Pliocene	do.	---
	b) J. R. and M. B. Fithian	Fithian	1930	4389	Middle Miocene	do.	---
96	Tony Carnero	Fithian 1	1936	1035	Tpn (0-900), Tpm (900-1035)	do.	---
97	a) Scott Pet. Prop. Inc.	Rincon	1928	5115	Tpm (4335-5115)	do.	---
	b) Shell Oil Co.	Shell Bates 1	1958	8838	Tnm (4600-8545+), Tpn (8645+-8838)	do.	---
	c) Shell Oil Co.	Shell Bates 2	1959	10,891	Tnm (1750-10,891)	do.	---
98	a) Chanslor Western Oil and Dev. Co.	Bates 1-36	1970	7114	Tnm (total depth)	do.	---
	b) Getty Oil Co.	Honolulu-Signal-Bates 1	1947	6381	Tnm (65-6381)	do.	---
	c) The Superior Oil Co.	Delwiche 1	1955	4960	Tnm (total depth)	do.	---
99	Tesoro Pet. Corp.	Delwiche-Dabney 1	1954	2145	Tpn (838-2145)	do.	---

Table 3.--Information on wildcat wells drilled in and near the study area--Continued

Map[1] No.	Producer	Well name	Year drilled	Depth (feet)	Units drilled[2] (thickness or depth to top of unit)	Well status[3]	Cumulative production
100	a) Chevron	Shepard 1	1930	2774	Oligocene	Abd., dry hole	---
	b) Chevron	Shepard 2	1930	1492	Oligocene	do.	---
101	Montecito Oil Prod. Co.	1	1928	3685	Tpn (surface), Eocene (at bottom)	do.	---
102	Maurice T. Grubb	U. S. Snowball 1	1947	6416	Tpm (3385-6416)	do.	---
103	Arctic Oil Co.	1	1957	1669	Tpn (at surface)	do.	---
104	Arctic Oil Co.	2	1958	2000±	Eocene (at surface)	do.	---
105	The Superior Oil Co.	Chismahoo 1	1952	8606	Tpm (200-8606)	do.	---
106	J.L.M. and Assoc.	El Diablo-Laguna Ranch 1	?	?	Tpm (at surface)	drilling	---
107	a) Getty Oil Co.	Honolulu-Sunray-Dunshee 1	1954	7594	Tpm (1082-7594)	Abd., dry hole	---
	b) Getty Oil Co.	Honolulu-Sunray-Mid. Cont.-Dunshee 2	1955	3210	Tpm (1082-3210)	do.	---
108	Getty Oil Co.	USL Meyers 1	1970	4362	Tpn (at surface)	do.	---
109	Sun. Oil Co.	Dunshee One	1951	7160	Tpm (2600-7160)	do.	---
110	Fazio Dev. Co.	1	1924	2035	Miocene	do.	---
111	a) Aminoil	Wadleigh 1	1954	2235	Tnm (990), Tpn (1060)	do.	---
	b) A. D. Rushing Inc.	Wadleigh, et. al. 1	1954	3413	Tnm (1040), Tpn (1110-3413)	do.	---
	c) A. D. Rushing Inc.	Newman 1	1955	1576	Tnm?	Abd., oil	Oil:726 bbls
	d) A. D. Rushing Inc.	Newman 2	1955	4709	Tnm?	Abd., dry hole	---
	e) Peterson-Larson and Co.	Newman	?	?	Tnm?	do.	---
112	a) Gordon Oil Co.	1	1921	235	Miocene (at surface)	do.	---
	b) Gordon Oil Co.	2	1921	1175	Miocene (at surface)	do.	---
	c) Gordon Oil Co.	3	1921	?	Miocene (at surface)	do.	---
	d) Super Oil Trust	1	1921	336	?	do.	---
113	a) Beulah Oil Co.	1	1921	171	Miocene (at surface)	do.	---
	b) Beulah Oil Co.	2-A	1921	1250	Miocene (at surface)	do.	---
	c) Hess-Rue-Henderson	2	1924	2555	Miocene	do.	---
114	a) Los Angeles-Ventura Oil Co.	1	1921	477	Miocene (total depth)	do.	---
	b) Shell Oil Co.	Canet C. H. 1	1921	1103	Miocene (total depth)	do.	---
115	a) Riva Oil and Gas Co.	1	1919	1174	Miocene (total depth)	do.	---
	b) Sumpf-Williams	Ex-Mission 1	?	?	Tnm?	do.	---
116	a) Summit Oil Co.	1	1921	400	Micene (at surface)	do.	---
	b) Summit Oil Co.	2	1921	1150	Miocene (total depth)	do.	---
	c) Sumpf-Williams	ARCO 1	?	3750	Tnm?	do.	---
117	L. G. Miller	8	1931	1500	Miocene (total depth)	do.	---
118	a) National Drilling and Dev. Co.	1	1923	902	Miocene (total depth)	do.	---
	b) Holly Dev. Co.	Macrate 1	1938	4786	Tnm (1030-4756), Tnn(4756-?), Tnm (?-4786)	do.	---
	c) L. M. Lockhart	Macrate 1	1948	6710	Tnm (650-6710)	do.	---
119	a) Wm. J. Rennick	1	1921	670	Miocene (at surface)	do.	---
	b) L. M. Lockhart	Macrate 2	1948	5914	Tnm (4647-4689), Tpn (4689-5914)	do.	---
	c) ARGO	Riva 1	1934	5343	Tnm (4906-4971), Tpn (4971-5343)	Abd., oil	Oil:191 bbls
	d) Aminoil	Haise 1	1957	5896	Tpn (5610-5896)	Abd., dry hole	--- ---
120	John Baron	1	1920	900	Miocene, Tnm? (at surface)	do.	---
121	a) J. W. Hackworth	Herb. Tareyton 1	1928	2215	Tpn (total depth)	do.	---
	b) R. E. Burke, Jr.	1	1928	2950	Tpn (total depth)	do.	---
	c) E. H. A. Andrews	Carty	1952	4423	Tpn (total depth)	do.	---
	d) Philadelphia Calif. Pet. Co.	1	1964	843	Tpn (total depth)	do.	---
122	Riddle and Gottlieb	USL 6-1	1969	4510	Tpm (at surface)	do.	---
123	Spectrum Oil Co.	Spectrum 36	1967	941	Tpn (at surface)	do.	---
124	Riddle and Gottlieb	USL 25-1	1969	8488	Tnm (at surface)	do.	---
125	Frank R. Halterman	1	?	5683	Eocene (total depth)	do.	---
126	J. C. Anderson	Whitelaw 1	1916	2400	Tpn (at surface), Tpm (to bottom)	do.	---
127	Chevron	Santa Paula Unit 1	1946	11,132	Fault (4700), Qs(4907-7532), Pliocene (10,881-11,132)	do.	---
128	MacFarland Energy, Inc.	Tiger-MacFarland 10-1	?	?	?	Drilling	---

Table 3.--Information on wildcat wells drilled in and near the study area--Continued

Map[1] No.	Producer	Well name	Year drilled	Depth (feet)	Units drilled[2] (thickness or depth to top of unit)	Well status[3]	Cumulative production
129	Sweet Pet. Dev. Co.	Faught 1	1950	2020	Tnm (0-460), Tpn (460-2020)	Abd., dry hole	---
130	Border Oil Co.	1	1929	2157	Tpn (235-2157)	do.	---
131	a) Beesum Oil Co.	Beesum 1	1949	230	Tpn (total depth)	do.	---
	b) Assoc. Piping and Engr. Co.	Assoc. Pipe and Engr. Co. 1	1945	2606	Tnm (0-170), Tpn (170-2606)	do.	---
	c) John Baldwin	Baldwin-Copa 1	1959	2638	Tnm (0-459), Tpn (459-2638)	do.	---
	d) Stansbury Inc.	Lee 1	1954	4679	Tpn (200-4365), Tpm (4365-4679)	do.	---
	e) B. A. Lasette & J. L. Van Dissen	Big Chief 1	1923	2519	Tpn (total depth)	do.	---
	f) B. A. Lasette & J. L. Van Dissen	Houston & Cohn 1	1926	504	Tpn (total depth)	do.	---
132	Jack Marantz, LTD Part	Diablo 1	1966	7808	Tnm (at surface)	do.	---
133	a) Ojai Pacific Corp.	Griffin 1	?	?	?	Drilling	---
	b) Clifford I. Miller	Reichenbach 1	1954	3699	Tnm (total depth)	Abd., dry hole	---
	c) Piru Creek Venture	Reichenbach 2	1956	1700	Tnm (640-1700)	do.	---
	d) E. B. Hall & Co.	No. 1	1958	2011	Tnm (total depth)	do.	---
	e) Mobil Oil Corp.	Reichenbach 34A-21	1958	1120	Miocene (0-1120)	do.	---
134	a) U. S. Natural Resources	Bolsa Chica 76-32	1947	4659	Tnm (total depth)	do.	---
	b) Jacob F. Kaar	V-27	?	?	Tnm (total depth)	do.	---
135	Henry R. Dabney	KARR 1	1925	1276	Miocene	do.	---
136	a) Delroy Pet. Corp.	Lisk 3	1942	3149	Miocene	Abd., oil	Oil: 8 bbls
	b) Continental Oil Co.	Burnham 1	1926	3721	Miocene	Abd., dry hole	---
	c) Shell	Rogers A	1944	895	Tnm (total depth)	do.	---
	d) Shell	Rogers B	?	?	Tnm?	do.	---
137	a) Bob Ferguson, Independent	Hathaway 5	1966	7391	?	do.	---
	b) Petroleum Securities Co.	Diablo 1	1926	6504	Tnm (1260-6504)	do.	---
138	Continental Oil Co.	McBurney USL 1	1952	6145	Tnm (total depth)	do.	---
139	a) Harold C. Morton and H. S. Kohlbush	Engman 2	1958	3134	Tnm (at surface)	do.	---
	b) Int. Oil and Mining Co.	14-1	1961	2775	Tnm (at surface)	Oil, idle	
	c) Int. Oil and Mining Co.	14-2	1961	2775	Tnm (at surface)	do.	Oil: 19,000 bbls - total field prod.
	d) Int. Oil and Mining Co.	14-3	1961	2775	Tnm (at surface)	Drilling, idle	
	e) L. H. Glaser	Govt. 1	1961	1149	Tnm (at surface)	Abd., oil	
140	a) Glen Ogles Oil Co.	Janes 1	1941	2863	Tnm (total depth)	Abd., dry hole	---
	b) Glen Ogles Oil Co.	Lisk 1	1941	1791	Tnm (total depth)	do.	---
141	Havenstrite Oil Co.	Lisk 1	1946	3478	Tnm (1417-3478)	do.	---
142	Continental Oil Co.	Cont. Herley USL 1	1951	3882	Tnm (478-3882)	do.	---
143	The Sun Drilling Co.	Schmidt 1	1961	9618	Qs (0-335), Tnn (335-9618)	do.	---
144	a) Von Glahn Oil Co. Inc.	Ralphs 1	1959	1127	Tnn (total depth)	do.	---
	b) Von Glahn Oil Co. Inc.	Ralphs 2	1959	1047	Tnn (total depth)	do.	---
145	Barney Cornett and Assoc.	Little Siberia	1956	2000	Pliocene (total depth)	do.	---
146	Leslie D. Vaughn and Assoc.	Bullock 1	1956	2000	Tnn (total depth)	do.	---

1 Map number refers to location on map.

2 Qs, Quaternary surficial deposits; Tnn, Neogene nonmarine sedimentary rocks; Tnm, Neogene marine sedimentary rocks; Tpn, Paleogene nonmarine sedimentary rocks; Tpm, Paleogene marine sedimentary rocks; Tks, undifferentiated sedimentary rocks (Upper Cretaceous, Paleocene, or Eocene); KJs, marine sedimentary rocks (Lower Cretaceous or Upper Jurassic); KJf, Cretaceous and Jurassic Franciscan assemblage, Jo, Jurrassic ophiolitic rocks; sp, serpentinite (Jurassic?); pTg, pre-Tertiary granitic rocks.

3 Abd., abandoned.

Table 4.--Rock-Eval I analyses for sampled rock in study area

[Study area is divided into six subareas for purposes of discussion and location on map]

Unit symbol[1]	Map No.	Sample No.	Org. C[2] (%)	S_1[3] (mg/g)	S_2[4] (mg/g)	S_3[5] (mg/g)	Total HC yield[6] (mg/g)	H Index[7] (mg HC/gC)	O Index[8] (mg CO_2/gC)	T_{S_2}[9] (°C)	$S_1/(S_1+S_2)$[10]
					Area I, South of Santa Ynez fault						
Tm	1	VF-81C-281	4.68	L.003[11]	28.92	1.14	28.92	618	24	416	0
Tr	2	-287	.16	.016	.08	.46	.09	50	288	434	.17
Do.	3	-288	.75	.198	2.65	.22	2.85	353	29	428	.07
Do.	4	-310	.13	.016	.39	.26	.40	300	200	428	.04
Do.	5	-313	.75	.062	1.44	.55	1.50	192	73	434	.04
Do.	6	-966	2.40	.280	13.12	.57	13.40	547	24	409	.02
Do.	7	-970	1.32	.492	14.55	.48	15.04	1102	37	411	.03
Do.	8	-973	2.52	.313	14.57	.58	14.89	578	23	413	.02
Tcw	9	VF-80C-629(s)[12]	.18	.017	.018	.19	.035	10	106	482	.48
Do.	10	-630(s)	.31	.033	.031	.13	.064	10	42	472	.52
Do.	11	-632(s)	.25	.014	.024	.08	.038	10	36	475	.38
Do.	12	NF-80C-17	.025	.021	L.004	.14	.021	L16	560	-	1
Do.	13	-19	.02	.004	L.004	.10	.004	L20	500	-	1
Do.	14	-21	.05	.009	L.004	.16	.009	L8	320	-	1
Do.	15	VF-81-227	.05	.018	L.003	.26	.02	6	520	-	1
Do.	16	SESPE A	.37	.070	.193	.15	.262	52	41	444	.264
Do.	17	CON 5	.12	.011	L.011	.19	.011	L9	158	-	1
Tcd	18	NF-80C-24	.53	.057	.361	.24	.417	68	45	447	.14
Do.	19	-25	.32	.046	.111	.23	.157	35	72	458	.29
Do.	20	-26	.79	.081	.125	.41	.206	16	52	468	.39
Do.	21	VF-81C-278	.13	.008	L.003	.40	.008	2	308	-	1
Tj	22	-299	.96	.024	.123	.62	.147	13	65	493	.16
Do.	23	VF-80C-598	.60	.011	.133	.56	.144	22	93	448	.08
Do.	24	NF-80C-33	.49	.161	.112	.56	.273	23	114	460	.59
Do.	25	-38	.91	.119	.069	.35	.189	8	38	482	.63
Do.	26	-41	.90	.129	.203	.28	.332	23	31	475	.39
Do.	27	-42	.53	.037	.048	.47	.085	9	89	496?	.44
Do.	28	-43	1.02	.016	L.009	.34	.016	L1	33	-	1
Ks	29	-45	.17	.013	L.009	.10	.013	5	59	-	1
Do.	30	-51	.32	.046	L.009	.14	.046	L3	44	-	1
Do.	31	-55	.59	.061	L.009	.19	.061	L2	32	-	1
Do.	32	-57	.12	.043	L.009	.18	.053	L8	150	-	.82
Do.	33	-58	.18	.019	L.009	.18	.019	L5	100	-	1
					Area II, between Santa Ynez and Pine Mountain faults						
Tm	34	VF-80C-605	0.16	0.013	L.005	0.60	0.013	L3	375	-	1
Tr	35	-603	1.60	.030	L.005	1.42	.030	L1	89	-	1
Tcw	36	-474	.47	.019	.151	.50	.169	32	106	452	.11
Do.	37	TS-80C-201	.40	.011	.066	.44	.077	17	110	456	.15
Tcd	38	VF-80C-463	.27	.032	.039	.42	.071	14	156	459	.45
Do.	39	-468	1.17	.044	.245	.70	.290	21	60	456	.15
Do.	40	-469	.56	.131	.231	.66	.362	41	118	459	.36
Do.	41	-470	.21	.012	.034	.57	.046	16	271	459	.26
Do.	42	TS-80C-203	.51	.025	.171	.43	.196	34	82	447	.13
Do.	43	-204	.38	.023	.118	.67	.141	31	176	443	.16
Do.	44	-206	.29	.057	.099	.39	.156	34	134	454	.37
Do.	45	-207	.35	.120	.079	.78	.197	23	223	446	.60
Do.	46	-209	.48	.049	.188	.70	.237	39	146	446	.21
Do.	47	-229	.41	.045	.116	.17	.161	28	41	451	.28
Do.	48	-230	.50	.028	.152	.33	.180	30	66	460	.16
Do.	49	-231	1.38	.073	1.564	.76	1.637	113	55	449	.04
Do.	50	-250	.29	.050	.032	.53	.083	11	183	446	.61

Table 4.--Rock-Eval I analyses for sampled rock in study area--Continued

Unit symbol[1]	Map No.	Sample No.	Org. C[2] (%)	S_1[3] (mg/g)	S_2[4] (mg/g)	S_3[5] (mg/g)	Total HC yield[6] (mg/g)	H Index[7] (mg HC/gC)	O Index[8] (mg CO_2/gC)	T_{S_2}[9] (oC)	$S_1/(S_1+S_2)$[10]
Tma	51	TS-80C-225	0.42	0.010	0.061	0.39	0.071	15	93	461	0.14
Do.	52	-226	.24	.044	.027	.36	.071	11	150	453	.61
Do.	53	-228	.32	.096	.070	.47	.166	22	147	457	.58
Do.	54	-239	.82	.047	.183	.79	.231	22	96	464	.21
Tj	55	VF-80C-475	.42	.016	.089	.68	.105	19	145	450	.15
Do.	56	-483	.48	.025	.322	.38	.348	69	81	446	.07
Do.	57	-484	.26	.014	.022	.47	.036	5	100	448	.38
Do.	58	TS-80C-211	.29	.016	.051	.45	.067	18	155	451	.24
Do.	59	-212	.46	.031	.095	.66	.125	21	143	452	.24
Do.	60	-215	.65	.020	.177	.70	.197	27	108	445	.10
Do.	61	-217	.69	.014	.146	1.21	.160	21	175	450	.09
Do.	62	-218	.78	.008	.143	.83	.151	18	106	452	.05
Do.	63	-221	.60	.032	.185	1.04	.217	31	173	454	.15
Do.	64	-222	.87	.017	.132	1.31	.149	15	151	459	.11
Do.	65	-223	.90	.062	.287	1.02	.349	32	113	451	.18
Do.	66	-234	.77	.085	.443	.59	.527	58	77	450	.16
Do.	67	-237	.39	.037	.037	.35	.075	9	90	453	.51
Do.	68	-238	1.04	.058	.030	.52	.356	3	50	459	.16
Do.	69	MAT B1	.77	.044	.038	.69	.082	5	90	487	.542
Do.	70	MAT B2	.74	.088	.109	.47	.197	15	64	472	.446
Do.	71	WS 04+50(s)[12]	.60	.071	.200	.84	.271	33	140	452	.262
Do.	72	WS 13+50(s)	.39	.050	.029	.62	.078	7	159	435	.634
Do.	73	THM M9	.95	.015	.19	.74	.21	20	78	438	.07
Do.	74	FM-81C-141	.42	.007	.008	.60	.02	2	143	449	.47
Ks	75	IMR Govt#1 -6001'(s)	1.45	.720	.245	.27	.964	17	19	462	.746
Do.	76	IMR Govt#1 -6500'(s)	1.30	.570	.216	.26	.786	17	20	466	.725

Area III, between Pine Mountain and Big Pine faults

Unit symbol[1]	Map No.	Sample No.	Org. C[2] (%)	S_1[3] (mg/g)	S_2[4] (mg/g)	S_3[5] (mg/g)	Total HC yield[6] (mg/g)	H Index[7] (mg HC/gC)	O Index[8] (mg CO_2/gC)	T_{S_2}[9] (oC)	$S_1/(S_1+S_2)$[10]
Tcw	77	VF-80C-592	0.29	0.010	0.005	0.64	0.015	L2	221	469	0.64
Tcd	78	-581	.25	.011	.019	.44	.030	8	176	452	.36
Do.	79	-578	.12	.031	L.009[11]	.62	.031	L8	517	-	1
Do.	80	-579	.27	.084	.057	.12	.142	21	44	449	.59
Tj	81	-494	.18	.012	L.007	.52	.012	L4	289	-	1
Do.	82	-539	.26	.033	L.007	1.00	.033	L3	385	-	1
Do.	83	-540	.98	.062	.271	.56	.334	28	57	428	.19
Do.	84	-541	.68	.017	.174	.30	.191	26	44	419	.09
Do.	85	-542	1.54	.013	.392	.61	.406	25	59	410	.03
Do.	86	-543	1.00	.022	.442	.91	.464	44	91	437	.05
Do.	87	-544	.97	.018	.191	.82	.209	20	85	446	.09
Do.	88	-552	.33	.013	L.007	1.06	.013	L3	2	-	1
Do.	89	-553	.30	.013	L.007	1.16	.013	L3	321	-	1
Do.	90	-554	.40	.009	.046	.57	.055	12	142	450	.16
Do.	91	-555	.36	.012	.042	.44	.055	12	122	454	.22
Do.	92	-556	.15	.007	L.007	1.40	.007	L5	933	-	1
Do.	93	-557	.16	.048	L.007	.58	.048	L5	363	-	1
Do.	94	-558	.08	.049	.288	.72	.336	360	900	438	.14
Do.	95	-559	.10	.048	L.007	.48	.048	L7	480	-	1
Do.	96	-560	.22	.013	.035	.63	.048	16	286	454	.27
Do.	97	-561	.69	.043	.177	.42	.219	26	61	451	.20
Do.	98	-563	.27	.057	L.007	1.44	.057	L3	533	-	1
Do.	99	-564	.36	.043	L.007	1.58	.043	L2	439	-	1
Do.	100	-565	.39	.030	L.007	1.34	.030	L2	344	-	1
Do.	101	-566	.94	.009	.211	.51	.220	22	54	432	.04
Do.	102	-569	.68	.017	.029	1.17	.046	4	172	472	.37
Do.	103	-570	1.89	.011	.173	3.15	.183	9	167	436	.06
Do.	104	-573	.95	.018	.087	.74	.104	9	78	421	.17
Do.	105	-574	1.18	.041	.124	1.27	.165	11	108	437	.25
Do.	106	-575	1.64	.018	.487	.46	.505	30	28	424	.04
Do.	107	-577	.34	.017	.010	1.36	.027	3	400	434	.64

Table 4.--Rock-Eval I analyses for sampled rock in study area--Continued

Unit symbol[1]	Map No.	Sample No.	Org. C[2] (%)	S_1[3] (mg/g)	S_2[4] (mg/g)	S_3[5] (mg/g)	Total HC yield[6] (mg/g)	H Index[7] (mg HC/gC)	O Index[8] (mg CO_2/gC)	T_{S_2}[9] (^oC)	$S_1/(S_1+S_2)$[10]
Tj	108	VF-80C-586	0.27	0.008	0.033	0.60	0.041	12	222	455	0.20
Do.	109	-587	.32	.030	.012	.96	.042	4	300	445	.71
Do.	110	-588	.70	.044	.251	.68	.295	36	97	441	.15
Do.	111	-590	.44	.017	L.005[11]	.93	.017	L1	211	-	1
Do.	112	-595	.74	.089	.110	.21	.199	15	28	466?	.45
Do.	113	-596	.47	.057	L.005	.33	.057	L2	70	-	1
Do.	114	VF-81C-101(s)[12]	.73	6.375	.39	.02	.449	53	3	453	.142
Do.	115	-102(s)	4.03	1.085	2.918	.18	4.002	72	4	449	.271
Do.	116	-112(s)	.71	.053	.026	.15	.079	4	21	477	.670
Do.	117	-115(s)	1.36	.200	.066	.30	.266	5	22	457	.752
Do.	118	-333(s)	1.21	.244	1.97	.53	2.21	163	44	423	.11
Do.	119	-334(s)	1.46	.094	.83	.82	.93	56	56	428	.10
Do.	120	-335(s)	1.14	.073	.65	.55	.72	57	48	422	.10
Do.	121	-336(s)	1.36	.045	1.51	1.15	1.56	111	85	424	.03
Do.	122	-337(s)	1.65	.395	3.31	.53	3.70	201	32	427	.11
Do.	123	-338(s)	1.00	.244	1.62	.32	1.86	162	32	425	.13
Do.	124	-339(s)	0.96	1.172	2.110	.811	3.282	220	84	425	.36
Do.	125	-340(s)	0.93	.509	1.35	.61	1.85	145	66	429	.27
Area IV, vicinity of Madulce and Cuyama Peaks											
Tm	126	VF-81C-266	0.25	0.042	0.14	0.49	0.18	56	196	430	0.24
Tj*	127	-261	.81	.025	.12	.59	.15	15	73	453	.17
Do.	128	-262	5.57	.017	.14	5.30	.17	3	95	418	.10
Do.	129	-265	.84	.027	.05	1.41	.08	6	168	454	.33
Do.	130	-268	.57	.011	L.003	1.39	.01	53	244	-	1
Do.	131	-269	.35	.005	.05	.91	.05	14	260	439	.10
Do.	132	-270	.57	.014	.05	1.22	.06	8	214	455	.24
Do.	133	-274	4.91	.006	.028	2.96	.035	57	60	433	.18
Do.	134	-276	.86	.014	.32	.18	.34	37	21	444	.04
Area V, vicinity Cuyama Gorge											
Tj*	135	VF-81C-354	0.38	0.011	0.07	0.17	0.08	18	45	432	0.14
Do.	136	-356	6.77	.006	L.003	6.09	.006	4	90	-	1
Do.	137	-358	.51	.011	L.003	.89	.011	6	175	-	1
Do.	138	-360	.70	.017	.024	.73	.040	3	104	524	.41
Ks	139	-349	.81	.012	.121	.38	.133	15	47	468	.09
Do.	140	-353	.70	.012	.18	.07	.19	26	10	450	.06
Do.	141	-359	.54	.010	.013	.63	.023	2	117	519	.45
Do.	142	-361	.58	.009	.068	.53	.077	12	26	499	.12
Do.	143	-362	.84	.009	.41	.22	.42	49	26	430	.02
Do.	144	-364	.41	.003	.97	.45	.10	237	110	444	.03
Do.	145	-370	.09	.005	L.003	.30	.005	3	333	-	1
Do.	146	-372	.70	.016	.09	.35	.11	13	50	455	.15
Do.	147	-378	.56	.006	.001	.55	.007	18	98	447	.85
KJf	148	-351	1.21	.012	.132	.11	.144	11	9	490	.08
Do.	149	NF-81C-57	1.08	.005	.094	.47	.099	9	44	482	.05
Area VI, vicinity of San Luis Obispo											
Tm	150	VF-81C-1021	0.55	0.069	1.60	0.69	1.67	291	125	420	0.04
Do.	151	-1043	3.24	.754	30.84	.87	31.60	952	27	411	.02
Do.	152	-1048	3.64	.694	14.63	2.05	15.32	410	56	429	.05
Do.	153	-1060	6.42	2.103	37.18	1.47	39.29	579	23	421	.05

Table 4.--Rock-Eval I analyses for sampled rock in study area--Continued

Unit symbol[1]	Map No.	Sample No.	Org. C[2] (%)	S_1[3] (mg/g)	S_2[4] (mg/g)	S_3[5] (mg/g)	Total HC yield[6] (mg/g)	H Index[7] (mg HC/gC)	O Index[8] (mg CO_2/gC)	T_{S_2}[9] (^oC)	$S_1/(S_1+S_2)$[10]
Tm	154	FM-81C-221	1.76	.431	10.36	.86	10.79	589	49	414	.04
Do.	155	-222	3.65	.878	17.48	.97	18.35	479	27	417	.05
Do.	156	-224	.37	.195	5.25	.61	5.45	1419	164	410	.04
Do.	157	-225	.49	.036	.48	.79	.52	98	160	414	.07
Do.	158	-235	1.02	.219	4.72	.82	4.94	462	80	415	.04
Do.	159	-237	1.32	.815	12.69	.28	13.50	961	21	413	.06
Ks	160	VF-81C-1052	.32	.010	.09	.70	.98	27	219	442	.11
Do.	161	FM-81C-260	.09	.013	.013	.48	.026	1	53	505	.50

1 Tm, Monterey Formation; Tr, Rincon Shale; Tsp, Sespe Formatin; Tcw, Coldwater Sandstone; Tcd, Cozy Dell Shale; Tma, Matilija Sandstone; Tj, Juncal Formation; Ks, Cretaceous sedimentary rocks; KJf, Franciscan assemblage; *, gross correlation.

2 Organic carbon, in weight percent, a measure of total organic matter in the rocks.

3 Thermally extracted bitumen (including free or absorbed hydrocarbons), that is, diagenetic or catagenetic bitumen.

4 The mobile products released by pyrolysis of the solid organic matter, that is, the remaining oil-generating capacity.

5 CO_2 produced by pyrolysis of organic matter.

6 Total hydrocarbon yield, $S_1 + S_2$, or genetic potential in mg/g.

7 Hydrogen index, pyrolytic hydrocarbon yield (S_2) normalized by organic carbon content.

8 Oxygen index, pyrolytic organic CO_2 yield (S_3) normalized by organic carbon content.

9 Temperature of maximum pyrolysis yield of S_2, an indicator of the maximum temperature experienced by the organic matter.

10 Transformation ratio or production index, $S_1/(S_1 + S_2)$, a measure of the degree of conversion of organic matter to bitumen which has occurred.

11 L, values less than indicated value.

12 Subsurface sample.

Table 5.--Average total organic carbon (weight percent) by sample unit, subarea, and age

[No., number of samples used to determine average. Averages derived from data in table 4. Subareas and sample units described in table 4; subareas located on map]

Unit symbol	Subarea sample type[1]	Subarea I %	I No.	II %	II No.	III %	III No.	IV %	IV No.	V %	V No.	VI %	VI No.	Combined %	Combined No.	Ratio subsurface/ surface	$2x^2$
Tm	Surface	4.7	1	0.2	1	-	-	0.3	1	-	-	2.3	10	2.2	13	- -	4.2
Tr	Surface	1.2	7	1.6	1	-	-	-	-	-	-	-	-	1.4	8	- -	2.8
Tcw	Surface	.1	6	.4	2	0.3	1	-	-	-	-	-	-	.2	9	- -	.4
	Subsurface	.3	3	-	-	-	-	-	-	-	-	-	-	.3	3	.3/.2 = 1.5	-
	Combined	.2	9	.4	2	.3	1	-	-	-	-	-	-	.2	12	- -	-
Tcd	Surface	.4	4	.5	13	.2	3	-	-	-	-	-	-	.4	20	- -	.8
Tma	Surface	-	-	.5	4	-	-	-	-	-	-	-	-	.5	4	- -	1.0
Tj	Surface	.8	7	.6	18	.6	33	1.8	8	2.1	4	-	-	.8	70	- -	1.6
	Subsurface	-	-	.5	2	1.4	12	-	-	-	-	-	-	1.3	14	1.3/0.8 = 1.6	-
	Combined	.8	7	.6	20	.8	45	1.8	8	2.1	4	-	-	.9	84	- -	-
Ks	Surface	.3	5	-	-	-	-	-	-	.6	9	.2	2	.5	16	- -	1.0
	Subsurface	-	-	1.4	2	-	-	-	-	-	-	-	-	1.4	2	1.4/0.5 = 2.8	-
		.3	5	1.4	2	-	-	-	-	.6	9	-	-	.6	18	- -	-
KJf	Surface	.3	5	1.4	2	-	-	-	-	1.2	2	-	-	1.2	2	- -	2.4
								COMBINED TOTAL BY AGE OF SAMPLE UNIT									
Neogene	Surface	-	-	-	-	-	-	-	-	-	-	-	-	1.9	21	- -	3.8
Paleogene	Surface	-	-	-	-	-	-	-	-	-	-	-	-	.7	103	- -	1.4
	Subsurface	-	-	-	-	-	-	-	-	-	-	-	-	1.1	17	- -	-
	Combined	-	-	-	-	-	-	-	-	-	-	-	-	.8	120	- -	-
Mesozoic	Surface	-	-	-	-	-	-	-	-	-	-	-	-	.6	18	- -	1.2
	Subsurface	-	-	-	-	-	-	-	-	-	-	-	-	1.4	2	- -	-
	Combined	-	-	-	-	-	-	-	-	-	-	-	-	.7	20	- -	-

[1] Surface and subsurface samples from a given sample unit are averaged separately and then together.

[2] Assumes surface samples degraded to half original content and represents possible preweathering average total organic carbon.

Table 6.--Porosity and permeability data from sampled rocks in study area.

Unit[1] symbol	Map No.	Sample No.[2]	Horizontal permeabilty to air (md)	Helium porosity (%)	Unit symbol[1]	Map No.	Sample No.[2]	Horizontal permeabilty to air (md)	Helium porosity (%)
Tm	P1	VF-81C-366	0.46	15.4	Tj	P18	VF-81C-357	0.63	10.7
Tr	P2	-311	27	18.2	Do.	-	HWS-6(nl)	.003	1.7
Tsp	P3	-280	.34	4.0	Do.	-	-9(nl)	.002	1.3
Tcw	P4	VF-80C-465	L.01[3]	8.6	Do.	P19	VF-80C-548	6.56	13.1
Do.	P5	-628(s)	L.01	1.8	Do.	P20	-567	38	16.6
Do.	-	HWS-22(nl)	.27	9.6	Do.	P21	-572	.09	6.5
Do.	-	-23(nl)	.17	12.3	Do.	P22	THM 1	-	3.4(bd)[4]
Tcd	P6	VF-80C-464	L.01	7.2	Do.	P23	2	-	6.5(bd)
Do.	-	HWS-21(nl)	.039	5.5	Do.	P24	3(slts)	-	7.0(bd)
Tma	P7	VF-80C-471	L.01	7.0	Do.	P25	4	-	6.0(bd)
Do.	P8	-477	1.32	9.9	Do.	P26	5	-	6.4(bd)
Do.	P9	-479	.11	12.0	Do.	-	HTTS-167+04(s, nl)	0	2.1
Do.	P10	-482	.02	10.2	Do.	-	-167+37(s, nl)	0	3.5
Do.	P11	-486	1.17	9.5	Do.	-	-176+ 9(s, nl)	0	3.5
Do.	P12	-488	.03	10.4	Do.	-	-185+69(s, nl)	0	3.2
Do.	P13	-583	4.72	6.8	Do.	-	-194+93(s, nl)	0	3.0
Do.	P14	VF-81C-304	L.01	8.1	Do.	-	-221+00(s, nl)	0	7.2
Do.	-	HWS-11(nl)	.002	2.6	Do.	-	-231+12(s, nl)	0	8.0
Do.	-	-14(nl)	.002	3.6	Do.	P27	HR-3000(s)	.02	8.5
Do.	-	-16(nl)	.002	5.5	Do.	Do.	-3500(s)	.03	8.7
Do.	-	-19(nl)	.002	3.9	Do.	Do.	-4100(s)	.01	4.4
Do.	-	HG-1(nl)	2.19	9.3	Do.	Do.	-5914(s, slts)	.04	2.6(Ave 3)
Do.	-	-2(nl)	.41	9.6	Do.	Do.	-7987(s)	.04	2.8
Do.	-	-5(nl)	1.02	10.7	Do.	Do.	-9203(s)	.00	1.1
Do.	-	-8(nl)	2.32	8.0	Do.	Do.	-9698(s)	.02	1.5
Do.	-	Tma-1(nl)	L.05	4.1	Ku	-	HWS-2(nl)	.165	3.1
Do.	-	-3(nl)	L.05	5.5	Do.	-	-4(nl)	.005	1.9
Do.	-	-7A(nl)	L.05	1.7	Do.	P28	IMRGov1-6001(s,slts)	-	1.3(bd)
Do.	-	-7(nl)	L.05	7.1	Do.	Do.	-6500(s,slts)	-	1.1(bd)
Do.	-	-15(nl)	L.05	6.6	Do.	P29	VF-81C-350	L.01	2.1
Do.	-	HTTS-261+80(s, nl)	0	3.2	Do.	P30	-363	.04	4.7
Tj	P15	VF-81C-264	.01	7.4	Do.	P31	-365	.02	6.0
Do.	P16	-267	.41	12.2	Do.		HTTS-159+33(s),(nl)	0	2.4
Do.	P17	-355	.03	9.3					

[1] See table 4 for unit symbol abbreviations.

[2] s, subsurface sample; slts, siltstone; nl, not located on map. VF samples analyzed by Core Laboratories, Inc. HR (Hattie Russell) samples courtesy of Chevron Oil Co. All other samples with H as first letter from Helmold and Van de Kamp (written commun., 1982): HWS samples from Wheeler Springs section; HTTS from Tecolote Tunnel (west of map area); and HG smaples from Gibraltar Road section. Tma samples from Matilija Springs area (Link and Welton, 1982, table 1).

[3] L, less than

[4] Porosity determined from bulk density and assumed grain density (T. H. McCulloh, written commun., 1982).

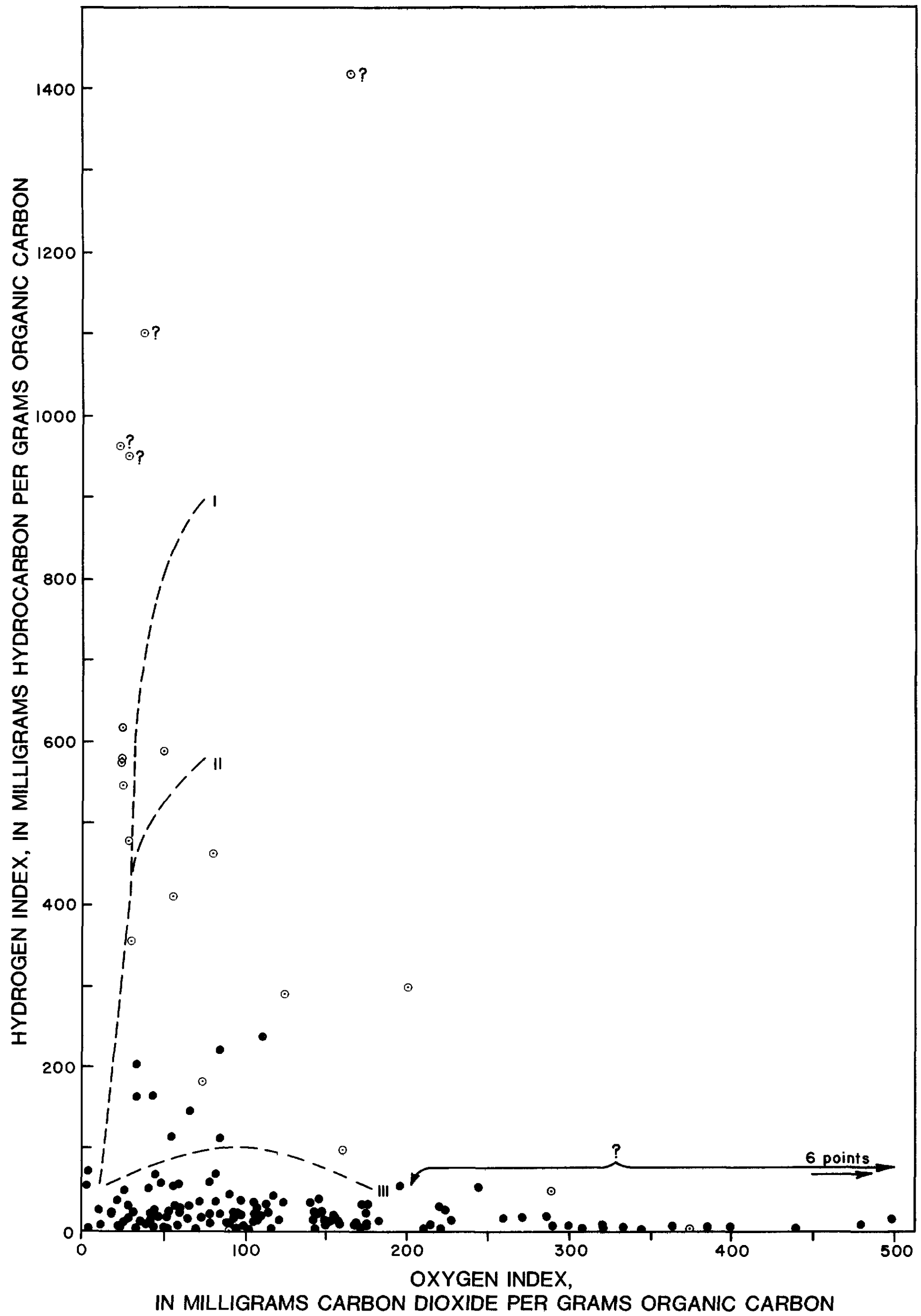

Figure 2.—Synthetic van Krevelen diagram showing oxygen index (pyrolytic hydrocarbon yeild, S_2, normalized to organic carbon index). Data is from table 4. Closed circles represent individual pre-Neogene samples; open circles, Neogene samples. Type I kerogens are extremely lipid-rich algal kerogens. Type II kerogens are lipid rich from typical marine sources. Type III are lipid poor from terrestrial types. The cluster of data points from pre-Neogene samples in the vicinity of the abscissa (less than 100 mg HC/gC) indicate the organic matter has little capacity to generate hydrocarbons. Suspect analyses, shown with queries, have unrealistically high hydrogen or oxygen indices, which are probably due to nonlinearities in the instrument response calibration.

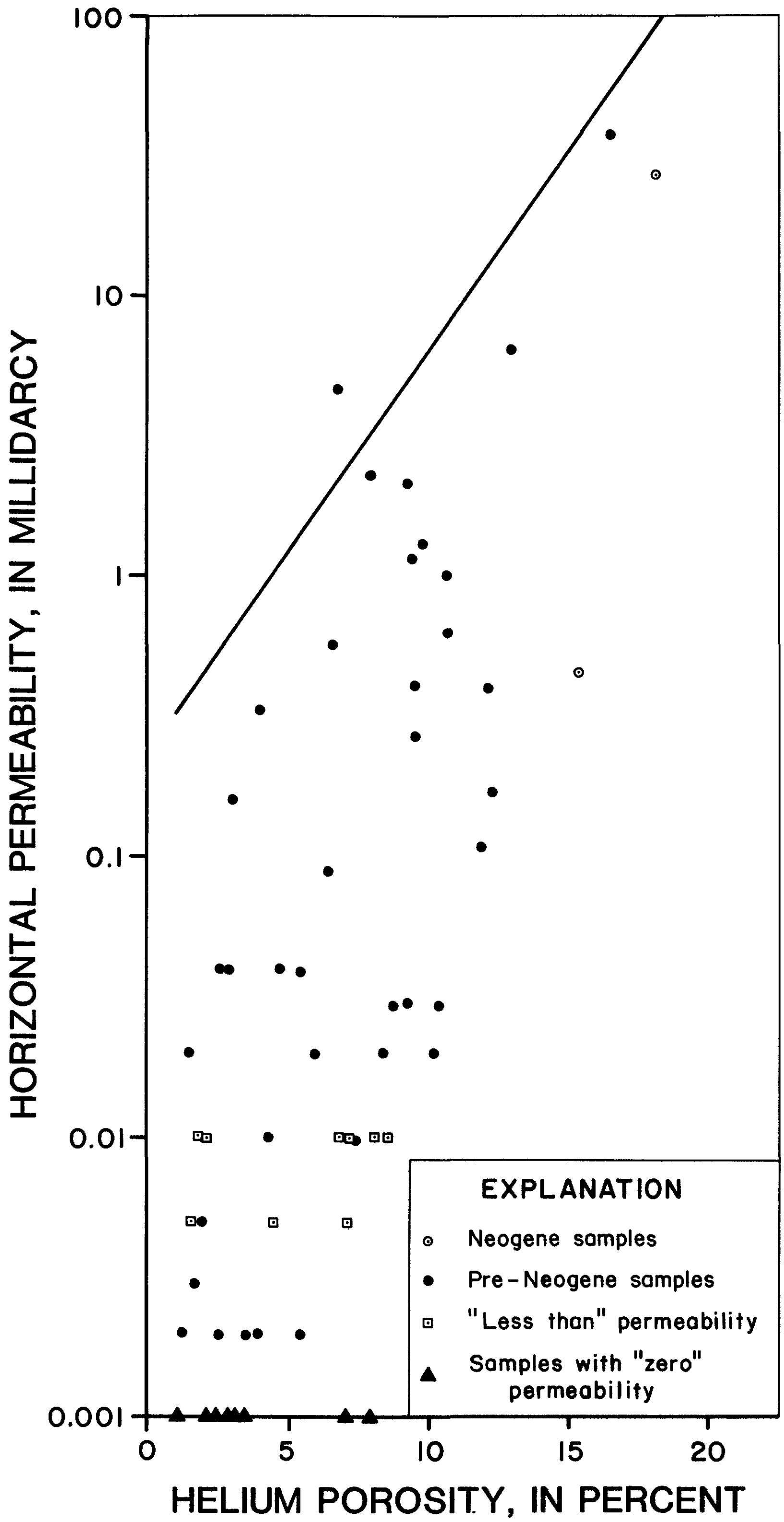

Figure 3.—Porosity-permeability cross plot for data from sandstones and siltstones in the southern Coast and western Transverse Ranges. Data from table 6. Line is "best reservoir limit" from Ziegler and Spotts (1978). Samples from units with good reservoir potential would lie above this line.