OCS Study
MMS 2002-049

Industrial Activity and Its Socioeconomic Impacts: Oil and Three Coastal California Counties

Final Technical Summary

Final Study Report

U.S. Department of the Interior
Minerals Management Service
Pacific OCS Region

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Prepared under MMS Cooperative
Agreement No. 14-35-01-00-CA-31063 (Task Order #17610)
by
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U.S. Department of the Interior
Minerals Management Service
Pacific OCS Region

Camarillo
May 2003

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Suggested Citation

The suggested citation for this report is:

Schmitt, R. J., Dugan, J. E., and M. R. Adamson. *Industrial Activity and Its Socioeconomic Impacts: Oil and Three Coastal California Counties*. MMS OCS Study 2002-049. Coastal Research Center, Marine Science Institute, University of California, Santa Barbara, California. MMS Cooperative Agreement Number 14-35-01-00-CA-31603. 244 pages.

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FINAL TECHNICAL SUMMARY

STUDY TITLE: "Industrial Activity and Its Socioeconomic Impacts: Oil and Three Coastal California Counties"

REPORT TITLE: "Industrial Activity and Its Socioeconomic Impacts: Oil and Three Coastal California Counties"

CONTRACT NUMBER: 14-35-01-00-CA-31063 (Task Order #17610)

SPONSORING REGION: Pacific

APPLICABLE PLANNING AREAS: Southern California

FISCAL YEAR(S) OF PROJECT FUNDING: FY 01

COMPLETION DATE OF REPORT: January 2002

COST(S): FY 01 - $20,558

CUMULATIVE PROJECT COST: $20,558

PROJECT MANAGER: Russell J. Schmitt

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KEY WORDS: Ventura; Santa Barbara; San Luis Obispo; Southern California; Petroleum Extraction; Petroleum Industry—Oil and Gas Firms; Petroleum Industry—Oil Service Firms; Petroleum Industry—Technology; Oil and Gas Pipelines; Oil and Gas Refineries; Urbanization; Tourism; Environmental Regulation; Environmental Consulting; Environmentalism; Remediation; U.S. Department of the Interior; Minerals Management Service; Bureau of Land Management; Media; Non-governmental Organizations

BACKGROUND: MMS requested a review, evaluation, and synthesis of prior research on the coastal California oil industry, including its onshore and offshore components. A single report reviewed, extended, and updated prior research on the politics of the offshore oil industry, the evolution of the character of communities in relation to the oil industry, and the oil industry's operations in the region, its role in a developing and diversifying economy, and its projected future. Prior research also addressed the regulatory context in which oil firms conducted business. The report also summarizes and extended this discussion. In addition, the project updated through 2000 the inventory of all firms that operated oil wells from 1950, and the fields in which they operated (MMS 98-0061).

OBJECTIVES: This study reviews and extends through additional research the findings of two previous projects sponsored by MMS: "Social, Economic, and Historic Characterization of San Luis Obispo, Santa Barbara, and Ventura Counties," and "The Petroleum Extraction Industry in Ventura, Santa Barbara, and San Luis Obispo Counties: Economic, Fiscal, Institutional, Social, and Historic Considerations." Reports relating to these studies were published in July 1996 and December 1998, respectively. The project teams produced a number of other study products, including several papers that subsequently appeared in peer-reviewed journals. In addition, the study considers the findings of James Lima's 1994 Ph.D. dissertation, "The Politics of Offshore Energy Development." (See the bibliography to this study for full references to these studies.) The goal is to provide a one-volume study that reviews and analyzes at the regional level earlier research findings that concentrated on counties and communities. This effort aims to make the findings of prior research more accessible to both the public and policymakers.

In particular the study reviews and evaluates findings regarding the social and economic environmental impacts of the offshore and onshore oil industry and, conversely, the shaping of the industry by the region's environment and communities. It updates previous projections about the future of local oil activity, in light of recent technological, business, and regulatory developments. It discusses the policy implications of this research and identifies opportunities for additional research.

DESCRIPTION: The investigation used the published reports of the prior studies and related study products as points of departure. It reviewed and evaluated the results of these studies. It then used primary sources, including trade publications, company information provided by Moody's Investor Service and the research divisions of investment banking firms, government publications, oil company publications, including annual reports and in-house magazines, and manuscript collections, as well as secondary sources, to extend the historical analysis of the oil industry across the entire lifecycle of the extractive region. (Prior research on the oil industry itself focused on the post–World War II period.) It used trade and company publications, and secondary sources, to extend the analysis of socioeconomic impacts on major communities of the coastal region, and to provide additional material on the regulatory context of oil operations.

The study provides analysis and discussion for three periods: an exuberant era, 1865–1965, an environmental era, 1966–1985, and an era of decline, 1986 to the present. Since much of the material provided in the section is new, the first part on the exuberant era is easily the largest one. It provides information on oil field development, a number of industrial activities, including the buying and leasing of land, exploration and production, and storage, transportation, and refining, urban development, and conservation and regulation. For the environmental era, the study discusses offshore leasing and development, local support and opposition to offshore activity, onshore activity, urban development, and economic diversification. For the era of decline, the study discusses the decline in production and the changes in industrial activity related to it. It assesses the place of the contemporary industry within a diversifying economy. It projects the future of the coastal California oil industry. For all periods, the study discusses technological advances and their impact on industrial activity. Cultural enthusiasm, or the lack thereof, for technological solutions to economic and social problems frame the discussion in all three sections.

The location of oil, rather than political boundaries, provides the organizing theme around which the discussion in the section on the exuberant era is organized. The narrative relegates the political lines that demarcate San Luis Obispo, Santa Barbara, and Ventura counties to the analytical background, and brings to the fore a focus on five areas, four of which are comprised of a principal city and its hinterland of oil fields and towns. Four areas correspond to the oil basins (or parts thereof) that fall in whole or in part within the tri-county area: Cuyama, Ventura-Santa Barbara, and Santa Maria. The fields of the Ventura-Santa Barbara basin are allocated to either Santa Barbara city or Ventura city, depending on geographical proximity, historical linkages to cities and towns, and industry-specific functional considerations. In this analysis, San Luis Obispo is shown to be hardly an oil-producing region at all, which is reflected in its social, cultural, and economic development.

All parts of the study consider the role of technology on oil operations and its socioeconomic consequences. The last part of the study pays particular attention to technological developments and the business strategies that have driven recent changes in the industry. The discussion of technology draws largely on trade publications and corporate publications. Corporate annual reports and press releases were used to explain both why majors for the most part left the area during the late 1980s and 1990s and the development plans of the region's leading firms. To perform the analysis, the data on operators, production, and exploratory wells gathered in a previous study were updated through 2000.

SIGNIFICANT CONCLUSIONS: The location and extent of oil reserves, and the timing of their development, explains local attitudes toward the oil industry. With one exception—the city of Santa Barbara itself—tri-county areas with oil developed it to the maximum extent possible technology, market conditions, and organizational capacities—at least until the 1969 oil spill in the Santa Barbara channel. The period of extensive onshore oil activity occurred during an "exuberant" era in U.S. history that valued economic and demographic growth, and technological progress. By World War I, only the city of Santa Barbara defined itself as an urban place that was incompatible with oil development. Nonetheless, the development of the Mesa field was not precluded, even as residents objected to some or all aspects of oil field

operations there. The city of San Luis Obispo—the political, cultural, and economic center of the county—developed without the presence of oil development, which occurred only in the southernmost part of the county and in the remote Cuyama valley. In Santa Barbara, San Luis Obispo, and some smaller coastal communities, urban development that favored tourism, the natural beauty of the environment, small-scale enterprise, and recreation took hold, either prior to, or in the absence of, extensive oil activity.

No tri-county community experienced an urban history that was similar in any way to the image of oil "boom" towns popularized in film and journalistic accounts. By placing individual community experiences with periodic bursts in oil activity in the context of the historical times in which they occurred, the study shows that the long-term benefits of oil "booms" outweighed any short-term costs. Short-term costs were manageable. Contemporary observers welcomed the new oil activity in the impacted communities. Those who arrived in search of work were willing to endure short-term hardships for the promise of long-term economic gain. Favorable attitudes regarding oil activity developed and persisted in communities that experienced substantial and sustained levels of oil activity.

As a heavy industry, oil became less and less compatible with an emerging post-industrial tri-county economy that valued tourism, recreation, and "clean" industries. Oil was also squeezed by demographic trends, including the suburbanization of much of Ventura county and the in-migration of people to coastal communities in Santa Barbara and San Luis Obispo counties. New migrants had the same interest as long-time residents in preserving the "small town" atmosphere of these cities and towns. The path dependency associated with prior land use ensured that properties that were used for oil activity continued to be operated as such. Yet by the 1980s, unproductive oil leases were yielding to golf courses and suburban tract home development. Oil activity was not necessarily compatible with agriculture during this period, either, especially in areas in which specialty crop production emerged as a major economic activity.

Economic diversification over time ensured that the tri-county area did not "overadapt" to oil. As an oil bearing region, much of California, including the tri-county area and the Los Angeles basin, was atypical in that it occurred in the midst of, or in close proximity to, major urban centers with public infrastructure in place. Oil development created the basis for self-sustaining economic growth in Ventura and Santa Barbara counties. For instance, numerous companies that were created to support oil-related activities no longer depend on local production for their viability. With World War II, the military established a significant and lasting economic presence in all three counties. The postwar growth and development of institutions of higher learning and high-technology industries, and the expansion of recreation and tourism, ensured that declines in oil production did not result in significant economic dislocation.

STUDY RESULTS: With this study, we now have a fairly detailed and comprehensive picture of the coastal California oil industry, from the late 1800s through 2000. It demonstrates that the coastal California oil industry expanded in a series of "bursts," accommodating entry on the part of all types of operators. Turnover in terms of operators was

high. Significant merger and acquisition activity occurred, particularly during the 1920s, 1960s, and 1980s. This activity was not necessarily atypical for an industry in which the "endgame" for operators often involves selling properties that they develop. However, these merger movements significantly affected the structure of the tri-county industry. The findings of this study augment earlier work on the 1950–1995 period. For this period, researchers found that the region's crude oil reserves supported a competitive, three-tiered upstream industry structure of seven integrated firms (majors), large independents (or principal minors), and small independents (including proprietorships, partnerships, and corporations). By using production figures, rather than number of producing wells, this study further confirms the dominance of the largest firms through the mid-1980s. This study shows that this structure emerged during the late 1920s, and persisted until the crash in oil prices of the mid-1980s. Today large independents operate all of the region's production, outside of the still-prolific Ventura field and the Santa Ynez Unit in the Santa Barbara channel.

The tri-county region is well past its peak as an onshore extractive region. Yet even after operators developed the area's onshore and tidelands fields to the maximum extent possible, lots of oil remains in the ground—at least fifty years worth in the area's mature onshore fields, given current rates of depletion and trends in technological advances and prices. Technology spurred the development of the region's oil fields, sustained their production, and mitigated the social and economic effects of their decline. In the future, wells and fields will be abandoned. Yet the decline of the tri-county extractive region will continue to be gradual. Short-term price- and technology-driven reversals in production are likely to occur. Technology is boosting reservoir recovery rates appreciably. Hence, the decline of the coastal region may be extended indefinitely.

Two trends apply to future offshore and onshore oil development: consolidation of producing properties and enhanced resource recovery from existing fields. During the 1990s, technological change, business strategy, and external demand factors intersected in ways that suggest that substantial oil development is possible in existing offshore and (some) onshore areas. The independents that have assumed control of many upstream activities initiated a process of property consolidation that will continue in the future. At the same time, a certain amount of fragmentation will persist, given leasing patterns, path dependency in land use, and other factors. The savings associated with consolidation will provide additional capital that operators may invest projects, stabilizing yields and extending the life of selected fields. New configurations of offshore infrastructure promise to reduce the impact of offshore operations. This trend was made possible by departure of all but one of the majors from California offshore production. The rationalization of offshore facilities may make capital available that operators may devote to the enhancement of production from existing platforms.

Proven reserves remain undeveloped off the California coast. Technological advances have expanded the opportunities to recover them. New entrants in the local structure of industry have demonstrated the capacity and desire to do so. Futures advances in technologies, such as subsea completions and floating production, may provoke renewed debate regarding offshore development policy, as operators and national policymakers pitch advanced technological solutions to oil and gas recovery to residents and state and local officials. In the short-term,

the visibility of new projects in existing fields should be marginal, as the infrastructure is in place to recover proven reserves with the technologies discussed above. Nonetheless, as recent events show, all proposals to develop production in the Santa Barbara channel will likely be resisted.

STUDY PRODUCTS:

Adamson, Michael R. "Comment: Oil Development and the Accomplishment of Place," *American Sociological Review* 67, no. 6 (December 2002): 911–917.

Adamson, Michael R. and Randolph Bergstrom. *Exploration and Production in Ventura, Santa Barbara, and San Luis Obispo Counties: Oil Well Operators, 1950–2000*. OCS Study MMS 98-0061 (revised).

FINAL STUDY REPORT

Introduction and Overview

Under the 1978 amendments to the Outer Continental Shelf (OCS) Lands Act of 1953, Congress sought to improve the quality of research on the physical and social impacts of federal OCS oil and gas activity, as conducted by the Department of the Interior's Environmental Studies Program. Through 1991 the federal government spent more than $500 million on such scientific research. However, as Freudenburg and Gramling (1994b: 101–116) have noted, the Minerals Management Service of the U.S. Department of the Interior (MMS), created in 1981 to manage and regulate oil and gas activity on federal OCS lands, was criticized for showing little evidence of interest in the quality of the studies that it sponsored. The National Research Council (1989, 1992, 1993) concluded that MMS studies were deficient in assessing the impacts on human, coastal, and marine environments. Subsequently MMS invested many more millions of dollars in social science research to investigate the social, cultural, political, and economic impacts of offshore oil development and assess public responses to OCS leasing and production. Several studies focused on the Pacific OCS region, with specific focus on California's Ventura, Santa Barbara, and San Luis Obispo counties. This study, also a product of a research program partially funded by MMS, reviews and evaluates this work, with the purpose of summarizing, reinterpreting, synthesizing, and updating their findings in a single volume. Its aims to inform the public and brief policymakers regarding the strengths and weaknesses of past research, discuss recent developments in technology and market structure that may impact future offshore activity, and suggest potential paths for additional research.

The principle studies that are reviewed and evaluated here include Lima (1994), "The Politics of Offshore Oil Development," a Ph.D. dissertation produced in the Department of Political Science at the University of California, Santa Barbara (UCSB), and two studies conducted by teams of researchers based at the Marine Science Institute at UCSB (MSI). The studies conducted by the MSI teams responded to requests by MMS to study (1) how three California counties, namely San Luis Obispo, Santa Barbara, and Ventura, evolved historically, owing to the presence of the oil industry, and (2) the oil industry itself from 1950. (Although the Ventura basin spills into north Los Angeles county, the latter area was not included in the studies.) In each study, the project teams responded with separate, stand-alone reports for each of the three counties.

The first MSI project team analyzed how the individual "character" of the three counties evolved historically in relation to the oil industry. The reports that they delivered included: Molotch *et al.* (1996), *Santa Barbara County: Two Paths* (hereafter SB I); Nevarez *et al.* (1996), *San Luis Obispo County: A Major Switching* (hereafter SLO I); and Paulsen *et al.* (1996), *Ventura County: Oil, Fruit, Commune, and Commute* (hereafter VC I). The project team paid particular attention to the cities of San Luis Obispo, Santa Barbara, Santa Maria, and Ventura. At the same time, researchers performed intracounty comparisons of community responses in order to understand why specific communities responded as they did. By

analyzing the evolving interplay among industrial development, political change, demographics, and other factors, the project team explained how counties and their principal communities developed particular cultural, social, and economic "configurations" that influenced their attitudes regarding oil activity—development of federal OCS lands in particular. The studies allocated roughly half of their analysis and discussion to three periods: prior to 1914, 1914–45, and 1945–69. Roughly half the analysis focused on an "environmental era" from 1969 to the mid-1990s.

The second team, of which the present author was a member, focused on the oil industry itself, and produced "industrial histories" for each the three counties for the period from 1950: Beamish *et al.* (1998), *Petroleum Extraction in San Luis Obispo County, California: An Industrial History* (hereafter SLO II); Nevarez *et al.* (1998), *Petroleum Extraction in Santa Barbara County, California: An Industrial History* (hereafter SB II); and Paulsen *et al.* (1998), *Petroleum Extraction in Ventura County, California: An Industrial History* (hereafter VC II). In addition, the team produced a "technical appendix," consisting of an inventory of all major firms, principal minor companies, and small firms that operated in the region from 1950–97, including the fields in which they operated and notes on principals, mergers, property transfers, agents and related organizational activity (Adamson and Bergstrom 1998). The reports analyzed the industry's evolving structure, including its onshore and offshore components, and made projections about the nature of possible future oil activity in the tri-county region. The reports also detailed the industry's relationship with the communities that it affected, the economic impact of the offshore industry, the regulatory environment of business, local technological innovations, labor practices, and local political responses. Although data constraints made analysis across the entire timeframe infeasible for a number of variables, the studies divided their assessments into three historical periods: 1950–68, 1969–85, 1986–96.[1]

This study also takes into account other products that the MSI team members produced in conjunction with, or as an extension of, the aforementioned studies, including working papers, interview notes, and publications. The latter include Beamish (2000, 2001), Molotch, Woolley, and Jori (1998), and Molotch, Freudenburg, and Paulsen (2000). Earlier work by Freudenburg and Gramling (1993, 1994a, 1994b) and Gramling (1996), which served as methodological points of departure and intellectual inspiration for much of the work contained in the MSI studies, particularly SB I, SLO I, and VC I (of which Freudenburg was an editor and principal investigator), inform and provide context for the analysis contained in this study.

After presenting a broad historical overview of oil activity in the tri-county area, this introduction summarizes the approach and findings of Lima (1994), SB I, SLO I, VC I, SB II, SLO II, and VC II in order to provide the context for the analysis of this study. This introduction is concerned with the key findings of the studies and the approaches that

[1] The three periods roughly correspond to levels of activity and changes in the regional structure of industry: a final period of expansion, a period of stasis, and a period of decline. Owing to the fact that SB I, SLO I, and VC I designated an environmental era from 1969 to the present, the second team retained this date in their periodization of the second period, even though the period of stasis begins earlier.

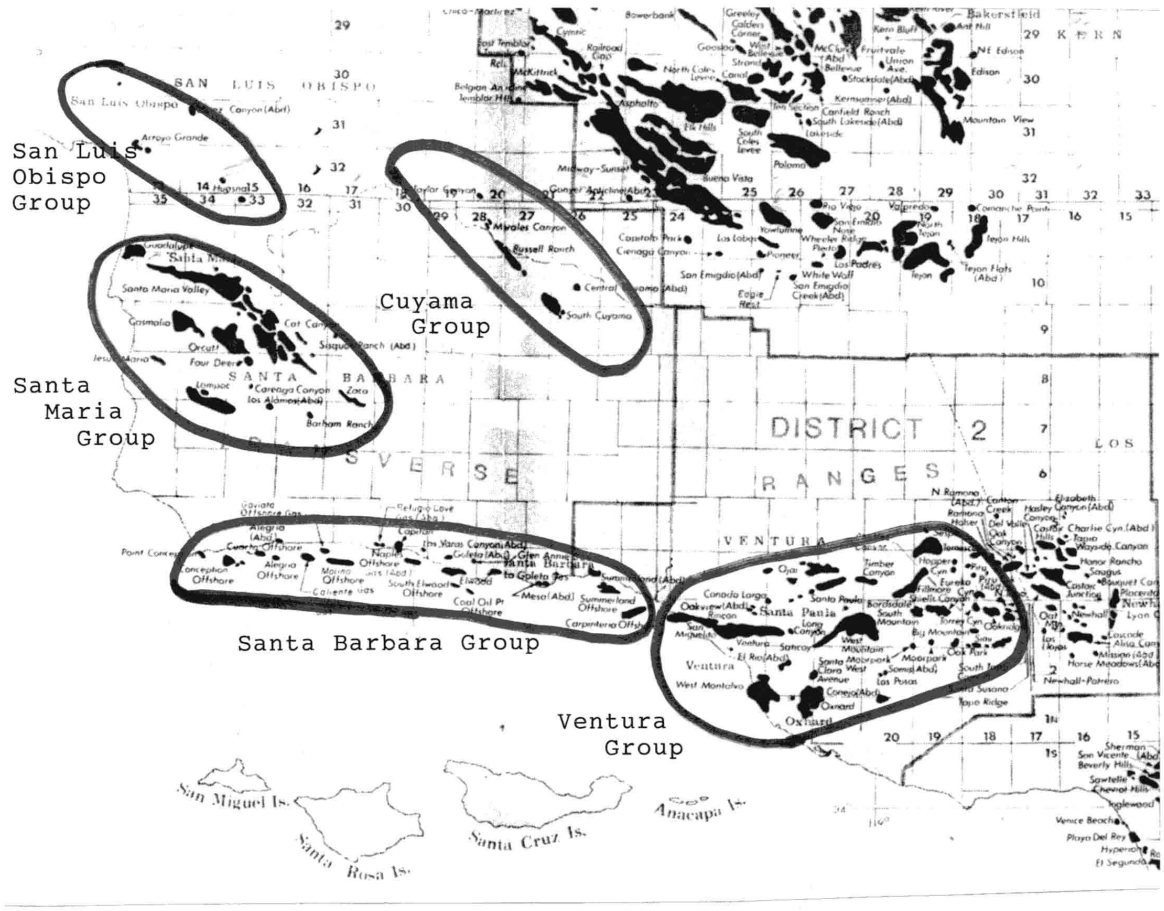
researchers used to arrive at their conclusions. Discussion of the historical evidence developed in these studies in support of their findings is deferred to the body of this study.

The introduction concludes with a discussion of the plan of the study, which is divided into three parts: an "exuberant era," 1865–1965; an "environmental era," 1966–1985; and an era of decline, 1986–2001.

One Hundred Thirty-Five Years of Tri-County Oil Activity

Oil and gas activity in California's Ventura, Santa Barbara, and San Luis Obispo counties has a long history. Serious efforts to develop commercial quantities of crude oil date from the Civil War. Comprising the bulk of the productive area of the state's coastal district and part of the San Joaquin valley district (see map 1), the tri-county area experienced some ninety years of onshore activity before the 1957 amendments to the 1955 Shell-Cunningham Act provided the real impetus for extensive leasing and development of California's offshore lands (Krueger 1958). As Part I of this study elaborates, reflecting the findings of SLO I, SB I, and VC I, the significance of onshore activity to local communities varied across the tri-county area, depending on when and where oil and gas was found and developed. Onshore oil and gas activity took place an era of cultural, social, and economic "exuberance." It proceeded essentially unimpeded, though not without objection from residents in south Santa Barbara county, where both town lot and beach drilling occurred in urban areas. Where companies found oil onshore, they generally developed it to the maximum extent possible, given geological and market conditions, technological capacity, managerial expertise, and capital availability.

Map 1. Tri-County Oil and Gas Fields by Group.
Source: California Division of Oil and Gas (1982a).



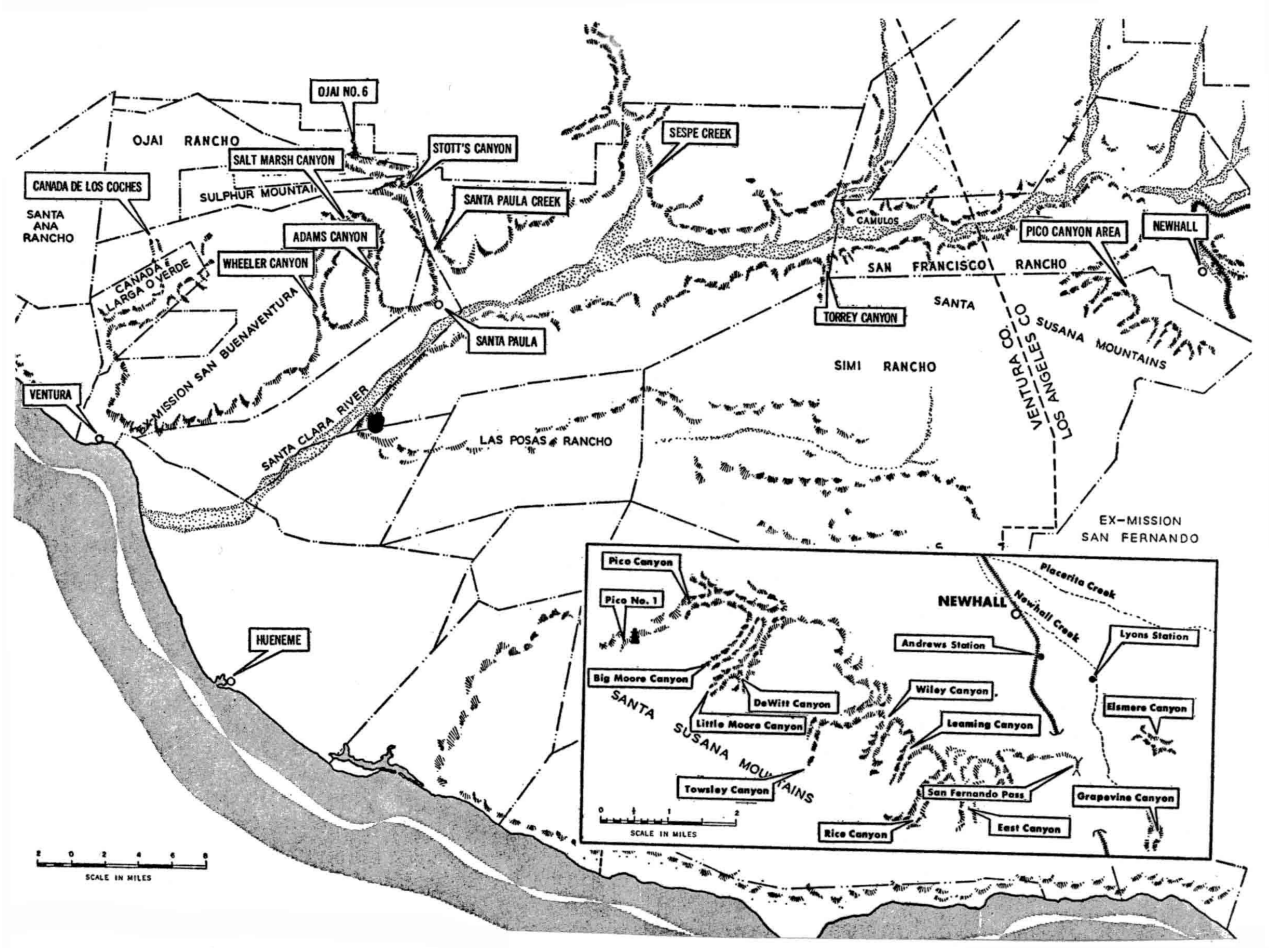
The tri-county area experienced several bursts of onshore oil activity. Ventura county experienced the earliest "booms," from 1865–67, during the early 1870s, and again in the mid–1880s, before E. L. Doheny's 1892 discovery of the Los Angeles field shifted the focus of attention to the Los Angeles basin. As map 2 shows, commercial production in California was first obtained in the Pico-Newhall area of north Los Angeles county (Pico No. 1 on the insert), where several predecessors of Standard of California (later Chevron) were active (White 1962: 23–84).[2] From 1865–1900, twenty-eight fields were discovered in the Ventura-Santa Barbara basin (Richardson 1972). By 1900 Union Oil had emerged as a capable competitor of the Standard companies, and a leading tri-county producer. Yet oil production in the coastal region was only about 1,000 barrels per day in 1900 (Richardson 1972). Truly

[2] Thomas R. Bard's Ojai No. 6, spudded late in 1866 on behalf of Thomas A. Scott's California Petroleum Company, lays claim to being California's first producing well. Unlike Bard's other six Ojai wells that he drilled in the 1860s, which came up dry, this one produced a thick, heavy crude oil for a short time. Pico No. 1, drilled in 1875 by C. A. Mentry on behalf of Denton Cyrus Scott's Star Oil Works, a Standard of California predecessor, is considered the state's first well, and Pico Canyon its first oil field (White 1962: 23–40; Hutchinson 1965a: 103–132).

significant crude oil reserves were not developed until the early 1900s, when Union Oil and other firms made important discoveries in the Santa Maria valley of north Santa Barbara county.

During the 1920s and the 1930s, oil companies made some of the region's most important finds. The Ventura Avenue field—the region's largest onshore field—was developed by Associated Oil and Shell. Large independents made important discoveries at Elwood, west of the city of Santa Barbara, and at Rincon in Ventura county. Union Oil discovered the Santa Maria Valley field (see map 1). At both Elwood and Rincon, exploitation of the state's offshore reserves went forward under California's Minerals Leasing Act of 1921, which allowed exploration permits to be issued for submerged lands, but also forbade leasing within two miles of any city's limits. In its aftermath, oil companies explored much of Santa Barbara's and Ventura's coastal areas (Lima 1994: 150–168).

Map 2. Pico-Ventura County Oil Region – Cradle Area of the California Industry
Source: White (1962). Copyright © by Appleton-Century-Crofts. Permission pending.



After World War II, so-called deep-drilling and other technological advances, as well as favorable market and regulatory environments, drove a robust expansion of activity across Ventura and north Santa Barbara counties, and important discoveries were made in the remote Cuyama valley that straddled Santa Barbara and San Luis Obispo counties. Numerous field and pool discoveries were made in Ventura county, but no "giants" (with potential production of 100 million barrels of oil) were discovered (Richardson 1972: 3). From 1973–85, high prices for crude oil, national energy policy, and favorable tax treatment for investments in exploration and production activity spurred new development drilling and the implementation of secondary recovery projects, which increased output in many of the area's existing fields.

With the collapse of oil prices in 1986, the tri-county region entered a period of decline. Throughout the post-1945 period, however, advances in technology stabilized and sustained production. Declines in output were gradual, and even reversed temporarily in selected fields. Further, they occurred during a period of continuous economic diversification and population expansion. Thus the assertion made in VC II (4.1.3) that "most oil fields produce for only a short time, after which companies literally pack up and go," has proved untrue for the tri-county area—and applies to few producing regions. Indeed, even small, old fields, such as Torrey Canyon in Ventura county, continued to produce for extended periods of time. Of thirty-one fields discovered in the California coastal region (which includes Monterey, San Luis Obispo, Santa Barbara, Santa Clara, and Ventura counties) from 1865–1900, twenty-seven were still producing in the early 1970s (Richardson 1972: 2). The tri-county area did not experience the "busts" associated with isolated, and rapidly abandoned, mineral and energy extraction regions of the nineteenth century. In time, some smaller onshore fields and most of the fields in state waters were abandoned, but today enough recoverable oil remains in the ground to sustain production from existing fields for perhaps fifty years or more, given market conditions that attract the capital needed to develop it.

From the early 1930s until 1953, the offshore era in California was delayed by protracted disputes between the U.S. government and the states regarding jurisdiction over submerged lands. A solution was ostensibly found during the Eisenhower administration in the Submerged Lands and OCS Lands acts of 1953, which demarcated California and federal offshore lands three miles from the shoreline, and established the basis for the development of energy resources in state offshore areas. However, in a lawsuit filed in 1956, the state of California contested the status of much of the southern California state-federal border under the two federal laws. Sacramento claimed all of the area from Point Arguello, to San Miguel Island, to San Nicholas Island, to San Clemente Island, to the Mexican border, as an "inland waterway." Although the main geological focus was on the Santa Barbara channel, the lawsuit delayed leasing, exploration, and development of the federal OCS area south of Point Arguello for at least twelve years. While the "disputed lands" were contested, a cooperative agreement was reached to allow limited exploration to continue, in the form of geophysical profiling and the drilling of core holes and their sampling.

Further, the 1938 State Lands Act still greatly restricted leasing of the state's tidelands. State lawmakers attempted to address the situation in 1955 with the Shell-Cunningham Act. As Krueger (1958: 466) argues, the law "was a well-drafted effort for comprehensive tideland

development." However, its royalty provisions generated controversy among lawmakers and operators. It was not until the act was amended in 1957 that the offshore era really began in California (Krueger 1958; Lima 1994: 198–200). From 1956–65, there were twelve field discoveries in state waters—eight were oil, four were gas—off the Santa Barbara county coast, from Carpinteria to Point Conception (see map 1) (Richardson 1972: 4).

Owing to the potential and actual locations of offshore oil and gas reserves, and the timing of their development, offshore activity received, and continues to receive, much more local scrutiny than onshore activity. For instance, it was clear that offshore development would affect the social and economic character of the city of Santa Barbara in a way that residents and local government would not approve. The city, which had already banned drilling within its limits, pressed for and received a no-drilling sanctuary, extending eighteen miles from the University of California campus to Summerland, under the Shell-Cunningham Act. Local groups and government in Santa Barbara city and county subsequently tried to exert influence over the process of offshore development, especially as it regarded the siting and building of onshore facilities that processed offshore production. Indeed, before federal OCS leasing began in 1965, most of the actions that came before the Board of Supervisors were largely routine, as these facilities were generally located in remote rural areas, or were sited on properties previously used to support onshore production (Lima 1994: 268–280).

Nevertheless, in a waning, but persisting period of exuberance, the state from 1955 to 1968 leased its "tidelands" in the Santa Barbara channel to consortia of oil companies, which invested millions of dollars in developing them. As Lima (1994: 265–266) has observed, the state demonstrated its desire to nurture and encourage offshore activity, while ensuring a fair return on its natural resources to the state's treasury. It wanted to maximize income in a manner compatible with oil and gas conservation—a term with a specific meaning and historical context in progressive reform that is often incompatible with the tenets of modern environmentalism.

By 1965 offshore development was abutting urban areas of Santa Barbara county, as the entire coastline addressed by the Shell-Cunningham Act was leased, except for the sanctuary established by the act. The success of the Carpinteria and South Elwood leases in 1964 and 1965, respectively, prompted the county to adopt a proactive and comprehensive approach to offshore oil development. Drainage of OCS reserves from the Carpinteria state lease brought the issue to a head. In 1965 the U.S. Supreme Court finally ruled on the case that the state of California had brought against the federal government in 1956, paving the way for federal leasing of its OCS lands to offset drainage from state leases. More OCS leasing followed, as the U.S. government tried to replicate the extensive offshore program in the Gulf of Mexico in other OCS regions. From 1967–69, five platforms were installed in the Santa Barbara channel to develop OCS leases, and the construction of onshore processing facilities at Rincon and La Conchita in Ventura county added to the infrastructure in place at Elwood and Carpinteria in Santa Barbara county.

With Santa Barbara county acting to protect the sanctuary and to manage the construction of onshore facilities in urban areas, an "environmental" era began. With the January 1969 oil

spill from Union Oil's Platform A in the Santa Barbara channel, Santa Barbara became "ground zero" for the environmental movement and opposition to offshore oil and gas development in the Pacific OCS region. State and local action, and national reaction, helped spur the creation of a new regulatory regime at the federal, state, and local level, which has restricted oil and gas activity offshore California. The 1969 spill has been given partial credit for passage of the National Environmental Protection Act (NEPA), the success of the first Earth Day in 1970, the eventual passage of the 1978 amendments to the OCS Lands Act, and the emergence of widespread, sustained, organized resistance to the federal OCS program in most coastal states. It also spurred passage of Proposition 20, the 1972 California Coastal Act, which established the California Coastal Commission with authority over most types of coastal development, extending seaward three miles to the federal OCS-state boundary (Kaplan 1982).

With much delay, many offshore projects went forward in the context of the energy crises of the 1970s and the pro-development stance of the Department of the Interior under presidents Richard Nixon, Gerald Ford, Jimmy Carter, and Ronald Reagan. Between 1976 and 1989, fourteen platforms were installed to produce oil and gas from federal OCS leases, and additional onshore infrastructure was built at Lompoc, Gaviota, and Las Flores Canyon in Santa Barbara county and at Oxnard in Ventura county. By the late 1980s, however, opposition to oil development in California had expressed itself in a series of local measures that banned onshore infrastructure projects, required a vote for their construction, or delayed construction pending decisions regarding permanent bans. In the tri-county area, San Luis Obispo county moved to prevent offshore development altogether with Measure A in 1986, and Santa Barbara moved to freeze activity at existing levels through Measure B in 1985, which limited new onshore construction to two coastal sites. Ventura county, however, adopted no county-level restrictions (Sollen 1998: 168–171). In 1990 President George Bush postponed further federal leasing offshore California until after 2000, except in the Santa Barbara area, which was to be available after 1996. The Clinton administration extended the moratorium on Santa Barbara channel leasing until 2012. In 1994 California governor Pete Wilson signed a bill that banned oil activity in all state waters that were not already leased, with an exception for offset drilling to prevent drainage from federal leases. No additional platforms were installed in the Santa Barbara channel, and all but one platform was removed from state waters off the Santa Barbara county coast. Thus MMS and oil companies found themselves denied access to many OCS lands that lay offshore California.

As of 2001, thirty-six federal leases in the Santa Barbara channel remain exempt from the moratorium, and remain underdeveloped. OCS production continues from nineteen platforms; local production from state reserves continues at Elwood from Platform Holly, at Rincon from both onshore wells and the artificial island constructed by Richfield Oil in 1957–58, and from onshore wells in Montalvo West field. However, these assets are now often operated by independents; majors such as Chevron and Unocal no longer consider offshore California to be a strategic area for their investment and consequently they sold their tri-county properties. Still, the curtain has not closed on the offshore oil industry in California, though many local residents would like it to do so. Substantial quantities of crude oil and natural gas reserves remain in the ground—the thirty-six undeveloped OCS leases in the Santa

Barbara channel alone may contain more than one billion barrels of crude oil and more than 900 billion cubic feet of natural gas reserves (Nuevo Energy Company 2001c). Moreover, the technology that can develop them is rapidly advancing, especially in the area of computer-aided exploration, planning, drilling, and operations. Oil companies remain prepared to invest in the production of offshore oil and gas reserves. U.S. policy remains biased toward the development of domestic sources of energy.

The Politics of Offshore Development: The Santa Barbara Channel, 1890–1975

Based on a case study of offshore development in the Santa Barbara channel from the 1890s to 1975, Lima concluded, "technology is the single most important factor affecting the politics and policy of offshore energy development. Technology determines the location of the activity as well as the cost of the activity. Location, in turn, determines which jurisdictions will be involved in the decision making process and whether this activity is compatible with local social and economic values" (1994: vi). Because of the costs involved, offshore development in California occurred through operators extending, as technology improved, from known onshore deposits to state fields and then to federal OCS areas. For instance, for many years the effective technological limit for so-called deep water drilling was about 300 feet. By 1960 the limit had doubled. Since most of the OCS area is in water over 600 feet, there was no impetus to settle the mid-twentieth century dispute between Washington and Sacramento. Once it was settled, however, technology quickly developed to exploit federal leases in the Santa Barbara channel. This historical process meant that offshore development occurred in concentrated areas, which prompted a set of political responses at the federal, state, and local levels that ultimately restricted actual offshore development to an area that was a fraction of possible development. As a result of continuous and breakthrough improvements in technology, and to changes in the external political and economic environment, economic and national policy forces continue to exert pressures locally to further develop California's offshore oil and gas reserves.

Lima (1994: 109–114) developed a sequential model to explain the history and politics of offshore development.[3] As he describes it, the private sector first decides to undertake the activity based on economics, technology, and location. The decision process to allow the activity to occur follows. Offshore oil policy is the outcome of offshore energy politics, which is primarily shaped by political jurisdiction and local social and economic factors. This process is in the domain of the public sector. The location of oil and gas reserves may change, but three levels of government historically have weighed in on the offshore permitting process: federal, state, and local. Technology primarily influences how development will take place, which may influence local reaction to additional development. Economics primarily determine when development will take place.

[3] For a summary discussion of the model, see Lima (1998).

The availability and cost of technology is a key strategic factor in oil firms' planning for offshore development, from the amount of their bids for leases to their approach in developing a field (Lima 1994: 81–99). As technology improves, development of additional areas becomes feasible, which makes extraction more likely and increases the potential area in which development occurs. Government lease decisions also take technology into account. However, as the history of development in both the state and federal lands of the Santa Barbara channel demonstrate, technological solutions that make possible oil extraction in areas offshore from communities that oppose such activity can be opposed by local interests and by regulators.

Economics, technology, and location of energy deposits thus determine the possible extent, and influence the level of, offshore development (Lima 1994, 99–109). Yet government approval remains the paramount factor in determining actual offshore development. At various times, both the reluctance of government to approve offshore activity and its enthusiastic encouragement of it resulted in political conflict. Federal, state, and local governments are involved, as are their respective institutions (bureaucracies, agencies, courts, legislatures, and direct democracy initiatives and referenda). Bargaining and using public opinion emerged as strategies for conflict resolution and gaining political concessions. Policy development has thus been an iterative, path dependent process that modifies the location, technology, and cost of offshore development over time.

Technology determines the locations in which offshore activity may occur. Local social and economic values determine whether such activity is compatible. Each political jurisdiction with authority in the matter will approve or disapprove of the activity on a cost-benefit basis. Oil firms will decide to undertake the activity based on profit calculations. Permission to proceed is granted only when all levels of government support the activity, and if the activity is compatible with local values. When governments approve the activity but others do not, the fight moves to the courts or other venues for resolution (Lima 1994: 117–123).

In the Santa Barbara channel, offshore development was an extension of onshore activities. Technology facilitated more intensive exploration, development, and production. In this respect, coastal California had more in common with the southern Louisiana area than the northern California coastal region, both of which Freudenburg and Gramling (1994b) investigated. At the same time, political action and regulation, which was motivated by the same quality of life and institutional concerns that motivated northern Californians to oppose offshore development during the 1980s, constrained the level of activity and the use of technology in the Santa Barbara channel. From 1970 to 1975, the terminal date of Lima's study, offshore development was contained to existing fields. Since the early 1980s, the Santa Barbara channel has seen no new leasing. Through initiatives and referenda, local and state jurisdictions also limited OCS activity in existing leases by restricting the construction of onshore processing facilities. Hence, little activity outside the maintenance and development of such leases has occurred.

Though Lima does not employ the term, path dependency is clearly a key issue in his study and explains why he argues that the temporal horizon of his study—that is, from the 1890s—

provides an important contribution over prior work that focused on the post–1969 spill era. With a focus on the city of Santa Barbara, Lima implicitly explains the nature of the city's opposition to offshore oil over time in these terms. Path dependency, or the idea that choices constrain or influence future decision making, can be used to explain not just the politics of offshore development, but local responses to onshore and offshore oil activity across the tri-county area for a 135-year period. A key theme that runs through all of the research under review in this study is that where the presence of the oil industry had a sustained and important socioeconomic impact locally prior to 1945, communities historically have viewed such activity favorably. In places where the "imprint" of oil, whether in social, cultural, political, and economic terms, was slight or non-existent, the introduction of oil activity has provoked resistance. Lima demonstrates this very well in the case of Santa Barbara, taking care to distinguish activity that occurred in rural areas of Santa Barbara county from that which impinged on the city of Santa Barbara.

Lima elaborated on a number of historical themes that served as points of departure for subsequent work on tri-county oil activity and its social and economic impacts. He established that many of the factors that have influenced the level of offshore development preceded the 1969 oil spill or even the 1955 Shell-Cunningham Act. He also explained the regulatory framework within which politics and policy developed over time, demonstrating how local, state, and federal jurisdictions gradually became involved in regulating an activity that was subject only to nuisance, tort, and related bodies of case law prior to the 1920s.

Lima also showed that the conflict over values has been a major theme in the development of offshore oil, involving all levels and institutions of government. Using as a point of departure Gramling and Freudenburg (1990), who suggested how the socioeconomic character of an area affects the politics of offshore energy development, Lima showed that resistance to oil development occurred in Santa Barbara whenever it was seen to be incompatible with the social, economic, and cultural character of an area that valued highly the aesthetics of the coastline, tourism, light industry, and higher education. Opposition thus predated the 1969 Santa Barbara channel spill. Moreover, resistance was motivated by much more than spill levels (though spills are shown to be effective in triggering broad-based resistance). Just as importantly, Lima also showed that Santa Barbarans prior to World War II supported or tolerated substantial oil development in the vicinity of their city, a theme elided in SB I and SB II, but one which this study elaborates in Part I.

Finally, Lima (1994: 239–253) showed how the substantial increase in offshore activity that followed passage of the 1955 Shell-Cunningham Act affected the operations of local government, namely the Santa Barbara county Board of Supervisors. For instance, the county district attorney began attending State Lands Commission meetings that addressed offshore issues. County ordinances were amended to reflect the presence of offshore oil activity and infrastructure. Board members also had to deal with each project individually. With the awarding of leasing, offshore development became a permanent agenda item, especially since onshore processing facilities were needed to support offshore activity. The local governments that were now interested in controlling the offshore development process found that they did not have the resources to deal with the offshore development proposals that reached their

desks (Sollen 1998: 155–162). As SB II describes, they responded by increasing their organizational capacities.

Lima's study and approach established points of departure and frameworks of analysis for the studies that followed, SB I, SLO I, and VC I in particular. Adopting the county level of analysis, these studies took into account onshore activity, elaborated historically on the social and economic impacts of the oil industry, and added to what we know about the period that followed the 1969 oil spill. SB II, SLO II, and VC II detailed how the oil industry operated from 1950 and made projections about the future, defined as the period to 2015. In extending Lima's study, these studies added to what we know about the operations and impact of the oil industry on coastal California. In doing so, they validated Lima's model of offshore oil development, and suggested that it may be applied to onshore activity as well. As such, this study makes use of the model in analyzing the work that has been done on the coastal California oil industry and its impact on San Luis Obispo, Santa Barbara, and Ventura counties.

Characterizing San Luis Obispo, Santa Barbara, and Ventura Counties Socially, Economically, and Culturally

The team that produced SB I, SLO I, and VC I explained how counties and their major communities developed economic and cultural "configurations" that influenced their level of acceptance of oil development, offshore development of federal OCS leases in particular. Major communities included the cities of Ventura, Santa Barbara, San Luis Obispo, and Santa Maria, the first three of which are the seats of their respective counties; the latter was the center of the major oil producing region in Santa Barbara county. The researchers also analyzed the way in which demographic and political change "intersected with one another over time" and how they differed from community to community.

To perform the study, researchers adopted a ethnographic approach that relied heavily on interviews with local officials, industry personnel, and community leaders to construct the past, understand the present, and identify documents and data sources that would prove useful to the study. They used census, employment, elections, and tax data, as well as measures of oil and gas activity produced by the relevant state regulatory agencies to develop quantitative indicators that characterized the communities that they were studying. The researchers also developed their own data that assessed the nature of local participation in environmental hearings that affected offshore development and measured recent local print media coverage of the oil industry. They also analyzed the nature and extent of local community organizations by developing indicators of their "density of development," resource bases, and "modes of networking." Using these data and sources, the studies contrasted cultural and political responses among communities within and across counties, and explained why communities responded to the impacts of oil as they did. With a view to understanding contemporary attitudes toward the offshore oil industry, the study teams examined geographic, cultural, economic, and institutional factors that influenced the development of these attitudes.

Moreover, the studies explained a community's distinctiveness of place in terms of the interrelation of these factors.

SB I, SLO I, and VC I split their attention about equally between the period prior to the 1969 oil spill in the Santa Barbara channel and an "environmental era" that followed. The methodology employed in the studies served the purposes of the research objectives far better for the "environmental era" than the pre–1969 period. Though SB I, SLO I, and VC I do an adequate job to show how oil interacted with local communities and helped to shape the character of the three counties, the use of newspaper accounts, local histories, and corporate biographies is highly selective, sometimes inappropriate, and generally "presentist" in analytical perspective, that is, not sensitive to historical time and place. A modern-day environmentalist perspective is read backwards in time to interpret social, economic, and business events that occurred in an age of technological "exuberance," or unprecedented faith in technological efficiency and ignorance of, or insensitivity to, environmental issues in the post-1960s sense of the term.[4] The imposition of contemporary standards and perspectives on such events renders ahistorical much of the analysis for the period prior to 1969 in each of the studies.

Owing to the literal use of these sources, the studies also read a bit too much like the newspaper accounts and local histories on which they rely. The assortment of interesting anecdotes that enliven the text of all three reports may have been more revealing had they been put more adequately into historical context, either through a broader and more intensive use of primary sources or through the use of secondary sources.

Two examples illustrate the point. The narrative in SLO I (9–15) on early exploration in San Luis Obispo county literally uses phrases culled from the newspaper or local history sources, such as "remarkable transaction," and "astonishing sums of money" that "changed hands in stock transactions for oil companies" without quantifying the level of activity in the county or investigating the cultural significance of local excitement in anticipation of the discovery of a large oil field. The evidence for "astonishing sums of money" is a newspaper account of local business owners investing $10,000 in a venture that intended to develop a property in San Luis Obispo county. As Part I shows, this level of capitalization is rather low, compared to many of the companies that formed at this time for the purpose of exploring and developing the Santa Maria and Ventura districts. Yet the analysts in this instance missed completely the cultural and economic significance of the contemporary belief that such transactions were "astonishing." To take another example, the description in VC I (43) of exploration and development activity the Oxnard plain in Ventura county during the 1950s mentions only two blowouts of drilling rigs. No mention is made of the substantial and extensive activity that occurred there, involving the drilling of dozens of wells, as VC II (3.2.15–3.2.18) details. The anecdote in this case provides little more historical perspective on the nature and extent of local oil activity than do U.S. newspapers whose coverage of European soccer is confined to periodic reports of rioting among hooligans.

[4] On the age of technological exuberance, see Catton and Dunlap (1980). For a discussion relating it to the historical development of the offshore oil industry, see Freudenburg, and Gramling (1993: 347–349); and Freudenburg, and Gramling (1994b: 75–95).

SB I, SLO I, and VC I omitted important studies of the California and U.S. oil industries, such as McLaughlin and Waring (1915), Federal Trade Commission (1922), Bain (1944), Williamson *et al.* (1963), Andreano (1970), and Johnson (1970) that would have provided an important statewide perspective on the tri-county experience. As this study will argue, this context improves our understanding of local oil industry activity and its socioeconomic impact on the tri-county's communities. Finally, a more intensive use of trade and company publications, including employee publications and annual reports, may have deepened the discussion of oil industry activity to World War II and provided a basis for a more extended discussion of postwar onshore oil activity outside the city of Ventura, which is given excellent coverage in VC I.

At the same time, the analysis of the pre-1969 era is supported by a wealth of charts and graphs on population, oil production, employment, and other relevant indicators. These data in fact drive the narrative. Nonetheless, as this study discusses in greater detail, the employment of these data sometimes hides more than it reveals regarding the extent and impact of oil-related activity. For instance, the reliance on county levels of oil production as a measure of local activity masks local differences and does not account for all the factors that prompted operators at a given point in time to produce less than maximum output. Pointing to a chart of onshore production that aggregated county totals from 1915–92, for instance, researchers in a journal article developed from the research conducted for SB I and VC I concluded that involvement of the cities of Ventura and Santa Barbara with oil production, in terms of production volumes and timing, "have been … remarkably alike" (Molotch, Freudenburg, and Paulsen 2000: 798).[5] As this study shows, a breakdown of production activity by individual community and its oil "hinterlands" shows that the urban experiences of Ventura and Santa Barbara with respect to both timing and volumes of oil production, differed considerably. While oil production in Ventura county was centered around the city of Ventura, this was not the case for Santa Barbara county.

This example also points up the inherent tension sustained throughout all three studies between the county level of analysis and the attention devoted to the four principal cities of San Luis Obispo, Santa Barbara, Santa Maria, and Ventura. In many cases, these cities serve as proxies for the counties in which they are situated. Certainly, on a number of issues, this makes sense analytically and historically. On the whole, all three studies handle potential disconnects between levels of analysis with skill, and supplement discussion of demographic issues with information on minor cities. As the case of using county levels of oil production as indicators of impacts on local communities suggests, however, the studies tend to display less sensitivity historically to the highly localized effects of oil activity.

Census data present another example in which statistics potentially mask or miss significant socioeconomic impacts of local oil activity. As Olien and Olien (1982: 34–39) have shown, census figures are inadequate measures of "boom" town populations and oil

[5] The chart cited by Molotch, Freudenburg, and Paulsen (2000) may be found on page 37 of SB II. County volumes of onshore production given in the chart in fact include offshore production from state waters.

industry employment. The greatest employment impacts of oil activity occur during the exploration and initial development phase of a field or area, rather than during subsequent periods of production, as SLO I, SB I, and VC I suggest (cf. SB I: 39). The activity attracts several types of workers on a short-term basis, who often move on to the next "boom" in a matter of days or weeks. These bursts of high activity are unlikely to coincide with decennial census taking. For the tri-county area, this has not been an important issue since the late-1950s, when a period of stable, and gradually declining, onshore production set in. Yet in earlier times there were numerous "boom" periods between censuses, as the narratives of SB I, SLO I, and VC I indicate. During these periods, as documented in VC II and SB II, numerous entrepreneurs from outside the tri-county region, as well as oil field and service workers, engaged in exploration activity as proprietors or partnerships for brief periods of time and then left the area. Even if these entrepreneurs resided locally, census figures that exclude self-employed persons would not count them in any category of employment related to oil and gas extraction.

In addition to missing self-employed entrepreneurs, who numbered in the hundreds annually during peak periods of activity such as the early 1950s, and transient laborers, for whom no estimates are given, census figures do not reveal which businesses unrelated to oil and gas extraction are in fact dependent on such activity for their viability. The researchers developed "extract-intact" ratios that related the number of jobs in mining, chemical and allied occupations, and mining, on one hand, to the number of jobs in eating and drinking establishments and lodging, on the other, as an indication of the dependence of extraction industries compared to tourism (cf. SB I: 39–40). Yet eating and drinking establishments do not always support the tourist economy. As documented in Molotch, Freudenburg, and Paulsen (2000: 798–802), Ventura Avenue was populated by numerous places, such as the Derrick Room, which oil field workers frequented.

Census data likely miss other "intact" activities related directly to oil activity. For instance, Ventura faced a housing shortage in 1925 once Associated Oil set off a "boom" with the completion of two major wells in the Ventura Avenue field. Many newly arrived field workers took up rooms in private residences (McPhee 1925). Census data would likely miss lodging of this sort. In the extreme case of company towns, such as Orcutt, where hundreds of workers flocked in the early 1900s in response to Union Oil's discoveries in the Santa Maria valley, and New Cuyama, which Richfield Oil constructed in the early 1950s to support its exploration and production in the Cuyama valley, every job depended on oil for its existence, at least initially (Stockman 1950; Nelson 1987). Measures that rely only on census data to develop the actual employment effects of oil and gas extraction will likely underestimate those effects.

The social science methodology served the research teams much better for analysis of environmental era, which relied on interviews, surveys, content analysis of statements made at hearings, newspaper accounts, and public documents to understand local attitudes and impacts. The sections on the environmental era in SB I, SLO I, and VC I focus their attention on the offshore aspects of oil development. However, the industrial histories of the second study (SB II, SLO II, and VC II) provide an in-depth analysis of the oil industry for the period

after 1950. Thus there remains somewhat of a gap among the studies between the pre- and post-1950 periods with respect to the history of the tri-county oil industry and its level of activity. Filling in this gap, which the discussion in Part I of this study begins to do, would seem to be of some value. As SB I (p. 85) observes, "the coming of oil over the decades has done little to alter the shape of social and economic life different from the first impacts early in the [twentieth] century."

That said, SB I, SLO I, and VC I constructed highly readable narratives that give readers an overview of the early history of the industry and explain contemporary local attitudes toward the oil industry and future offshore activity. Analyzing each county as a distinctive place, the studies concluded that Ventura county differed markedly from Santa Barbara and San Luis Obispo in recent attitudes toward the oil industry. In the aggregate, support for the oil industry persisted in Ventura county. VC I suggested, however, that future (that is, post-1995) support for oil may dwindle in the county with declines in production, growth in other economic sectors, and the increasing value that residents put on such things as open spaces, recreation, high tech industry, and resisting Los Angeles-type sprawl.

Residents in Santa Barbara and San Luis Obispo counties adopted measures to hinder or restrict oil operations. In Santa Barbara county, however, there was a distinct split in attitudes. Support for the oil industry remained strong in the oil-producing region in the north, while the residents of the more populous southern part of the county saw oil as incompatible with their way of life. In San Luis Obispo county, the imprint of the onshore oil industry was slight overall and non-existent in most places. Its towns and cities developed in ways that were incompatible with the introduction of onshore industrial plants associated with offshore development from 1969 onward. The researchers who compiled SLO I characterized the San Luis Obispo's stance with respect to oil as "a major switching," since the onshore industry was supported in the few rural areas in which operators established production.

The studies pointed to a number of factors that influenced individual county development and the shaping of attitudes toward the oil industry. They included the extent and timing of oil activity, its compatibility with agriculture, patterns of landholding, economic diversification, corporate citizenship on the part of oil companies, and political climates. The discussion of these factors is premised on the idea that communities had distinctive values that both shaped, and were shaped by, oil activity. In communities that rejected oil industrialization, the development of values generally predated, or occurred in absence of, an extensive oil industry. For communities that viewed the oil industry positively, urban development was generally intertwined with a significant and sustained oil industry presence. In addition, values that expressed an opinion regarding the oil industry were applicable to large-scale, or heavy, industrialization generally.

Thus, foremost, the location and extent of oil reserves, and the timing of their development, is crucial to understanding local attitudes toward the oil industry. With one exception—the city of Santa Barbara itself—tri-county areas with oil developed it to the maximum extent possible, given technology, market conditions, and organizational capacities, until the 1969 oil spill in the Santa Barbara channel inaugurated an "environmental era," which produced a

regulatory regime that scrutinized both onshore and offshore oil more closely. This is not surprising, given that the period of extensive onshore oil activity occurred during an "exuberant" era in U.S. history that valued economic and demographic growth—the bigger and faster, the better—and technological progress. By World War I, only the city of Santa Barbara defined itself as an urban place that was incompatible with oil development. Nonetheless, even there the development of the Mesa field was not precluded, even as residents objected to some or all aspects of it. The city of San Luis Obispo—the political, cultural, and economic center of the county—developed without the presence of oil development, which occurred only in the southernmost part of the county and in the remote Cuyama valley. In Santa Barbara, San Luis Obispo, and some smaller coastal communities, urban development that favored tourism, the natural beauty of the environment, small-scale enterprise, and recreation took hold, either prior to, or in the absence of, extensive oil activity.

In Ventura county, oil was one of the county's first industries. Commercial production volumes remained low and agriculture continued to dominate the economy until the development of the Ventura Avenue field on the city of Ventura's eastern edge during the 1920s. Yet important land use precedents were established during this period, including the 1876 siting of a refinery on the city of Ventura's waterfront—an early shipping point for oil, owing to the substantial cost advantage that ocean transport enjoyed over Southern Pacific rail rates from Newhall (White 1962: 38–47). Indeed, much of the urban growth and character of the city of Ventura in its formative years was linked to oil (Hutchinson 1965a: 101–103. 271–274, 328–339; Reith 1963: 110–142). From the 1920s, the industry played a leading role in shaping the county's economy, demographic profile, and political life, with production at Ventura Avenue accounting historically for 50–80 percent of county output. Development booms after World War II and during the 1970s and early 1980s, together with technological advances that sustained production, promoted economic growth on an industrial rather than extractive model. By the mid-1950s, oil supported a large oil service industry and sustained numerous other businesses. Large property tax revenues and charitable contributions funded school districts, cultural activities, and recreational facilities. Oil company employees participated in local civic organizations, including the Rotary Clubs, Boy Scouts, and fraternal societies. Though VC I does not offer the comparison, oil-driven development in and around the city of Ventura had much in common with contemporaneous development in across much of the suburban Los Angeles area, as Viehe (1981) describes.

Much the same pattern can be seen in north Santa Barbara county. Here the oil industry played a leading role in shaping the area's economy, demography, and so on, though SB I provides a less detailed and textured on the impact of the industry on the cities of Santa Maria, Orcutt, and Lompoc than VC I provides on the city of Ventura. SB I, for instance, does not provide data on the extent of the oil service sector, which VC I provides for Ventura (though the data supplied by VC I offer only a snapshot of the sector in the early 1950s rather than a historical series). The cities of north Santa Barbara county also retained their status as agricultural processing centers. In this respect, they differed from Ventura, which ceded agricultural processing to Oxnard in the late nineteenth and early twentieth centuries (Reith 1963: 117–120).

Across the tri-county area, oil development was compatible with agriculture. As Cleland (1941: 204–237) observed, much of the area was dominated by large ranches and farms when entrepreneurs began developing the oil bearing regions of Ventura and north Los Angeles counties. Indeed, a small group of families were involved in both petroleum and the earliest "agribusiness" in the area. Oil royalties provided additional income to landowners, whether they were small homesteaders or purchasers of large rancho tracts. In many cases, royalties made them rich. Oil activity also provided seasonal work for farmhands.

As Viehe (1981) demonstrates, from 1890 to 1930 oil was also compatible with urbanization and industrialization, whose growth and development was associated with progress. During the 1920s, many communities of the Los Angeles basin welcomed oil development and moved aggressively to incorporate oil fields within their political boundaries to capture the tax revenues that oil activity produced. Government officials and business entrepreneurs alike saw oil an engine of local population and manufacturing growth: goals that were compatible with contemporary cultural values. In the tri-county area, the city of Ventura closely followed this urban development model. By contrast, Santa Barbara and San Luis Obispo opted for qualitative growth on a non-industrial model.

Compatibility, then, has much to do with historical timing. Prior to World War II, oil was compatible with most industries and communities throughout California. Places where oil was incompatible invariably were communities with beachfronts that valued the amenities associated with tourism, resorts, and leisure: Santa Barbara, Montecito, and Summerland. Even during the "exuberant era," oil was generally not welcomed in these communities. Above all, however, for the tri-county area, timing of oil development and building of oil-related infrastructure is the most important factor in assessing the compatibility of the industry with other land uses, rural or urban.

As oil development encroached on expanding and increasingly urban communities, land use and values conflicts arose. In the tri-county area, this environment emerged in the 1950s, when development in state waters offshore the city of Santa Barbara became possible. Yet onshore development proceeded more or less unabated throughout the tri-county area until the city of Santa Barbara prohibited drilling within its city limits in 1953. Until World War II, in the areas in which it occurred, oil development was compatible with cultural values. The negative aspects of the oil industry included physical and economic waste of natural resources, incompatibility with aesthetic and social values, and the industrial infrastructure that accompanied production, transport, and refining of crude oil. All objections on these grounds were local and narrowly construed; activity was not viewed in systemic or environmental terms. Even Santa Barbarans who objected to oil activities within their city on aesthetic grounds applauded the development in nearby Goleta for its potential to provide "much additional prosperity" to their city, as one editorial put it (*Santa Barbara Morning Press* 1928a). Moreover, as Lima (1994) observes, given the extant regulatory regime, property owners who objected to oil development in their vicinity had to file nuisance cases in court. State regulation regarding onshore development has been permissive historically and had nothing to stay regarding tidelands development until after World War I.

With the exception of the Cuyama valley, oil development occurred in areas that diversified and advanced economically over time. Institutions of higher learning and military bases became large employers during and after World War II. Owing to their climate, natural amenities, and small town character, many coastal communities attracted migrants who wanted to preserve the character of their new homes. Historically, "the Santa Barbara alternative" meant an alternative to the Los Angeles model of urban development that was emulated in part or in whole by California communities from San Diego to San Jose. In a reinterpretation of the findings of SB I, SLO I, and VC I, Part I of this study argues that in the "exuberant era" Santa Barbara, rather than Ventura, was exceptional. Over time, tri-county communities such as San Luis Obispo developed attitudes and policies that would protect their distinctive character from the industrialization that came with offshore oil development. That is, they opted for the Santa Barbara "alternative."

In the postwar period, oil (as a heavy industry) became less compatible with an emerging post-industrial tri-county economy that valued tourism, recreation, and "clean" or "high-tech" industries. Oil was also squeezed by demographic trends: the suburbanization of much of Ventura county, on one hand, and the in-migration of people to coastal communities in Santa Barbara and San Luis Obispo counties who had the same interest as long-time residents in preserving the "small town" atmosphere of these cities and towns, on the other. The path dependency associated with prior land use ensured that properties that were used for oil activity continued to be operated as such. Yet, by the 1980s, unproductive oil leases were yielding to golf courses and suburban tract home development. Oil activity was not necessarily compatible with agriculture during this period, either, especially in areas where specialty crop production emerged as a major economic activity.

The persistence of large land holdings was another factor that influenced social and economic development in the tri-county region, though among the studies this factor is most tightly linked to Ventura county development. This study will have more to say about patterns of land ownership. Suffice it to say here that, at the time of the Civil War, all of southern California consisted of large land holdings. The ranchos of the Spanish and Mexican eras had largely passed into American hands, but slow economic growth provided no impetus to break these holdings into smaller plots for Americans seeking agricultural land. In the late nineteenth century, much of the Los Angeles basin was broken into town lots or small farms (Cleland 1941: 220–242). Economically isolated, much of the tri-county's land remained in large blocks. Entrepreneurs acquired many of these tracts for purposes of oil exploration and development soon after the Civil War. When their search for oil failed to develop commercial quantities of crude oil, their owners began to divide them for sale as agricultural lands. Nevertheless, many land holdings remained large. On many of these tracts, oil was eventually found. Overall the relative lack of urban development in the tri-county area meant that large oil lease blocks were available to the firms that developed some of the area's largest fields. Even when large landholding were broken up into small farms, oil firms often retained the mineral rights, which was another factor that facilitated the development of fields by small numbers of operators (Hutchinson 1965a: 65–79, 101–132; Ventura County Historical Society Staff 1957). Thus, except on the Mesa in Santa Barbara, tri-county oil field development was not characterized by the town lot activity experienced at Santa Fe Springs, Signal Hill,

Huntington Beach, and other Los Angeles basin communities.[6] Large land holdings partly explain the finding of Bain (1944) that the oil industry in the coastal region was relatively more concentrated and controlled than in either the Los Angeles basin or San Joaquin valley, the two other oil-bearing regions of California.

Economic diversification over time ensured that the tri-county area did not "overadapt" to oil in ways that created problems of adjustment for communities along the Gulf coast during downturns in the industry, as described by Freudenburg and Gramling (1994b: 40–41, 92–95, 126–136). Indeed, as an oil bearing region, much of California, including the tri-county area and the Los Angeles basin, was atypical in that it occurred in the midst of, or in close proximity to, major urban centers with public infrastructure in place (Olien and Olien 1982: 61–62). From the late 1880s, the tri-county area was linked by railroad to statewide markets. Thereafter, only the Cuyama valley depended on oil as much as communities such as, for instance, Midland in the Permian basin in west Texas (Olien and Olien 1982). Agriculture was, and remains, a viable industry. Indeed, today Santa Barbara and San Luis Obispo counties support thriving wine making businesses. Further, oil itself created the basis for self-sustaining economic growth in Ventura and Santa Barbara counties. Numerous companies that were created to support oil-related activities no longer depend on local production for their viability (Molotch, Wooley, and Jori 1998). With World War II, the military established a significant economic presence in all three counties, though on a much smaller scale than in Los Angeles, San Diego, and the San Francisco bay area, as detailed by Lotchin (1992). The postwar growth and development of the California Polytechnic University at San Luis Obispo and the University of California at Santa Barbara had a significant impact economically on both cities. Each institution played considerable roles in shaping the political climate of the counties in which they are located.

The coastal region enjoys a climate and natural beauty that historically attracted tourists, wealthy elites, retirees, artists, workers, and entrepreneurs. In addition to Santa Barbara, a number of coastal communities began to thrive as tourist and recreational destinations. Even the people of Ventura—who, like the residents of Los Angeles, remained for many decades "an inland people," as Cleland (1959: 286–287) put it—looked to attract tourists to their city as the economy that oil directly and indirectly supported gradually diminished. The oil industry had a significant impact on many tri-county communities, but there have been many other sources of economic growth recently for them.

Local views on oil companies as corporate citizens correlate with the size of the industry in community-specific terms. Where the industry maintained a large and enduring presence, as in Ventura and Santa Maria (and their respective hinterlands), benefits in terms of employment, royalties, and dividends, tax and direct contributions to schools, the United Way, and other institutions, sponsorship of local activities such as Little League, and the prominent participation of entrepreneurs and employees of oil and oil service firms in civic life, built reputations that even the largest of pollution events has failed to destroy. Elsewhere in the tri-county area, the lack of sustained or significant oil activity has meant that many residents have

[6] On town lot drilling in Los Angeles during the 1920s, perhaps described most vividly by Upton Sinclair in his 1926 novel *Oil!*, see, for instance, Beaton (1957: 171–188); Tompkins (1964); Tygiel (1994: 18–35).

no personal ties to, or interests in, the oil industry. Pollution events, such as the 1969 oil spill and the contamination of Avila Beach and the Guadalupe and Nipomo dunes, and the manner in which Union, the perpetrator in all three cases, handled them, confirmed the image of oil firms as less-than-stellar corporate citizens in the minds of many residents and groups. In all three aforementioned events, the Union behaved in ways that reinforced residents' unfavorable views of the oil industry (and, not incidentally, the public agencies that regulated them) (Sollen 1998; Beamish 2000; Beamish 2001). Recent public relations efforts of oil companies to establish their bona fides as environmentally sensitive organizations have to contend with regional newspapers and local groups that keep these pollution events in the news.

Political climates in all three counties expressed the social, economic, and cultural concerns of residents. The oil industry exerted an influence in the districts in which it established and maintained a strong presence. Indeed, in the case of Ventura, oil company employees and their family members served in local government, including the city council (Molotch, Freudenburg, and Paulsen 2000: 803). In areas in which the presence of the oil industry was weak or not sustained during a community's formative years, politics expressed a bias that viewed all large-scale industrial activity, not just oil, with skepticism. Reflecting the desires of residents, politicians worked to preserve ways of life that valued the natural environment and nurtured economies that depended on non-industrial activity for their vitality.

This is not to say that these communities rejected the idea of urban growth. Rather, local politicians and their supporters promoted growth in qualitative ways that were consistent with local values rather than along the quantitative lines envisioned by boosters across the American West in the nineteenth and twentieth centuries. (Los Angeles of the 1920s offers perhaps the boldest and most undiluted expression of the latter approach [cf. Starr 1990: 65–119; Tygiel 1994: 8–16]).[7] In Santa Barbara, for example, the local political climate favored the building of infrastructure, such as Cachuma Dam, that enabled the city's population to more than double from 1930 to 1970, and wanted the city's built environment to express the post-1925 earthquake vision of the city's Plans and Planting Committee. During this period, Santa Barbara promoted proprietary capitalism—owner-operated service, craft, and light industrial firms—built homes, and attracted a University of California campus. "Slow" and "no" growth politics came later, accompanying the local environmentalism accelerated by the 1969 Santa Barbara oil spill.

The qualitative path that Santa Barbara charted during the interwar period was one that many California communities began to emulate several decades later, when the costs of quantitative growth were perceived to have overwhelmed its benefits. As SLO I documents, as early as the interwar period the political climate of San Luis Obispo also favored a planned approach to urban development, and sought to preserve the city's small-town quality of life. In these efforts, politicians and their supporters were aided by a lack of economic growth generally from the 1930s and 1960s, and, as indicated, a lack of industrialization associated with the oil (or any other) industry. Thus, with respect to environmentalism, the studies (SB I, SLO I, and

[7] For a categorization and discussion of urban growth strategies, see Miranda and Rosdil (1995).

VC I) characterized Ventura county as "weak" and San Luis Obispo and Santa Barbara counties as "strong," though it must be kept in mind that these generalizations mask stark and significant differences within both Ventura and Santa Barbara counties.

Newspapers historically played a key role in shaping, reinforcing, or reflecting the political climate of the three counties. SB I, SLO I, and VC I devote considerable attention to newspaper coverage of, and editorial opinion on, key events, hearings, and referenda of the "environmental era." For this period, unsurprisingly, the *Ventura Star-Free Press* generally supported the oil industry. The *Santa Barbara News-Press* was generally environmentalist, though its editorial position was more moderate and more supportive of business and development generally than the more stridently environmentalist *San Luis Obispo Telegram-Tribune*.

No systematic attention was given to newspapers prior to 1969 as boosters or critics of either local development generally or oil activity specifically. VC I notes the support of the *Ventura Star-Free Press* in a discussion of the "Oil Progress Week" special sections that appeared annually in the newspaper during the early postwar period. SB I gives some coverage of editorial opinions of Santa Barbara newspapers regarding particular oil activity from the 1920s through the 1950s. Elided, however, is the stance that both of the city's daily newspapers, the *Morning Press* and the *Daily News*—which merged in 1938 to form the *News-Press*—took with respect to oil, and the detailed and regular coverage of oil field activities that both of them provided in their business and financial sections throughout the "exuberant" era: one indication of the generally high level of local interest that the industry generated. During the early postwar period, Howard Kegley's "Oil Field News" was a regular feature of Thomas M. Storke's *News-Press*. Storke—a leading booster of Santa Barbara growth in a manner consistent with its values—counted Kegley and numerous oil entrepreneurs among his friends (Storke 1958: 293–295). While both newspapers opposed heavy industrial, and thus, oil, development within the city boundaries of Santa Barbara, and adopted a conservationist stance with respect to the physical and economic waste of oil, neither paper was "environmentalist" in any modern sense of the term. Of the Santa Maria valley and San Luis Obispo area newspapers, little is said about them as local institutions prior to 1969 in either SB I or SLO I, though each study employs them as sources in support of their respective narratives.

In sum, the researchers developed a number of key factors and themes from a historical review of local urban and industrial history, and conducted original research that shed light on the variety and intensity of local responses to the oil industry since the 1969 Santa Barbara channel spill. The conclusions that the studies reached are broadly supported by the historical record, though, as this study attempts to show, further research would deepen our understanding of particular and significant aspects of the relationship of the oil industry to local urban, social, and economic development. At the same time, as these studies demonstrate, contemporary attitudes with respect to ongoing oil activity can be explained to a great extent by developments over the past thirty years.

Charting the Post–World War II Oil Industry in San Luis Obispo, Santa Barbara, and Ventura Counties

The research team that produced SB II, SLO II, and VC II provided a historical analysis of the oil industry for the period from 1950–95, and projected the industry's future to 2015, in each of the three California coastal counties. It did so through a number of methodological approaches that documented the presence of the industry, and considered the impacts and consequences of that presence. A number of articles were produced from the research performed for these studies. Those that have been published to date include Molotch, Freudenburg, and Paulsen (2000), Beamish (2000), and Beamish (2001).

In terms of space, each of the reports devoted the most attention to the functional presence of the industry. For illustrative and organizational purposes, the reports provided an overview of the basic functions of oil and gas extraction, including leasing, drilling and well maintenance, storage, and transport. Owing to the predominance of upstream activity in the tri-county area—the bulk of downstream processing of the tri-county's production took place historically in the Los Angeles or San Francisco metropolitan areas—the studies paid close attention to the industry structure in terms of the factors that accounted for the number and mix of majors, large independents, and small firms that operated in the region throughout the lifecycle of the extractive region.[8] This analysis was based on the technical appendix produced by Adamson and Bergstrom (1998): a compilation of all tri-county onshore and offshore operators for the period under study, with data on the fields in which they operated, type and location of firm, and organizational notes gleaned from a variety of sources. Discussion of how oil supply and service firms adapted to the contraction of the local industry, drawing on earlier MMS-sponsored work by Molotch, Woolley, and Jori (1998), and a valuable review of the opportunities for environmental consulting firms that the decline of the extractive region produced, completed the discussion of industry structure. Separate sections, relating to business functions of the industry, addressed labor and labor conditions as well as technological innovations motivated by the unique geophysical conditions that offshore operators encountered in the Santa Barbara channel.

In a number of areas related to the socioeconomic impact of oil activity, SLO II, SB II, and VC II summarized and/or extended the findings of their predecessor studies. To quantify the economic impacts of the oil industry, economists on the research team performed an

[8] In this report, a "major" is an integrated firm with upstream and downstream operations. Its operations do not have to be national in scope. The majors in California all had pipelines, refineries, and wholesale or retail distribution outlets. Independents are foremost exploration and production companies, though many large independents operated refineries and some even had distribution outlets. The difference between a large and small independent is a matter of size and scope. Small firms generally confined themselves to a field or a district. Large independents generally operated across one or more of the state's three regions.

The upstream segment is comprised of three functions: (1) exploration, or the search for new reserves in places where entrepreneurs or scientists believe them to exist, (2) development, or the installation of production facilities to extract newly-discovered oil and further drilling to maximize the output of a field or pool within a field, and (3) operation, or managing the production of a developed area, including the maintenance of wells to extend the productive life of the reserves. Downstream activities include transportation, refining, and the wholesale and retail distribution of refined products.

econometric analysis that assessed the impact on income of offshore oil activity; others produced data on employment, tax payments, and philanthropic contributions. The information on tax payments and employment updated the data presented in SLO I, SB I, and VC I. The data produced on philanthropic activity, which included a listing of recent contributions of fifteen firms, covered the period from 1987 to 1996. A section on local support and opposition summarized that findings of SLO I, SB I, and VC I, adding only brief discussions of recent corporate contributions to county political campaign contributions and related lobbying efforts. Similarly, a discussion of the regulatory context of local oil activity, which focused especially on the environmental laws governing offshore development, summarized and extended the findings of SLO I, SB I, VC I, as well as those of Lima (1994: 356–371). It provided additional data on industry environmental compliance costs at the national and local levels, and provided a compendium of environmental laws and regulations governing oil and gas exploration and production. The studies also extended the findings of Lima (1994: 239–253, 322–327) regarding the impact of offshore development on the operations of city and county government by discussing the departments and agencies that have been created to provide planning and regulatory oversight. Finally, the research team projected the local impacts of future offshore development scenarios that MMS provided.

The sources used in the study included annual reports, newspaper accounts, state and county government publications, oral interviews, census data on employment and other socioeconomic indicators, environmental impact reports (EIRs), telephone and city directories, oil industry directories, trade publications, and company histories. The methodologies employed by the researchers varied by section; the team itself and its advisory committee included economists, geographers, historians, political scientists, and sociologists.

In terms of the impacts of the oil industry on the tri-county area, the studies reinforced the findings of SLO I, SB I, and VC I in terms of local support and opposition, local regulation, and economic benefits, even as they contributed in new ways to what we now know about those impacts. In Ventura county, the oil industry was much more economically significant than in Santa Barbara county, which in turn benefited economically to a greater extent than San Luis Obispo county, which had little onshore oil production and hosted no onshore processing of offshore production. Ventura county has given much more support to oil activity, and regulates it much less, than either Santa Barbara or San Luis Obispo counties, both of which have severely constrained offshore activity through restrictions on new onshore support infrastructure.

The significance of the oil industry to each of the three counties remains unclear. The econometric analysis relating per capita income to offshore oil production from 1969–93 suggested tentatively, and in carefully worded terms, that production did not have a significant effect on income. That is, had no offshore oil activity occurred, the economic well-being of each of the three counties would have changed little, owing primarily to the substitution effects of other economic activity. Specifically, the researchers disputed the $727.4 million to $991 million positive gain on the economies of the three counties that the Western States Petroleum Association (WSPA) found in a 1997 study, *The Economic Contribution of the Oil and Gas Industry in the Tri-Counties*. The WSPA report relied on the multiplier effect to

estimate gains; the research team in SLO II, SB II, and VC II argued that the "crowding out" effect on other economic activities negated most of the gains. The latter performed a regression analysis of the effects of oil and gas production on county income. In a way that tried to account for the negative impact of the "crowding out" effect, the researchers tried to determine the impact on county income from offshore production from 1969–93 by analyzing income from 1950–93.

The study concluded that the estimated contribution of offshore oil production to the adjusted gross income of Ventura county was $299 million. For Santa Barbara and San Luis Obispo counties, the results were $192 million and negative $187 million, respectively. But large confidence intervals associated with these data suggested that the estimates were imprecise. The latter figure was discounted by the researchers, who concluded on the basis of other analyses that offshore oil "has had no appreciable effect on the welfare of the citizens of San Luis Obispo County" (VC II: 2.1.11). Then the analysis considered negative impacts on per capita income in Santa Barbara and Ventura counties, and reached the conclusions already noted.

The economists who performed the work conceded that the study was "admittedly imperfect" and its results were "somewhat inconclusive" (cf. VC II: 2.1.13, 2.1.12). Nevertheless, this aspect of the study was its most visible and controversial (Polakovic 1999). The reports generalized the results to include both the 1950–1968 period and onshore activity in both the study results and introduction sections of each of the three reports. The narrative of Section 2.1: Econometric Analysis of SLO II, SB II, and VC II indicates that the researchers are addressing the impact of offshore exploration and production only on per capita income for the 1969–1993 period. Nonetheless, for instance, VC II concludes that "although oil activity has been a steady part of the local economies over the period of our study, the region would have been equally as well off economically had there been no such activity" (ix). This seems to overstate the carefully worded conclusions of the researchers who conducted the econometric analysis. At best, the broad conclusion points out the growing diversity of the tri-county economy in the post–World War II era and the diminishing contribution of the industry within it. Potentially, other activities may have substituted for oil industry employment during this period. Yet the reports offer no specific scenarios regarding what the economic and urban history of the region may have been like had there been no oil in the ground, or what may have constituted historically possible alternative paths. Indeed, the counterfactual scenarios implied by the statistical analysis are ahistorical, given the large role played prior to, and during, the 1950s by the oil industry in the economic, social, demographic, and urban development in parts of the region. This is especially true for Ventura, described in VC I (38) as "something of a…single-industry town" during the 1945–68 period, and the cities and towns of the Santa Maria and Santa Clara valleys. What is clear from a reading of SLO II, SB II, and VC II as a whole, however, is that whatever the economic impact of the oil industry on the tri-county region may have been, it has diminished substantially from its post–World War II peaks, and that the decline has been especially marked after 1985.

The principal focus of SLO II, SB II, and VC II was on the activities of oil firms themselves, for the purpose of constructing an "industrial history" of their ongoing local presence, both offshore and onshore. The studies described the sequence of functional activities in which oil

firms remained engaged locally, and showed how different types of firms sought and produced crude oil from the region's fields from 1950–95. Substantial actual and potential onshore and offshore oil reserves supported a competitive industry structure of many corporations of various sizes and numerous partnerships and proprietorships. As the narratives of all three studies describe, and as Adamson and Bergstrom (1998) show, seven major firms dominated local exploration and production until the mid-1990s. Yet more than 1,050 firms operated locally during the period of the study. As figures presented elsewhere in this study show, local oil-related activity sustained more than 220 operators throughout the 1950s during a final, and largest, "boom" phase of the extractive region. Owing to the drop in exploration, the number of operators subsequently dropped off rapidly to a range of 135 to 150 during a period of a period of stable onshore production. This statis lasted until the mid-1980s. Thereafter the number of operators declined significantly.

The seven majors—General Petroleum (Mobil), Richfield (ARCO), Shell, Standard (Chevron), Texaco, Tidewater, and Union—used their capital and managerial expertise to establish dominant positions in the tri-county onshore and tidelands areas.[9] Yet there remained room for large independents and small firms to explore for oil and operate producing properties. The researchers identified three "generations" of large independents that engaged in tri-county exploration and production, and tracked numerous small firms that did business through the vehicle of the non-integrated corporation, partnership, or proprietorship.

A number of factors contributed to the diversity found in the industry structure over time. They included expected and actual discoveries of onshore fields in the 1940s and 1950s, decisions of major firms to invest in opportunities elsewhere, the stable—yet relatively high level—of production sustained from the 1960s until the mid-1980s, relatively low barriers to entry in exploration and production, leasing patterns, and the presence of independents and small operators from the prewar period. While managerial and technical expertise, as well as substantial amounts of capital, gave major firms competitive advantages, supply factors, such as the relative attractiveness and extent of local reserves, and demand factors, such as price, remained at least partially outside the control of the integrated firms.

The pattern of increasing or sustained production, interrupted by periodic bursts of exploration activity, suggests that opportunities for independents did not increase during a competitive moment of exploration and production in the late nineteenth or early twentieth centuries and decline thereafter as upstream activity became concentrated in the hands of majors. Instead, non-integrated firms maintained their presence in the industry structure. Barriers to entry onshore remained low. Further, majors found it uneconomic to devote substantial resources to buying out the properties of independents and small firms. Moreover, as Part III of this study elaborates, majors for the most part declared the tri-county extractive region to be non-strategic, and transferred many producing properties to large independents, who now dominate

[9] Humble Oil and Refining, the production arm of Standard Oil of New Jersey (Exxon), was active onshore during the post–World War II period, but did not establish a dominating presence. The offshore situation was an entirely different matter. There, Exxon was, and remains, the leading operator in the Santa Barbara channel.

local onshore (and, increasingly, offshore) production that is some 80–90 percent off its early 1950s peak as of 2000.

Majors and large independents routinely employed the latest technological advances in their operations. Smaller firms generally relied on traditional technology throughout the period, though by the 1990s, horizontal drilling, long-reach lateral wells, computer-enhanced geology, improvements in pumping capability and hydraulics, and improvements in drilling became more cost-effective for them. Yet, since all firms during the period of the study contracted with oil service and supply firms to provide supplies and equipment, capital, rather than proprietary resources, increasingly determined access to technology. By the 1990s, state-of-the-art exploration and production technology was well within the reach of large independents, and was becoming increasingly cost-effective for small firms as well.

The tax and regulatory environment affected the size of the industry to a greater extent than its structure. This was particularly the case for offshore development, where regulatory constraints limited state and federal lease sales and development. Onshore activity was much less affected. One important reason was that California's conservation regime was far less severe and restrictive than it was in states such as Texas, Louisiana, Oklahoma, Kansas, and New Mexico. Indeed, until the 1970s (when supply and demand factors overwhelmed the policy) the state benefited enormously from market-demand proration (MDP) in these states. California maintained its share of the national market despite the rise of major mid-continent producing areas after 1927. Rather than practice MDP, California relied on its 1931 spacing law to regulate onshore production well into the postwar period. To the extent that regulation imposes costs on the industry—the cost of environmental compliance increased substantially since 1966, for instance—the level of oil-related activity is smaller than markets might dictate. On the whole, however, the industry-specific characteristics of oil exploration and production, the segment of the oil industry that has been dominant historically in the tri-county area, were more determinative of the structure of industry than tax and regulatory policy.

The number of operators and the oil-related activity they generated determined the size and structure of the service and supply sector that supported it. SLO II, SB II, and VC II added little to what SLO I, SB I, and VC I provided in this area, other than to concentrate the discussion in a section that provided a useful overview of trends and an illustration of the various ancillary functions of the industry. This section on basic processes and linkages (3.1 in all three reports) also offered a summary of the storage, transport, leasing, and processing functions that occurred locally, and an inventory of all thirteen onshore processing facilities in Ventura and Santa Barbara counties that currently support offshore production. No comparable inventory was produced that details the infrastructure that has supported onshore production. Comprehensive attention to leaseholders and the service and supply sector over time would have deepened our understanding of oil activity and local attitudes toward it. However, each of these tasks are time consuming, comparable to the effort expended in producing the inventory of operators (Adamson and Bergstrom 1998), and were generally outside the scope of the project. VC II, however, used city directories to provide figures on the number of supply/service firms and contractors along Ventura Avenue in 1975 (67 firms) and 1996 (21 firms), down from the 83 firms reported for 1955 in VC I (VC II: 3.1.8, 3.1.9).

Still, there is no information on types of firms and their size. Overall the use of examples in section 3.1 of the reports adequately illustrates the historical trends and processes that are relevant to these functions that supported exploration and production.

For each of the three counties, the team considered three possible future scenarios for offshore development: no new projects, one new slant drilling project, or two new slant drilling projects (see section 8 in SLO II, SB II, and VC II). The Molino Project undertaken by Carpinteria-based Benton Oil and Gas in 1998 in the Molino, Gaviota, and Caliente fields located thirty-five miles west of Santa Barbara (see map 1), indicated how such projects would proceed in Santa Barbara county—a blueprint to which SB II conformed. Indeed, while investigators conducted their research, Benton acquired a 40 percent interest in the fields from the Molino Energy Company and used "slant drilling" techniques to drill an exploratory well from an onshore site, one of two "grandfathered" locations in which oil and gas activity is permitted by the county without a public approval process. Drill stem tests proved to be "inconclusive or non-commercial." In late 1999 Benton abandoned the project to concentrate on existing producing properties (Benton Oil and Gas Company 1998; Benton Oil and Gas 2000b: 16). Thus one of the future scenarios was being realized even before the researchers were able to publish their results.

Quite properly, each of the studies concluded that the economic impacts of each of these scenarios would be minor. The exercise also provided an opportunity to review the political factors involved in project approval/rejection among the three counties that would be affected by any slant drilling from an onshore location. Yet the scenarios under consideration did not encompass all the possibilities of offshore activity, given technological, industrial, and economic trends. Since the mid-1990s, new entrants in offshore production, such as Nuevo Energy and Venoco, have acquired the assets of major operators and have invested in offshore activity within the limits imposed by state and local government. They also have petitioned for permission to expand selectively in proven areas (cf. Dain Raucher Wessels 1999; J.P. Morgan 2000; Nuevo Energy Company 2000; Venoco 2000; Nuevo Energy Company 2001; Venoco 2001). Ultimately, the scenario building did not provide a robust basis for understanding the future of the oil industry in the tri-county area. This is not to fault the research team; they were provided the scenarios to consider by the sponsors of the study.

In contrast to SLO I, SB I, and VC I, the reports produced for this study adopted a county level of analysis. That is, there is much less focus on the principal cities of San Luis Obispo, Santa Barbara, Santa Maria, and Ventura, even as many of the conclusions of the earlier studies were applied at the county level in SLO II, SB II, and VC II with respect to the impact of oil activity. Much of the analysis addresses activity at a tri-county level, so there is much more basis for making comparisons among counties. Yet there is a lack of synthesis across sections. Sections clearly stand alone, and often do not draw on one another's information to inform their own analyses. Some of the discussion across sections is redundant, such as discussion of retrenchment by major operators in the 1980s, or repackages the findings of the earlier studies, as in discussion of local opposition. Overall, SLO II, SB II, and VC II are valuable compendia of data. The research on company- and industry-specific activity added substantially to the body knowledge on the impact and presence of the industry, the discussion

of bureaucratic responses constitutes a valuable extension of Lima (1994), and the research on local responses to industrial decline is innovative and illuminating. The studies of Beamish (2000, 2001), which examine Unocal's organizational behavior with respect to the contamination of Guadalupe Dunes in San Luis Obispo county over a period of four decades, and how this behavior, and the perceived lack of regulatory oversight that accompanied it, shaped local views of both oil companies and regulators, constitute an especially fruitful extension of the research done in association with this project. Indeed, the products of this research effort illustrate the gap in our knowledge of local industrial history between the pre- and post-1950 periods.

Plan of the Study

This study aims to (1) evaluate, review, summarize, and synthesize the findings of prior work, discussed above, in a single volume for the benefit of the public and policy makers, (2) reinterpret the findings of previous work in the context of relevant secondary works and new evidence, where it is appropriate and where it may prove useful, and (3) review projections about the future made in prior work in light of technological advances, structural changes and trends in the oil industry, and events related to offshore oil since 1995. It aims to assist the public, policy makers, and future researchers in understanding the historical context of contemporary perceptions of oil activity. As such, it may help them draw conclusions on a number of issues, including: (1) the extent to which energy firms operating in the region may be expected to have a future interest in developing the tri-county extractive region, (2) the relationships between technological advances and policymaking, and (3) how future OCS and onshore activity may impact coastal communities. The study also aims to help policymakers evaluate the need for further study of the socioeconomic impact of both oil activity and MMS decision making on the extractive region. As a review of prior work, the scope of this study does not permit a comprehensive or systematic investigation into all of the areas discussed herein that call for additional research. Where appropriate, it identifies future research needs.

The first part of the study is the most extensive. It extends and reinterprets prior research and discusses local oil development in the context of statewide and/or national trends, the functional presence of the industry, urban development and economic diversification, environmental impacts, and political responses. In all of these areas, attention is paid to the competitive, regulatory, and technological contexts of oil industry activity. The second part of the study covers these areas as well. However, it essentially summarizes prior work, and is therefore much shorter in length. The final part of the study addresses recent national and statewide trends in the oil industry, changes in the local industry structure motivated by the relative and absolute decline of the coastal area as an extractive region, and recent technological advances that have revolutionized the way in which oil companies search for and extract oil and gas reserves, both onshore and offshore. In this section, the study addresses the implications of these developments and trends for future tri-county onshore and offshore activity.

The location of oil, rather than political boundaries, provides the organizing theme around which the discussion in Parts I and, to a lesser extent, Part II is organized. That is, the narrative relegates the political lines that demarcate San Luis Obispo, Santa Barbara, and Ventura counties to the analytical background, and brings to the fore a focus on five areas, four of which are comprised of a principal city and its hinterland of oil fields and towns. Four areas correspond to the oil basins (or parts thereof) that fall in whole or in part within the tri-county area: Cuyama, Ventura-Santa Barbara, and Santa Maria (see map 1). The fields of the Ventura-Santa Barbara basin are allocated to either Santa Barbara city or Ventura city, depending on geographical proximity, historical linkages to cities and towns, and industry-specific functional considerations. Since the research design of VC I and VC II excluded the Pico-Newhall area of north Los Angeles county, which is part of the Ventura-Santa Barbara basin, the oil activity associated with its fields have been excluded from the statistical profiles presented in this study. As White (1962) and Hutchinson (1965a) have shown, however, the development of these fields was highly integrated with the early development of the fields of the Santa Clara and Simi valleys of Ventura county. At least until the development of the Ventura Avenue field in the 1920s, the Newhall-Ventura region was considered one area for statistical purposes, and a couple of fields straddle both Los Angeles and Ventura counties. For their part, the oil fields of the Cuyama valley have no principal city per se, but are geographically associated with the San Joaquin valley and have been oriented historically toward Bakersfield.

As will be shown in Part I, the cities of Ventura and Santa Maria were centers of industrial activity that served substantial oil hinterlands. From a glance at map 1, Santa Barbara may appear to serve a large hinterland as well. In fact, historically this has not been the case. In contrast to oil activity centered on Ventura and Santa Maria, onshore and tidelands oil development in and around Santa Barbara was flush—that is, it dissipated quickly after a short period of high production—and was concentrated in two brief periods: 1928–38 and 1958–69. Early on the city of Santa Barbara rejected the use of its harbor for oil storage and transport infrastructure. For its part, Cuyama valley production was confined to the post–World War II period. Like Santa Barbara, its production was flush, although its initial output was far more substantial than any Santa Barbara production, including fields in state waters. For all intents and purposes, San Luis Obispo had no oil hinterland, and only one field in its vicinity sustained commercial production.

This approach accommodates the historical analysis in several ways. It provides critical explanatory power to arguing the thesis that the presence or absence of oil was the primary and overwhelming factor in oil's impact on local urban and economic development, and in understanding contemporary attitudes toward oil activity. It also eliminates the unit of analysis problem associated with aggregating data at the county level. At the same time, it permits the analysis to retain the valuable focus of Lima (1994), SB I, SLO I, and VC I on the principal cities that interacted with oil activity. Moreover, it is consistent with the discussion of the area's evolving industry structure, which is tied to the geophysical lifecycle of the extractive region. This approach also reinforces the theme asserted in SLO I, SB I, and VC I that surface geography greatly influenced local development. This approach thus provides a basis for a deeper historical understanding of local socioeconomic impacts of the oil industry.

For instance, many oil fields straddle the political boundary between Santa Maria and San Luis Obispo counties (see map 1). Analyzing them separately makes little sense, at least the exuberant era.

To be sure, politics at the county level have exerted a substantial influence on offshore activity during the environmental era. Yet county political boundaries carried little meaning as far as regulation was concerned in the formative years of the oil industry. During this period, oil exploration and production was driven by the location of reserves, technology, and market conditions. The regulation or restriction of such activity occurred at the national, state, or city level. U.S. policy concerned public lands, both onshore and offshore. California policy governed most activity in non-urban areas, and was permissive with respect to onshore areas, and tidelands until the 1930s, when jurisdictional disputes with Washington developed. In the post–World War II period, local governments asserted greater jurisdiction over oil activity when it came into conflict with other land uses.

Oil production generated county tax revenues, but until county boards of supervisors and countywide referenda became factors influencing offshore activity in the late 1950s, counties exerted little measurable influence on the structure of industry, number of wells, volumes of production, where entrepreneurs sought oil, and so on. Thus, parts I and II organize data on onshore and state offshore oil production by the five groups already noted rather than by county. Data on the number and type of operators are aggregated at the tri-county level. Data on exploratory well drilling is retained at the county level, in large part owing to the effort that would be required to present it in any other way. Oil activity in federal OCS waters is treated separately, on a tri-county basis, with particular attention paid to county-level responses to the federal Pacific OCS Region program.

Part I reinterprets the exuberant era of essentially untrammeled oil activity in the tri-county area within this framework. It locates coastal California oil activity within the context of development statewide, and pays close attention to the timing and extent of this activity in particular areas, and the effects that external factors such as regulation, market conditions, and technology had on the general level of tri-county activity. By breaking out levels of production by producing area, rather than by county, this section provides the basis for discussing the crucial differences in the urban histories of Santa Maria and Ventura, on one hand, and Santa Barbara and San Luis Obispo, on the other.

Part I then discusses the industry as it operated in the region. The focus is functional, with discussions of lease patterns, exploration and production, storage and transport, refining, retail, and service and supply firms. No compilation of operators was done for the pre-1950 period in the manner of Adamson and Bergstrom (1998). Rather the discussion of the structure of industry remains largely descriptive. However, for selected years (1915, 1929, and 1941) a compilation of operators was performed, in order to provide some basis of comparison with the size and structure of post-1950 period, and to supplement the analysis of Bain (1944)—an extensive study of the Pacific Coast petroleum industry as of 1940. From the work performed by Adamson and Bergstrom (1998), there is also visibility to all firms whose pre–World War II production carried into the early postwar period. A full series of

exploratory wells by county was also compiled, which provides additional information on nature and extent of operations in the tri-county on a year-to-year basis. For the period after 1950, of course, detailed data on operators has been generated. The analysis developed for this study shows that by the 1930s, the three-tier structure of industry described in section 3.2 of SLO II, SB II, and VC II had already emerged. It also shows that tri-county activity has been concentrated historically in the upstream segment, though a number of firms had local refining operations in the period before World War II. Finally, it confirms that the decade from 1949–58 was the period of peak exploration and production for the area's onshore fields, and therefore the period that attracted the most operator activity.

The rankings in section 3.2 of SLO II, SB II, and VC II of tri-county operators in terms of producing and potentially producing wells tend to overstate the small independents' share of the market, since a high proportion of wells operated by small firms have been stripper wells, that is, those that produced no more than ten barrels per day. This study uses data from the annual reports of the California Conservation Committee of Oil and Gas Producers to portray more accurately and meaningfully the structure of the industry for the post–World War II period.

For all other functional aspects of industrial activity, the study draws largely on information provided in the studies already discussed, augmenting it with material found in secondary sources and serendipitously discovered in newspapers, company publications, and trade journals. That is, no systematic study was made of information such as county assessor records or city directories to develop historical data on leases or supply and service firms, respectively, though data on each of these activities would provide a much more richly textured picture of how the oil industry operated in the region over time. By demonstrating the path dependency of land use, a discussion of the location of onshore tanks, pipelines, and processing facilities explains the siting of onshore processing facilities in support of offshore operations.

Part I reorganizes much of the material on urban development in the earlier studies to drive a discussion of the tri-county's "boom" towns that is highly revisionist. Drawing on the analytical framework of Olien and Olien in their 1982 study of five west Texas "boom" towns of the Permian basin, this section argues that no tri-county community experienced an urban history that was similar in any way to the image of oil "boom" towns popularized in film and journalistic accounts. By placing individual community experiences with periodic bursts in oil activity in the context of the historical times in which they occurred, the discussion concludes that the long-term benefits of oil "booms" for cities such as Ventura, Santa Paula, and Orcutt outweighed any short-term costs. It draws on new material to suggest that these short-term costs were manageable and that contemporary observers welcomed the new oil activity in the impacted communities. Those who arrived in search of work were willing to endure short-term hardships for the promise of long-term economic gain. In addressing issues of employment, labor, and corporate citizenship, this discussion helps to explain the development and persistence of the favorable attitudes of communities that experienced substantial and—owing to technological advances—sustained levels of oil activity.

A discussion of regional economic diversification provides yet more insight into the lack of boom-bust urban experiences in the region. Part I relies largely on material provided in the MMS-sponsored studies to elaborate on economic diversification away from, or in the absence of, oil developement. It also draws on the large and growing literature of the impact of the military build-up associated with World War II on California to deepen the discussion of the impact on the area of defense-related spending and employment from the 1940s.

These sections provide the points of departure for a discussion of "the Santa Barbara exception." Drawing on Starr (1990) and other sources, Santa Barbara is shown to have developed a distinct character in the exuberant era that was both incompatible with industrialization and compatible with growth. Self-consciously rejecting the Los Angeles model of urban development, which had no room for controlled growth, historical preservation, or small-town intimacy, the wealthy elites of Santa Barbara established their city as a "selective and genteel" place that "represented refinement, self-impose limits, the past" (Starr 1990: 231). At the same time, leading citizens such as *Santa Barbara News-Press* publisher Storke wanted the city to grow and develop in a progressive, non-industrial manner that was compatible with its natural setting.

Even during the exuberant era, oil was incompatible with this model of urban development. However, as this section shows, Santa Barbara's attitude on oil activity was far different from the stance that the city adopted during the environmental era. Using Lima (1994) as a point of departure, it elaborates on the nature of the city's tolerance for oil development in its rural hinterland and within its boundary. The section also argues that Santa Barbara was an exceptional tri-county community demographically and socioeconomically during this period.

The final section focuses on conservation. Conservation, or the prevention of economic and/or physical waste of oil and gas production, is related to the "law of capture" in crude oil production, which states that property rights to oil are generated only when oil is pumped to the surface. Conservation directly affected California tri-county oil activity during the 1920s, 1930s, and 1940s. Moreover, as Olien and Olien (2000) show, it engaged government officials, oil industry personnel, and outside consultants in a protracted debate that yielded very little in terms of public policy nationally, much less in California. Though it is a significant issue, it is one that SLO I, SB I, and VC I largely ignore. Conservation is discussed in its national, state, and industrial contexts, and examples are offered to illustrate how firms responded locally to the issue (in terms of shutting-in wells, and so on).

Lima (1994), Sollen (1998), SB I, SLO I, and VC I document incidents that contemporary observers would have deemed pollution events. Residents objected to oil activity in cities and on beaches during the exuberant era for many of the same reasons that would motivate protesters today. Yet the remedies for such activity were more narrowly based on property damage or impairment, and not at all based on a systemic approach to protecting the environment, as it is now understood. As Gramling (1996: 38–41) suggests, oil activity until the 1960s was characterized by environmental "ignorance" and should be understood in this context. As Lima (1994) shows, the regulatory environment reflected the cultural context of industrial activity over time. In discussing oil company behavior during the exuberant era,

and the regulatory context in which it occurred, Part I provides a basis for understanding the revolution in thinking and policy that occurred in the wake of the 1969 Santa Barbara oil spill and the enormous cultural gap that environmentalism created between pro-development oil industry executives and federal officials, on one hand, and local residents, groups, and governments that wanted the oil industry out of their communities, on the other.

In addressing the environmental era, Part II moves from reinterpretation toward summary and synthesis of the findings of prior work. Part II focuses on the shift from seeking oil onshore to the search for, and development of, offshore reserves in an era of increasing urbanization, rising wealth, income, and education levels, and post-industrial economic diversification. As Lima (1994) shows, the move offshore introduced a regulatory complexity that did not apply to onshore development. Moreover, offshore discoveries were made in locations that encroached on the expanding urban area in and around the city of Santa Barbara. Finally, the scale and nature of offshore activity differed markedly from that found onshore. It was literally Big Business, requiring huge amounts of capital and involving consortia of majors and large independents.

At the same time, in describing oil's local industrial history, its socioeconomic impacts, and local responses, the discussion sustains many of the themes pursued in Part I. After the period of onshore discovery for the coastal district essentially ended in 1958, secondary and tertiary recovery sustained production levels, and thus the structure of industry. The effective end to the onshore search for new fields, of course, had implications on employment levels, the number of operators and service/supply firms, and so on, but the story from 1966–1985 was not one of onshore decline. Indeed, the more than threefold increase in real oil prices that followed the 1973 OPEC oil embargo motivated operators to undertake development drilling and secondary recovery programs that reversed production declines in many maturing fields. Here production volumes alone are shown to be a poor measure of the state of the industry.[10] In terms of the value of output, the 1973–85 period was one of marked expansion of the onshore industry, and constituted a reversal of the relatively somnolent 1960s, as far as onshore activity was concerned. Had offshore activity not been confined to existing fields for most of the decade, the tri-county area may have experienced as intense a boom as it enjoyed during the early 1950s.

From 1958–69, offshore discovery and development of state and federal OCS leases in some respects compensated for the effective end to the search for onshore reserves. Production offshore California was substantial. Like production at Elwood earlier, it was largely flush, and production from state leases in the Santa Barbara channel fell rapidly during the 1960s. Federal OCS production was more substantial during the 1970s and 1980s. Yet, owing to the regulatory and political environment, it remained far below potential output. Still, production levels do not adequately relate the impacts of onshore and offshore activity, which are qualitatively and quantitatively different in significant ways. For instance, offshore activity concentrates production by operator and by well. There is no equivalent of the stripper well

[10] For instance, California mineral production for 1924 increased by some $15 million over 1923, to an estimated $358,745,000. Even though oil production decreased by 33 million barrels, the increase in price received for a barrel of oil during 1924 more than made up for the drop in output (*Petroleum World* 1925c).

offshore, and little or no room for the small independent. Labor, capital, and technology for offshore development was much more likely to be sourced from outside the tri-county area than was the case for onshore activity. And, of course, the political response to offshore oil activity was of a different order from anything that operators encountered onshore.

Technological advances helped to ensure that no tri-county community experienced the social or economic dislocation associated with the "bust" of the mid-1980s to the extent that many communities along the Gulf coast and across Oklahoma, Louisiana, and Texas did. To be sure, large firms closed or relocated local division offices, service and supply firms shut down or relocated to Bakersfield or Houston, and the level of activity fell. But as SLO I and SB I show, local economies were far more dependent on tourism, recreation, high technology, and public sector institutions than on oil. As VC I shows, the economy of Ventura county was increasingly linked to the Los Angeles conurbation. It was diversifying in a post-industrial direction. To the extent that the region experienced a post-1950s "bust," it owed far more to failure of expected offshore development to materialize for political reasons rather than to any precipitous collapse of the onshore industry.

Part II also summarizes the findings of Lima (1994), SLO I, SB I, and VC I in describing local responses to offshore development during the environmental era. It is in this area that the focus on county polities is most relevant, as county regulation of onshore processing facilities had a substantial constraining impact on the level of offshore development. By the late 1980s, San Luis Obispo and Santa Barbara counties had taken explicit measures to restrict or prohibit additional offshore activity, and were regulating onshore activity more vigorously as well. Ventura county took no explicit action regarding offshore activity, but in the 1980s it began to scrutinize onshore activity on the Santa Barbara and San Luis Obispo models. The prior studies did an especially good job at demonstrating the extent of the county response in a number ways. Thus there is little that is new in this study in this area. It should be noted here, however, that onshore activity on federal lands, and the regulation thereof, received no systematic historical attention in any of the studies, and remains an area for future research.

Part III concerns itself with recent developments in technology and corporate strategy, and their implications for future onshore and offshore activity. It includes a discussion of industry trends and changes in local industry structure since 1986, because this era of decline is all of a piece in terms of industry structure, business opportunity, remediation, adaptation, and the like. Part III continues the discussion of the evolving industry structure, with a particular emphasis on the declining attractiveness of the extractive region for majors seeking above average returns for their shareholders, and unable to obtain that return from mature onshore fields and restricted offshore areas. The theme stressed in this section, however, is that continued investment by large independents and small firms is sustaining the life of the extractive region. New technology makes possible and economically feasible the recovery of reserves from mature fields, and a new generation of large independents has emerged to exploit these technologies. These firms tend to have lower "lifting costs" than majors do and can operate marginal fields that majors would otherwise have abandoned. They also have the capital and interest in expanding production from existing offshore leases. Thus the story for

the post-1985 period is not only one of abandonment and remediation, but one of extending the life of the extractive region.

Part III focuses its attention on technological developments and the business strategies that have driven changes in the industry since 1986. The discussion of technology draws largely on trade publications and corporate publications to describe recent advances in exploration and production technology, and discusses its recent and possible impacts on local onshore and offshore activity. Part III sets up the discussion of corporate strategy with material used in SLO II, SB II, and VC II, and supplements it with a survey of corporate annual reports and press releases. It explains why majors for the most part have left the area, and how the principal firms now active in the region plan to develop local reserves. To perform the analysis, the data on operators, production, and exploratory wells were updated through 2000. Adamson and Bergstrom (1998) have been revised to reflect this new information.

Part I. The Exuberant Era, 1865–1965

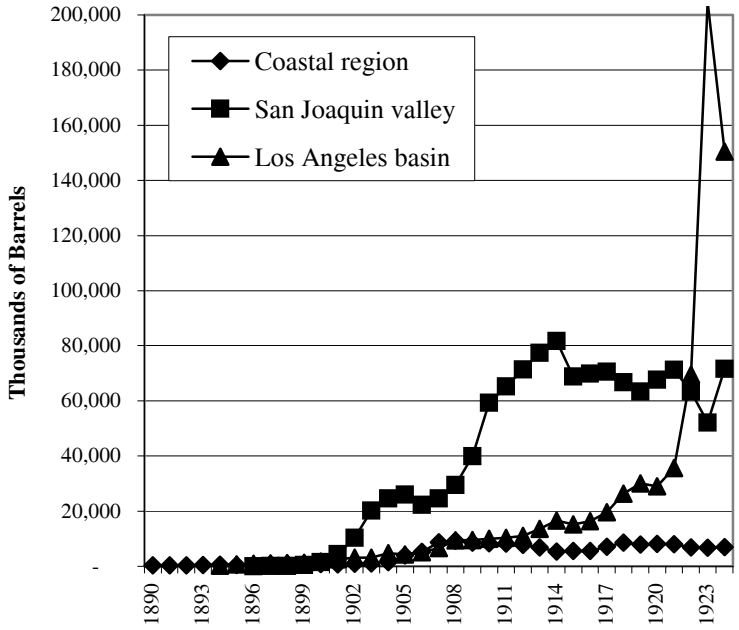
Tri-county oil activity in the period from 1865–1965 took place during a time of unprecedented cultural enthusiasm for technology, technological transformation, and modern times, and should be understood in this context. As Hughes (1989: 2–3) observes, during this period, "Americans created the modern technological nation," and, he suggests, historians "may well decide that the century of technological enthusiasm [1870–1970] was the most characteristic and impressively achieving century in the nation's history." Technological advances that thrilled the nation and were cause for national celebration became embedded in systems that included machines, processes, transportation and communications networks, organizations, and people. Though contemporary observers recognized the complexities and contradictions of technological systems, people generally lent support for building systems that they viewed as the foundation of modern life, rather than on the possible negative consequences of their creation (4–7). Further, negative consequences of industrial activity were not viewed from the ecological and environmental perspectives with which readers are now familiar. Few observers imagined any limits on what might be achieved. Culturally, this exuberance regarding the possibilities of technological achievement peaked during the interwar period (295–352). Only in the wake of the dropping of the atomic bombs on Hiroshima and Nagasaki did a countercultural movement that cast doubt on the perceived positive impacts of technological invention and improvement begin to emerge. Only after 1970 did the movement gain political and social momentum, spurred by such events as the Santa Barbara oil spill and the Three Mile Island nuclear disaster.

Tri-County Field Development

Tri-County Field Development, 1865–1941

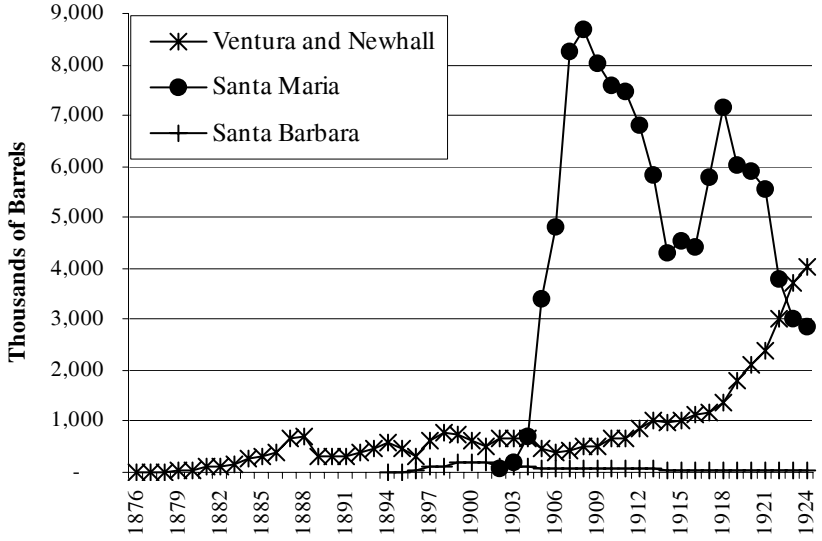
The search for oil in the tri-county area constituted the birth of the industry in California. During and immediately after the Civil War, a number of entrepreneurs who had invested successfully in the oil fields of Pennsylvania, including Thomas A. Scott, bought up large tracts of land in Ventura and north Los Angeles counties, where numerous oil seepages offered hope that great mineral wealth might be found (Hutchinson 1965a: 65–75). Capitalists from San Francisco, including Charles Felton, Lloyd Tevis, Frederick Taylor, and Demetrius Scofield, soon became interested in these lands for their potential in supplying their city with illuminating fuel, eastern supplies of which the war had interrupted (White 1962: 6–19, 23–57; Hutchinson 1965a: 235–243, 271–274). (Coal was not plentiful in California.) For more than twenty-five years, most of California's exploration, and almost all of its production, occurred in the area between the city of Ventura and what is now the town of Newhall, in north Los Angeles county. By 1900 twenty-eight field discoveries had been made in the Ventura-Santa Barbara basin (see maps 1 and 2). As figures 1 and 2 illustrate, however, commercial production during this period was quite low by twentieth-century standards, peaking at 690,333 barrels in 1888, and falling to 385,049 barrels in 1892—the year that Edward L. Doheny began developing the Los Angeles field (*Petroleum World*, 1925a).

Figure 1. California Crude Oil Production, 1890-1924



Source: Petroleum World (1925)

Figure 2. Coastal California Crude Oil Production, 1876-1924



Source: Petroleum World (1925)

Technology was simply inadequate to meet the geological challenges presented by California's oil fields. With its frequent tilts and folds in its strata, the geology of the Newhall-Ventura area was unlike anything that entrepreneurs had found in the east. In the 1860s, operators such as Thomas Bard, W. G. Adams, and Frank Thayer used spring poles or resorted to tunneling as recovery methods, after standard light cable tools proved to be ineffective. Refiners also had difficulty producing quality products from the heavy crude oil, which was high in carbon content and low in paraffin. The poor quality and high price of refining California's crude oil meant that refiners could hope to compete with eastern products only when the latter were scarce (Johnson 1970: 157). Yet during the 1860s entrepreneurs proved that crude oil was present in the region. Its development awaited only the technological advances of petroleum engineers and scientists that would enable its more economical and efficient recovery and refining (White 1970: 145–150).

In the meantime, entrepreneurs continued to search for oil. In the late nineteenth century, many firms tried their luck in California. Few succeeded. Among those that did were Pacific Coast Oil Company (1879–1906) and its affiliate, California Star Oil Works Company (1876–1901), predecessor firms of Standard Oil Company of California, and the three firms that eventually merged to form Union Oil in 1890: Hardison, Stewart and Company, Sespe Oil, and Torrey Canyon Oil (White 1962: 19–24; Hutchinson 1965b: 3–115; Pederson 1990: 9–15). All of these companies were active in the Newhall-Ventura area.

Important land use precedents and attitudes regarding the oil industry were established between 1865 and 1900 in the city of Ventura and its hinterland, to where the local industry was confined (excepting the Summerland field in Santa Barbara county, which was significant more for its offshore nature than the production it yielded). Yet the tri-county area had yet to realize its potential as an oil producing region. As of 1900, the proven acreage in the coastal district was less than 5,000 acres: an area that was smaller than many of the individual fields discovered in the twentieth century (Richardson 1972: 3). Production, including the Pico-Newhall fields, was stable at 628,734 barrels, but its share of state output, at 14.5 percent, was dwindling (see figures 1 and 2). As figure 3 suggests (albeit from incomplete data), the level of exploration in the Ventura-Santa Barbara basin remained relatively low, as entrepreneurs directed their attention to the San Joaquin valley and the Los Angeles basin. As table 1 suggests, tri-county production prior to the late 1904 completion of Union Oil's Hartnell No. 1, which inaugurated the great leap in production in the Santa Maria district, came from stripper wells at Summerland and in the canyons of Ventura county. San Luis Obipso county had no production at all. Reflecting the emergence of Los Angeles as a center for the state's oil business, Union Oil moved its headquarters there in 1900 from its location in Santa Paula in Ventura county (Pederson 1990: 28–29).

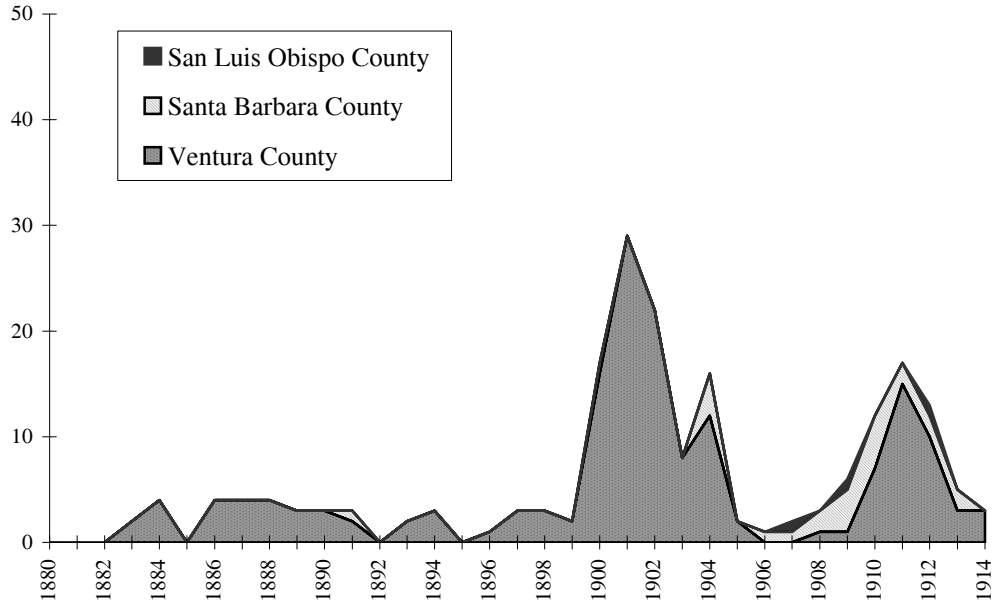
Table 1. Record of Field Operations to December 31, 1903

County	Wells Producing	1903 Output (barrels)	Wells Abandoned	Wells Drilling	Wells of Doubtful Value
San Luis Obispo	0	0	11	0	1
Santa Barbara					
Summerland	198	131,125	100	0	114
Santa Maria	21	204,890	10	18	2
Ventura	306	682,185	181	11	26

Note: Abandoned wells for San Luis Obispo and Ventura counties probably low. Ventura output includes Newhall district.
Source: Prutzmann (1904: 19); *Petroleum World* (1925a)

Driving the search for crude oil in California at the turn of the twentieth century was its use as fuel for locomotives, ships, and manufacturing processes. It could be used this way without refining, and it was cheaper than coal, which had to be imported. Through the end of World War I, some 80 percent of California's oil was burned as fuel; the balance was refined into other products. The reverse was true for the United States as a whole (Johnson 1970: 157).

Figure 3. Tri-County Prospect Wells Drilled Prior to 1915



Note: Does not include 36 Ventura county wells, 12 Santa Barbara county wells, and 1 San Luis Obispo county well listed only as "pre-1915" in Division of Oil and Gas records
Source: California Division of Oil and Gas (1982a)

Entrepreneurs such as Doheny and Union Oil's Lyman Stewart expanded the fuel oil business as a strategy to dispose of their production, which grew rapidly from the late nineteenth century (*Petroleum World* 1940: 56–58; Associated Oil Company 1922b; Ansell 1998: 87–104). Doheny's development of the downtown Los Angeles field, richly detailed by Ansell (1998: 23–51), was the first of several significant discoveries that propelled California to top of the nation's oil producing table in the early 1900s—a position it maintained until the late 1920s. The successful marketing of crude oil as fuel oil by Doheny, Stewart, and others enticed hundreds of firms to search for oil in California prior to World War I. Discoveries of giant fields—those with ultimate production of at least 100 million barrels—occurred with regularity (with year and overall rank as of December 31, 2000 in parentheses): Midway-Sunset (1894, 1st), McKittrick (1896, 21st), Kern River (1899, 3rd), Cymric (1909, 17th), Lost Hills (1910, 19th), Belridge South (1911, 4th), Elk Hills (1911, 5th), Belridge North (1912, 44th) in Kern county, at Coalinga (1890, 9th) in Fresno county, and Santa Maria, later renamed Orcutt (1901, 33rd), and Cat Canyon (1908, 18th) in north Santa Barbara county.[11] As reflected in figure 1, this burst of activity shifted the epicenter of the California oil industry to the San Joaquin valley. Fueled by soaring production at Kern River and Coalinga, California leaped from fifth among the nation's oil producers to first in three years, with 24.3 million barrels of output in 1903. Production of crude oil jumped climbed steadily until World War I, reaching 103.6 million barrels in 1914 (*Petroleum World* 1925a).

Discoveries in the Santa Maria district, which also included Union's discovery of the Lompoc field (1902) and Doheny Pacific Petroleum's discovery of Casmalia field (1917), established north Santa Barbara county as the center of tri-county oil activity through the end of World War I (see figure 2). (The serious development of Ventura county's South Mountain [1916, 36th] and Ventura Avenue [1917, 7th] fields awaited the interwar period.) As discussed elsewhere in Part I, these oil finds generated the great excitement across north Santa Barbara county and southern San Luis Obispo counties, as reported in SB I (12–18) and SLO I (9–15). Neither area had any production to speak of in 1900. The state's three dominant oil companies, Standard, Union, and Associated, became active in the district, as did dozens of smaller firms. The boom prompted the creation of the town of Orcutt, fueled the growth of other towns in the area, and helped to embed the oil industry into the social and economic relations of north Santa Barbara county. The effect was less intense in southern San Luis Obispo county, for the excitement generated by the possibility of discovering another Santa Maria field was not matched by actual success in the field.[12]

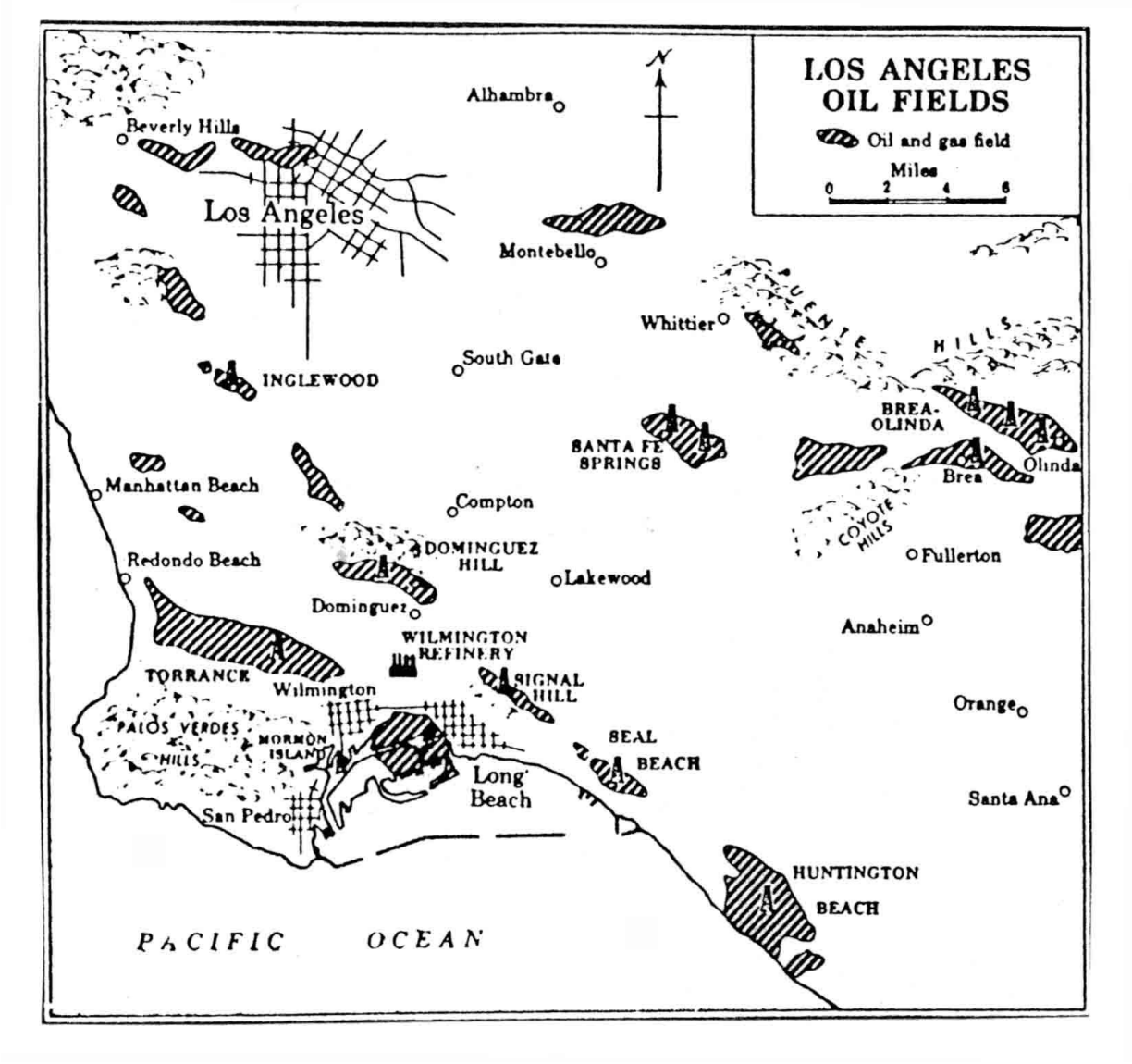
After World War I, the center of the California oil industry shifted back to the Los Angeles basin (see figure 1). For two decades, the dominant fields in California had been in the San Joaquin valley. Discoveries at Santa Fe Springs (1919, 11th), Huntington Beach (1920, 6th), and Signal Hill (1921, 8th) changed all that (see map 3). Signal Hill, for instance, proved to be the world's richest oil deposit in terms of barrels produced per acre. By 1950 this field—known officially Long Beach—had produced 750 million barrels of oil. At the time, it stood

[11] All field discovery dates and overall ranks as of December 31, 2000 listed in this study may be found in State of California (2001: 57).

[12] San Luis Obispo county had no sustained production until World War I. It reached 62,744 barrels in 1918, only fall back to 31,656 barrels in 1919 (California State Mining Bureau 1921: 18).

third in terms of cumulative output among U.S. fields, behind only the East Texas and Midway-Sunset fields. Oil production in the Los Angeles basin was so overwhelming that in 1923 it accounted for 20 percent of global output (Beaton 1957: 171–183). The development of these and other giant fields, including Montebello (1917, 32nd), Torrance (1922, 26th), Dominguez (1923, 22nd), Inglewood (1924, 16th), and Seal Beach (1924, 28th), sustained California's position as America's leading oil producer until Mid-Continent discoveries propelled Oklahoma and Texas ahead of it in the late 1920s (White 1970: 138). The state, which accounted for 36 percent of U.S production in 1923, contributed only 29 percent three years later, and its share declined throughout the interwar period (Johnson 1970: 165).

Map 3. Los Angeles Basin Oil Fields
Source: Viehe (1981). Copyright © 1981 by Sage Productions, Inc. Reprinted by Permission of Sage Publications, Inc.



The Los Angeles oil boom was fueled by the increase in prices generated by foreign demand for, and domestic shortages of, petroleum during wartime, and the postwar surge in demand for gasoline by owners of automobiles. The demand for fuel oil by the world's navies, much of it supplied by U.S. producers, ended the isolation of the California oil market (Johnson 1970). In 1916 the average price of a barrel of crude oil increased from $0.64 to $1.10. Nationally, the number of wells drilled increased from 14,157 to 24,619. By 1920 crude oil prices reached a record $3.07. Accordingly, almost 34,000 wells were drilled nationally. By 1921, moreover, there were 10.5 million automobiles on the road, up from 3.5 million in 1916, and up from less than 10,000 at the turn of the century. In 1921 the industry produced 472 million barrels of crude oil, which was more than double the output of the previous decade (Olien and Olien 1990: 25–27).

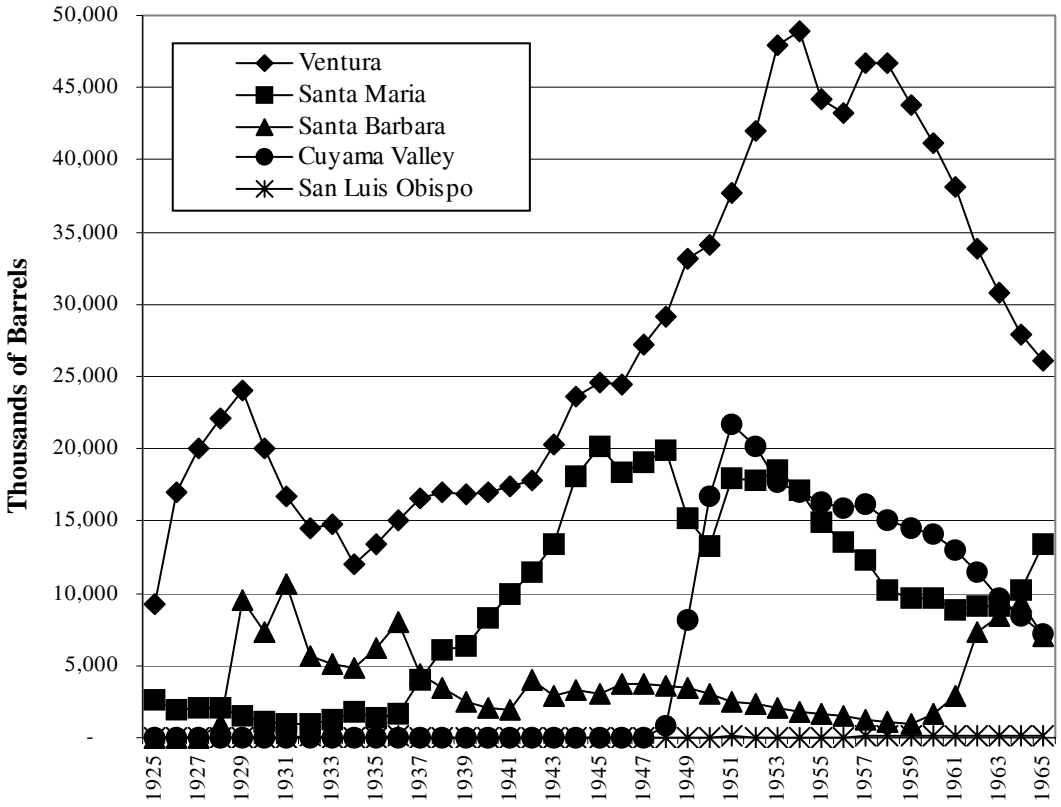
Production in the Los Angeles basin, which peaked in 1923 at more than 200 million barrels, literally fueled the expansion of the manufacturing sector. By 1925 Los Angeles was one of America's leading industrial centers. It became a national leader for the oil equipment and service industry and, as of June 1927, its refineries had a daily capacity of more than half a million barrels of oil (Viehe 1981: 13–16). Still, Los Angeles basin production, much of it flush, overwhelmed the existing storage, transportation, and refining infrastructure. Fortunately for producers, oil fields were adjacent to deep-water transportation facilities, enabling the shipment of crude oil to eastern U.S. or foreign refiners without the delay that would have been involved, had pipeline construction been required (Beaton 1957: 183–185). Indeed, shipments of crude oil led an eightfold increase in the value of the goods shipped from Los Angeles harbor from 1920–30 (Cleland 1959).

Importantly for the coastal oil industry, the Los Angeles oil boom created wealth that subsequently was deployed in tri-county exploration and production. Majors such as Shell, with some 25 percent of the production at Signal Hill, and Union, with the discovery wells and substantial production at Santa Fe Springs and Dominguez, saw their fortunes rise in step with the output of these fields (Beaton 1957: 174–188; Pederson 1990: 59–63). In the case of Shell, for instance, success in the Los Angeles basin reversed a record of failure at the Ventura Avenue field and elsewhere, and generated capital that Shell invested at Ventura, with substantial success, after 1925. Discoveries and developments in the Los Angeles basin also bred a generation of independents that invested in the tri-county area once Los Angeles basin fields began to mature in the 1930s. Until the 1970s, Los Angeles-based concerns also made up the majority of the small firms that operated in the tri-county region, and accounted for the most of the wildcat wells drilled by small firms. Finally, the suburbanization of Los Angeles, as elaborated by Viehe (1981), offered a model that was embraced in the tri-county area by communities whose residents, like newcomers to Los Angeles, sought to fulfill an industrial ideal based on disciplined work in manufacturing or oil and gas extraction, and was rejected by those communities whose residents valued a rural or small town ideal based on the cultivation of home and the preservation of open spaces and the natural environment.

Within the three counties, the epicenter of oil activity shifted to Ventura, spurred by the development of the Ventura Avenue field. There the substantial investment of Associated paid off in 1925 with a series of wells that almost quadrupled the output of the field in one

year, from 1.85 million barrels to just over seven million barrels, transforming the city of Ventura into an oil "boom" town.[13] Development programs by Associated and Shell increased field production to its pre–World War II peak of 21 million barrels in 1929. Ventura county production rose accordingly, from 3.9 million barrels in 1924 to 24 million barrels in 1929 (see figure 4).

Figure 4. Coastal California Crude Oil Production By Group, 1925-1965



Source: California State Mining Bureau (various years); California Division of Mines and Mining (various years); California Division of Oil and Gas (various years)

[13] Unless otherwise noted, field production figures may be found in the *Annual Report of the Oil and Gas Supervisor* for the relevant years. The report was issued on a monthly basis by the State Mining Bureau of the California Department of Petroleum and Gas from 1915 through July 1927, and by the Division of Mines and Mining of the California Department of Natural Resources until April 1929. Until June 1939, it was issued on a quarterly basis by the Division of Oil and Gas in the California Department of Natural Resources. Until 1973 it was issued on a semi-annual basis. It is now issued annually by Division of Oil, Gas, and Geothermal Resources of the California Department of Conservation.

Table 2. Crude Oil Production By District for Selected Years (barrels)

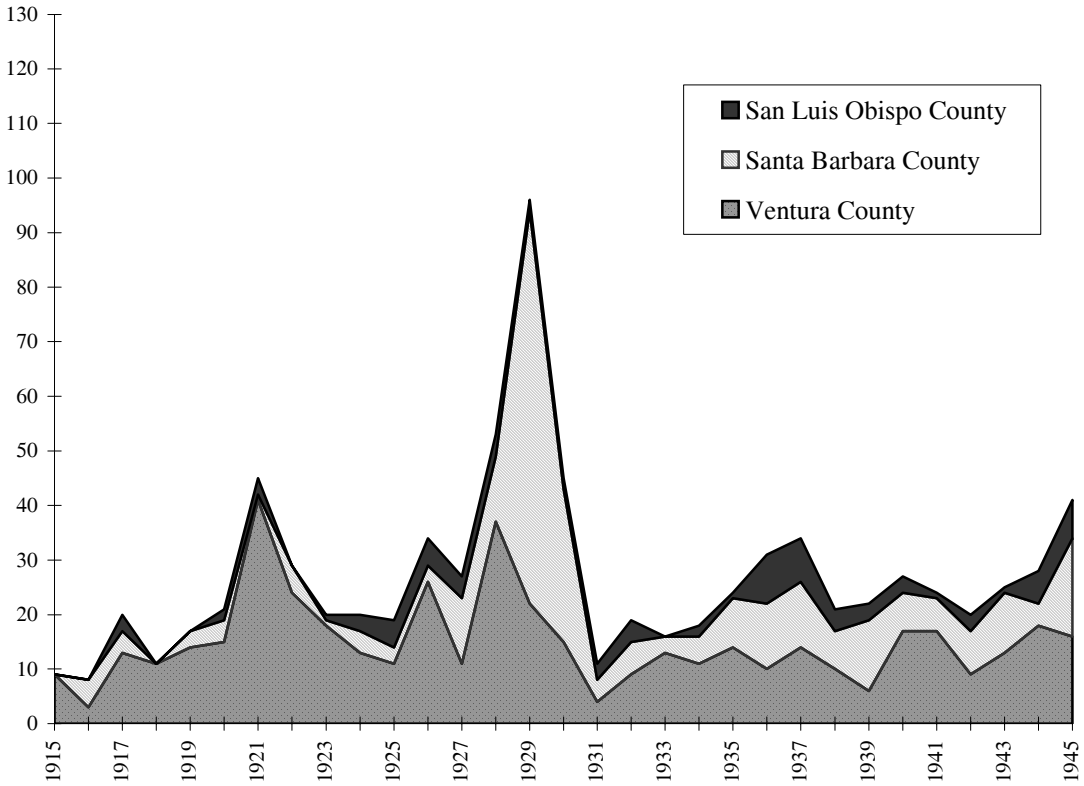
District (Counties)		1924	1936	1945
1	(Los Angeles, Orange)	150,467,050	93,190,375	117,405,992
2	(Ventura)	3,958,010	15,579,567	24,638,277
3	(Santa Barbara, San Luis Obispo, Santa Clara, Monterey)	2,951,596	7,279,121	23,176,701
4	(Kern)	61,175,405	61,795,543	110,295,670
5	(Fresno, Kings)	10,156,405	35,358,062	52,745,894

Source: California State Mining Bureau; California Division of Oil and Gas

County production during the 1920s was augmented by the development of South Mountain field and the 1927 discovery of the giant Rincon field (the 35th largest in the state as of 2001), and its subsequent development by large independents, including Doheny's Pan American Petroleum, Chanslor-Canfield Midway Oil (CCMO), and Honolulu Oil, (Shannon 1991: 351–352; Associated Oil Company 1928a; *Petroleum World* 1932). During this period, the fields that constituted "the cradle of the oil industry" in California during the nineteenth century contributed only a small part Ventura county's overall production. Union Oil and numerous small concerns continued to produce crude oil from stripper wells in these fields (Godde 1924).

Production fell off significantly over the next five years, owing to a statewide conservation program that cut Ventura Avenue output by as much as 43 percent (*Petroleum World* 1930; *Petroleum World* 1931a; *Petroleum World* 1931b). According to the state's Division of Oil and Gas, as of June 1932, only 154 of 265 wells in the field were producing oil. For Ventura county overall, only 578 of 916 wells were pumping in June 1933. Yet, for the 1930s, production figures distort the record as far as exploration and development work is concerned. *Contra* Reith (1963: 144–145), exploration in the county continued at an above-average pace until 1931, when it plummeted. Even then it did not cease, as she asserted (see figure 5). Indeed, the giant San Miguelito field (the 45th largest in the state as of 2001), was discovered in 1931 (*Petroleum World* 1932).

Figure 5. Tri-County Prospect Wells, 1915-1945



Source: California Division of Oil and Gas (1982a)

Shell and other major operators in the county certainly retrenched in the wake of the collapse in the average California price per barrel of crude oil from $1.20 in 1930 to 72¢ in 1931 (Williamson *et al.* 1963: 539). This was associated with the October 1930 discovery and rapid development of the vast East Texas oil field, which produced 1.5 *billion* barrels of crude oil in its first year, and which by 1940 contained twice the number of producing wells as all of California (Olien and Olien 1984: 56–62).[14] Still, oil activity in the Ventura district never ceased, even during the nadir of 1933 (*Petroleum World* 1934).

From 1934 development work revived. For instance, Shell and Lloyd Corporation extended the eastern limits of the Ventura Avenue field, where Associated also continued its

[14] For instance, Shell's capital budget fell from $100 million in 1929 to $16.6 million in 1931. The firm sharply curtailed drilling activity, already on the decline in 1929, surrendered $4 million in leases in 1930, let $8 million in leases lapse in 1931, and tried to farm out acreage to avoid drilling expenses. Yet the firm still had to spend $6 million on drilling during 1931 for competitive reasons or to satisfy lease conditions (Beaton 1957: 373–385). *Contra* VC I (29), Shell had great drilling success at Ventura Avenue after 1927 and cut back production only in response to market conditions.

development program (Beaton 1957: 468; Jenkins 1935b; Kegley 1953d; Lloyd 1934a; Lloyd 1935a; Lloyd 1935b; Lloyd 1936b; Lloyd 1936c; *Ventura County Star-Free Press* 1949g). CCMO, Continental, and others continued their development of the Rincon and San Miguelito fields (Adamson and Bergstrom 1998). According to *Petroleum World*, as of February 1940, Ventura county had 935 producing wells, and though actual output remained below its potential level, its production was climbing toward its 1953 peak (see figure 4).

The pattern of Ventura county exploration and production also mirrored state and national patterns more closely than other areas of the tri-county region. Nationally the number of well completions fell from 15,572 in 1929 to 6,788 in 1931. Thereafter drilling activity rebounded, with oil well completions reaching 22,386 in 1937, before tapering off to 19,552 in 1941. During the 1930s, average California crude oil prices failed to recover to the $1.20 level of 1930, but they stabilized within the $0.97 to $1.04 range from 1936–41. After falling to 172 million barrels in 1933, California oil production reached 249.7 million barrels in 1938, before falling back slightly to 230.3 million barrels in 1941 (Williamson *et al.* 1963: 537, 539, 540).

In the Santa Maria and Lompoc valleys, Union Oil, with holdings of 81.8 million acres among the four producing fields, curtailed production severely as part of a conservation program that was motivated by the crude oil flooding the market from the Los Angeles basin. In May 1922 Union shut in the majority of its producing wells in north Santa Barbara county, and kept them shut in for five years, before its production department resumed pumping on a limited basis (Matier 1927). Owing to the depression and the limited market for the oil produced in the district, development of the valley's fields was stagnant until late 1937, when Union and others began serious development of the giant Santa Maria Valley field, which the former had discovered in 1934. Even then, actual production remained far below potential production, owing to unfavorable marketing conditions for the output of low specific gravity, ranging from 10.9˚ to 18.4˚ API (Frame 1939).[15] For these reasons, production in north Santa Barbara county remained restricted until it began a steady rise through the end of World War II (see figure 4).

[15] Specific gravity weight is expressed in terms of standards developed by the American Petroleum Institute, or API, for short. The scale is an inverted one, in which lower number represent higher specific gravities. As Bain (1944: 34–38) observed, there is a considerable degree of differentiation among California fields in terms of the type of crude oil produced, and therefore also in terms of the mix of products refined from it. On a weighted average gravity basis, crude oil produced in the state in the early 1940s was heavier (and therefore of a lower gasoline content) than that in other regions. California's 27˚ to 28˚ API compared somewhat unfavorably to the weighted average of 30˚ to 35˚ API found in the Mid-continent region and the 30˚ to 40˚ found in the Texas and Louisiana Gulf area. Thus, the prices that California operators received for their production lagged those from these regions. Even within region, the crude oil produced in California varies considerably, with coastal and Los Angeles basin production generally lighter that that produced in the San Joaquin valley. Within the coastal region, for instance, the crude oil produced in the Santa Maria valley and the "backcountry" of Ventura country was much heavier than that produced at Ventura Avenue, which typically fell into the 26˚ to 28˚ API range (cf. Associated Oil Company 1925b; Associated Oil Company 1926a; Associated Oil Company 1930; Shell Oil Company 1936). Benchmark state crude oil prices were typically set at Signal Hill (Long Beach), which averaged 27˚ API, and at Rosecrans-Dominguez, which averaged 32˚ API.

While much of the Santa Maria district's production was shut in, the area in and around the city of Santa Barbara became the county's center of oil exploration and production during the late 1920s and early 1930s. Indeed, until the offshore era, the decade from 1928–37 was the only period of intensive oil activity in the immediate vicinity of the city of Santa Barbara (see figure 4). Production from the fields developed during this time was flush, however, and not sustained into the post–World War II period. Thus the timing and extent of oil activity in and around the city of Santa Barbara contrasts significantly with that experienced by Santa Maria and Ventura.

The July 1928 discovery by Rio Grande and Barnsdall, two Los Angeles independents operating jointly, of the giant Elwood field, California's 47th largest of all time, was the first major field discovery along the south coast of Santa Barbara county (Oliver 1928; *Santa Barbara Daily News* 1928). (As *Santa Barbara News-Press* publisher Storke later wrote, "the shallow 'post-hole' wells at Summerland were not important enough to count" [Storke 1958: 292].) The discovery and development of the field is of interest to this study for several reasons. The discovery set off a frenzy of wildcat and leasing activity in the area (as suggested by figure 5), from Carpinteria to Gaviota (cf. *Santa Barbara Daily News* 1929b; Goble 1930a; Goble 1930b; *Santa Barbara Daily News* 1930h; *Santa Barbara Daily News* 1930i). Under the 1921 Mineral Reservation Act, operators submitted applications for offshore permits off Capitan, Goleta, and Refugio fields in hopes of finding another Elwood. No additional giant discoveries were made, but new areas of production were found at Summerland, Capitan, and on the Mesa in Santa Barbara, the scene of extensive town lot drilling (Dolman 1938a; Dolman 1938b; Richardson 1972: 3). In the early 1930s, policy issues regarding state-federal jurisdiction over tidelands development were taken into the courtroom, which limited the amount of leasing that occurred. Still, leases that had been granted continued to be developed.

Owing to the frenzy set off by the Elwood discovery, exploration in Santa Barbara did not peak until 1929, and continued at a high rate before collapsing in 1931 (see figure 5). As was the case in the Ventura district, prospecting resumed at a moderate rate until the end of World War II. Reflecting the lack of conservation and the uncertain legal regime with respect to tidelands drilling, the pattern of production along the south coast after 1933 was not in keeping with national, state, or tri-county trends. After recovering during 1936–37, production in the Santa Barbara area collapsed, and production from the fields discovered during the interwar period never revived. In stark contrast to the Ventura, Santa Maria, and Cuyama districts, Santa Barbara experienced none of the burst in production that all three of these areas experienced after World War II. An oil hinterland never developed around the city of Santa Barbara as occurred in Ventura and north Santa Barbara counties, and the city continued to grow along the qualitative growth path that its civic and business leaders desired for it.

Technological Advances, 1900–41

During the period from 1900–41, advances in technology played an important role in the development of California's oil fields. The introduction of rotary drilling rigs, larger diameter

pipe, and diesel engines to operate main line pumping stations were especially critical to the development of fields with difficult geological structures, such as Ventura Avenue, and the transportation of increased amounts of crude oil to refineries in the San Francisco and Los Angeles areas. Continuous improvement in drilling and pipeline technology also made possible the boom of the early post–World War II that marked the peak period of onshore production for the tri-county area.

Until about 1900 operators relied on the cable drilling technique utilized by Edwin Drake, who drilled the world's first commercial well at Titusville, Pennsylvania, in 1859. Cable tool rigs relied on drills with a sharpened, solid, cylindrical bit that worked vertically in the hole. The cable drill was suspended by a wire rope and activated by a walking beam. As early operators in California discovered to their frustration, cable tools that worked well in the fields of the eastern United States were no match for the local geology. Rotary drilling rigs provided the solution. A basic rig included the hoist, or drawworks, that raised and lowered the drilling tools, a derrick that provided the structure for operating the drill pipe, a system of blocks that improved the lifting power of the drawworks, a motor-driven table that rotated the drill bit, and a pump and mud circulating system that cleaned the hole as drilling proceeded. When oil was found, the operators removed the drilling apparatus and put the well "on the pump." Thereafter the flow of the well could be adjusted for market conditions. Rotary rigs were first used to develop the Gulf Coast area. Operators fastened the bit of a rotary drill to the end of a steel pipe, or drill stem, through which water or special drilling muds were pumped in order to bore through unconsolidated sands and shales that characterized Gulf Coast oil strata. This system worked well enough for the Gulf Coast fields, but advances in bits, casing, and drilling fluids and in derrick construction were needed before rotary drilling came into general use in California on the eve of World War I (Williamson *et al.* 1963: 29–34).

Rotary rigs provided a cheaper and faster way to drill wells, and made possible the discovery and development of major fields in California. Part of the reason was that they enabled operators to bring in productive wells through so-called deep drilling. Oil wells drilled prior to 1900 seldom reached 2,000 feet in depth. During the 1900–19 period they averaged some 2,000 feet in depth, reaching an average of 3,000 feet by 1930 (Williamson *et al.* 1963: 331–332). The wells that marked the significant expansion of production in the Ventura Avenue field in 1925, for instance, were completed with rotary rigs at depths below 5,000 feet (Associated Oil Company 1925b). Indeed, by July 1927 Associated Oil was producing from twenty-three Ventura Avenue wells at depths of a mile or more (Associated Oil Company 1926a; Associated Oil Company 1927). By the early 1930s, wells in the field reached 7,000 feet or more (Associated Oil Company 1930; Associated Oil Company 1931). Some productive wells reached 10,000 feet in depth at this time, including CCMO's Hobson No. 2 in Rincon field. Completed in 1929, it was the first well anywhere to be drilled to this depth (Richardson 1972: 3).

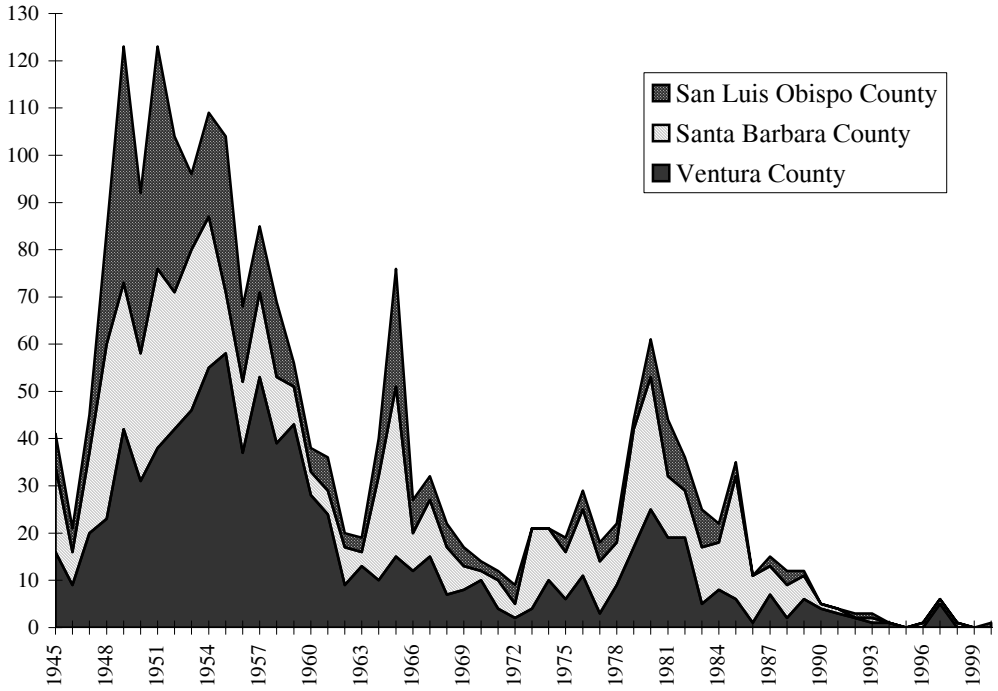
As detailed by Gilbert and Siemon (1933), discoveries at Elwood and Rincon motivated advances in the construction of offshore drilling rigs and rig foundations that constituted a significant advance over the technology and techniques employed at Summerland during the

1890s. At Summerland, operators drilled on the public beach, proving the shallowness of the productive zone. To develop the field, operators built wooden piers and drilled shallow wells from wooden derricks that were supported by light "five-leg" foundations. This arrangement was adequate for the sheltered location of the field and the wells needed to exploit it. At Elwood and Rincon, however, steel pilings were needed, and a number of foundation configurations were developed to drill from piers that were exposed to wind and waves. Changes in foundation type responded to the seaward extension of the field, which resulted in longer piers and therefore drilling sites in deeper water. Drilling the wells themselves remained much the same. Development at Rincon was notable for the construction in 1932 of the first offshore structure in state waters. Made entirely of steel pilings, it was installed in fifty feet of water half a mile off Rincon Point. However, its life was short. In January 1940 waves generated by a winter storm destroyed it (Richardson 1972: 3–4).

Tri-County Field Development, 1941–65

Important onshore discoveries during the late 1940s and 1950s in the Cuyama valley and Ventura county, and in deeper zones of existing fields such as Ventura Avenue, marked the tri-county area's most substantial period of exploration and production. All three counties experienced sustained exploration activity from 1946–58 (see figure 6). In three of the five producing districts—Cuyama, Santa Maria, and Ventura—majors and large independents engaged in intensive development programs, which included the region's initial secondary recovery efforts, to increase and maintain production levels from new and existing fields. After the 1950s, there were no further significant onshore discoveries in the tri-county area. Proven productive acreage in the coastal district overall, including north Los Angeles and Monterey counties, reached 33,000 acres (Richardson 1972: 3). Tri-county production in 1959 was more than 110 times higher than it was in 1900 (see table 3). The waning of this period of expansion in the late 1950s coincided with the beginning of the offshore era that commenced with the leasing of state lands in the Santa Barbara channel.

Figure 6. Tri-County Prospect Wells, 1945-2000



Source: California Division of Oil and Gas (1982a); California Division of Oil and Gas, *Annual Report of the State Oil and Gas Supervisor* (various years)

In several respects, the onshore fields of the tri-county area seemed to be reaching maturity at the end of World War II. No major discoveries had been made since 1934, and existing fields had been drilled extensively, given available technology. In this context, the discovery of the Russell Ranch and the Cuyama South fields (the latter the 27th largest in California history) in the Cuyama valley in 1948 and 1949, respectively, generated a flurry of exploration activity in San Luis Obipso and Santa Barbara counties for a number of years (see figure 6), and intensive development work on the part of Richfield.[16] Still, Howard Kegley, whose column, "Oil Field News," appeared regularly in the *Santa Barbara News-Press* until 1961, predicted that the 1950s would see "a new era in California petroleum development," with exploration shifting out of the southern, central and coastal areas to the northern half of the state (Kegley 1951b).[17] This proved to be premature. Discoveries of new zones of production in established areas of Ventura and Kern counties prompted Kegley (1952o) to observe that "the California oil industry [had been given] a blood transfusion at a time when it faced the possibility of growing hopelessly impoverished so far as petroleum reserves were concerned."

[16] All field-level information found in this study for the period 1950–97 was developed for the project whose products included SLO II, SB II, and VC II, and is taken from the Index of Well Records (IWR) kept at the district offices of the California Division of Oil, Gas, and Geothermal Resources in Ventura (District 2) and Orcutt (District 3). This information is summarized by operator in Adamson and Bergstrom (1998). Each office maintains individual well records by firm for each field in its district.

[17] In his column of August 19, 1956, Kegley described himself as an informant who was reporting on behalf of loyalty owners, landholders, and the interested public.

The discovery of the Russell Ranch and Cuyama South fields established the Cuyama valley as a new area of production among the three counties (see map 1). On January 1, 1948 the Norris Oil Company, a small Ventura firm, discovered oil on the Russell brothers' ranch. In June Richfield brought in the first major producing well. In May 1949 Richfield discovered the Cuyama South field some three miles northeast of Russell Ranch (Jones 1972: 239–250). By October 1949 there were 145 wells in the valley producing 30,000 barrels of crude oil (*Ventura County Star-Free Press* 1949c). Russell Ranch's peak production of 7.9 million barrels in 1950 ranked it among the region's leading fields, roughly equivalent to Cat Canyon in the Santa Maria group and Rincon-San Miguelito near Ventura. Production at Russell Ranch was not sustained as it was in these latter fields, however, and in 1965 it was only 12 percent of its peak. Richfield's development program in Cuyama South yielded peak production of 14.1 million barrels in 1951, a level that was sustained with additional development drilling throughout the 1950s. During the 1960s, however, production in the field fell off rapidly. For the group, which included the much smaller Cuyama Central, Taylor Canyon and Morales Canyon fields, production in 1965 was only one-third of its 1951 peak. Indeed, output in the valley declined in relative terms as well, as operators elsewhere were more successful in sustaining field production through secondary recovery methods and were making offshore discoveries along the Santa Barbara county coast. Steady declines in Cuyama valley production occurred despite the conservation and development efforts of Richfield, the dominant operator, ensuring that the district would be less significant with respect to the history of the oil industry in the tri-county region than the fields associated with the cities of Santa Maria and Ventura.

At the time, the prospects for additional finds in the Cuyama area spurred the highest level of exploration in the tri-county area ever, with firms spending half a million or more dollars on prospect wells that they drilled from the Carrizo plain in San Luis Obispo county to the Sespe Condor Sanctuary in Ventura county (Kegley 1951c). For all their efforts, only the three aforementioned minor fields were found, and Cuyama Central was soon abandoned. The 1950 discoveries of the Taylor Ranch and Morales Canyon fields gave operators hope that another Cuyama South field might be found. After drilling a series of dry holes, however, the pace of exploration slowed, and by the end of 1951 it was evident that chances of another significant Cuyama valley discovery were slim (Kegley 1951m, 1951o, 1951t, 1951w). Diminishing expectations in the Cuyama valley accounted for declines in exploration across the tri-county area after the mid-1950s (see figure 6).

During the 1950s, the area stretching from Ventura to Newhall was one of California's top exploration and production areas. Two of the three principal areas of exploration in California for 1951 were the area between Castaic in north Los Angeles county and Santa Paula in Ventura county and the northeastern part of Ventura county, in the Sespe National Wildlife Reserve. Oil production in Ventura county, which had been rising almost continuously from its 1933 nadir, increased rapidly in the early 1950s. Vigorous development programs by major operators Shell, Richfield, Standard, Tidewater, the Texas Company (Texaco as of 1959), and Union resulted in soaring output in established fields, including Ventura Avenue (officially Ventura as of 1950), Rincon, San Miguelito, South Mountain, and Torrey Canyon. Ventura county production peaked in 1954 at 48.8 million barrels, an increase of 47.4 percent

in five years (see figure 4). The Ventura field led the way, at 29.8 million barrels, up from 21 million in 1950 (though slightly off its 29.9 million barrel peak achieved a year earlier). Field discoveries at Fillmore, Oakridge, and Saticoy, the discovery of the Bridge pool at South Mountain, and the ongoing development of the Oxnard plain, compensated for declines in activity and output in the Ventura and San Miguelito fields over the next five years. By 1965, overall production in Ventura county stood at 53 percent of its 1954 peak. Still, at 26 million barrels, it remained higher than the 24.6 million barrels produced during the last year of World War II (see figure 4).

In the Santa Maria district, production peaked during World War II. On the strength of production in Santa Maria Valley field, output reached 20.1 million barrels in 1945. In contrast to the Ventura group of fields, the Santa Maria group experienced declines in production in the late 1940s. The outbreak of the Korean War helped to reverse the trend. Demand for fuel oil encouraged operators such as Union, General Petroleum (GP), and Tide Water Associated to pump from shut-in wells and to initiate development programs, boosting the production of several fields, most significantly Cat Canyon, where production peaked at 8.4 million barrels in 1953 (cf. Kegley 1950p, 1950q, 1950v, 1950w, 1950x; *Santa Barbara News-Press* 1950a). During the 1950s, operators focused on defining the limits, and developing the reserves, of existing fields, employing both primary and secondary recovery methods to do so. Two new fields were discovered—Guadalupe in 1948 and Jesus Maria in 1952—but these were at best medium-sized finds. Following trends in Ventura county and the Cuyama valley, production recovered, increasing to 18.4 million barrels in 1953. As elsewhere in the onshore tri-county area, output declined during the late 1950s and early 1960s. However, secondary recovery efforts reversed the trend and thereafter helped to keep production stable for two decades. Annual output for the group, which had fallen to 48 percent of its postwar peak in 1961, revived to 73 percent of 1953 production by 1965 (see figure 4).

Late in 1957, S. F. Bowlby (1957), president of the Western Oil and Gas Association, noted that oil was becoming ever harder to find onshore in California. In 1957 only one in sixteen exploration wells discovered a new field, against a national average of one in nine. Indeed, the number of prospect wells drilled in the region plummeted from 104 in 1955 to 38 in 1960 (see figure 6). Onshore activity remained strong in the Ventura basin, but Kern county regained its status as California's "hot spot" for exploration and production. From the late 1950s, operators shifted their attention and resources to the San Joaquin valley and offshore leases in state waters.

This was evident especially with respect to exploration across Santa Barbara and San Luis Obispo counties. In February 1956, for instance, C. E. Dyer, the Santa Barbara county oil well inspector, reported that activity for the county overall was at an "extreme low," with only three drilling rigs in operation at the end of January (Quoted in *Santa Barbara News-Press* 1956a). In September Dyer added that "the number of dry holes drilled during the past few months does not present a very encouraging picture for exploration" (Quoted in *Santa Barbara News-Press* 1956c). Of 106 notices to drill in the county for 1957, 85 were for core holes in state offshore leases. The trend was even more marked during the early 1960s.

Moreover, onshore prospect wells were producing little more than dry holes—twenty-three of twenty-six prospect wells drilled in the county during 1959, for instance, were "dusters"—which discouraged additional onshore exploration (*Santa Barbara News-Press* 1957d, 1957e, 1958a, 1958b, 1958c, 1959, 1960). Even in Ventura county, exploration declined markedly, with prospect wells drilled reaching a postwar low of nine in 1962 (see figure 6).

From 1956, supply dealers, drilling contractors, oil operators, and leasing specialists looked to offshore production to compensate for declining onshore results (cf. Kegley 1956a, 1956i, 1956k, 1956l). With the 1953 federal Submerged Lands and OCS Lands acts, and California's 1955 Shell-Cunningham Act, such development had become legally possible. The federal acts established the basis for the development of offshore energy resources in both state and federal areas. Given the law of capture, the laws set up a competitive situation for royalties and revenues from lease sales that biased the process toward development. For the moment, technology was incapable of drilling in the Santa Barbara channel beyond the three-mile state-federal demarcation. For its part, the 1955 Shell-Cunningham Act loosened restrictions on leasing of state offshore lands that still were in place from the 1938 State Lands Act—which, not incidentally, had also claimed for the state of California unrestricted title to offshore oil, lands, and minerals (Lima 1994: 198–200). However, as discussed below, the royalty provisions of the 1955 act were controversial, and letting of state leases in the Santa Barbara channel did not take off until lawmakers amended the act in 1957.

Oil companies began preparing for the offshore era in California in the wake of the Supreme Court's June 1947 ruling in favor of the federal government in *U.S. v. California*, through which the Truman administration sought to put control of offshore lands in federal hands. After the war, abandonment of pier-based drilling in the offshore portions of Capitan and Elwood fields proceeded without abatement. At the same time, the State Lands Commission (SLC), which was created by the 1938 act, issued permits to firms that were interested in exploring twenty-four parcels that lay adjacent to these producing areas. From 1948–55, according to Standard of California geologist Roger Alexander, oil companies spent $9.85 million on seismic surveys and another $5.6 million on core sampling along the California coast. Based on this work, analysts estimated that some one billion barrels of crude oil reserves lay in the waters off the Santa Barbara county coast (Lima 1994: 169–197).

In June 1952 Monterey Oil made the first move to develop one of the state permits with a $1 million project off Seal Beach in Orange county. It entailed the construction of a circular steel island to accommodate the requisite drilling equipment (Kegley 1952l, 1952p). Together with Humble, Monterey also drilled the first well in state waters after Congress passed the Submerged Lands Act—at Newport Beach, also in Orange county (Kegley 1953d; Kegley 1953h). In May 1954 Monterey and Texaco, operating jointly, drilled the first well from the island constructed at Seal Beach. Kegley (1952i) commented: "The curtain [has gone] up … on a new era in the California oil business."

State offshore leases were auctioned from 1957–68. However, as elaborated below, the development process began slowly, owing to political opposition to the royalty provisions of the Shell-Cunningham Act (Krueger 1958: 460–466). Only one lease (at Summerland) was

let under the 1955 legislation. Thus, despite promising results at Summerland from a well drilled by Standard and Humble from Platform Hazel, Kegley (1958c) could report in early 1958 that "not much has been accomplished the last two years in the way of offshore drilling."

After lawmakers amended the Shell-Cunningham Act in 1957, leasing and development work commenced in earnest. Exploratory drilling yielded four fields of significant size, the subsequent development of which temporarily reversed production declines along the south Santa Barbara county coast (see figure 4). Texaco and Phillips developed the Conception field from platforms Harry and Herman; production peaked at five million barrels in 1964. At Summerland, Standard and Humble realized peak production of 3.8 million barrels, also in 1964. In February 1966 Standard and Richfield discovered the Carpinteria field. From Platforms Hope and Heidi, they developed peak production of 3.7 million barrels, in 1969. In July 1965 Richfield and Mobil discovered South Elwood offshore field, and installed Platform Holly to develop it. Development activity by operators in the smaller Alegria, Coal Oil Point, Cuarta, and Point Conception fields failed to sustain annual output at levels greater than 100,000 barrels in any one of these fields.[18]

Despite the enthusiasm for offshore activity on the part of operators and government officials, production from state offshore leases did not fully offset the declines that operators were experiencing onshore. Production from fields discovered after 1955 peaked at a mere 8.9 million barrels in 1964—not a substantial return, considering the marginal investment needed required to extract oil and gas from offshore areas. As at Elwood earlier, production in these fields was flush. Operators hoped for better results from federal OCS leases, but, as Lima (1994) has observed, the social, environmental, and aesthetic impacts of offshore activity, the siting of onshore processing associated with it in particular, were generating local opposition long before the 1969 oil spill in the Santa Barbara channel.

Thus in January 1965 Santa Barbara county oil consultant Robert Williams described the county's oil, allocated among the Cuyama, Santa Maria, and Santa Barbara groups, as a "waning asset." Thinking in terms commensurate with the era of exuberance in which all previous activity had taken place, Williams suggested that, "What we need is another Elwood or Cuyama. But there is not too much possibility of that" (Quoted in Betwright 1965). According to county assessor Harry Holmquist, the value of the county's onshore petroleum assets was decreasing at rate of 4–20 percent, depending on the field. (Much the same was true for the fields of Ventura county.) He singled out Cuyama South for its surprisingly rapid depletion rate. Neither Williams nor Holmes believed that state offshore production would ever achieve the volume generated by the onshore fields at their peaks (Betwright 1965).

[18] Offshore activity in state waters along the Ventura county coast was limited to the offshore portions of onshore fields at Montalvo West, where Standard of California began tapping offshore reserves in 1953, and at Rincon, where Richfield spent $4 million to construct an earth-filled island, from which it drilled seventy-two wells (Smith 1956b; *Santa Barbara News-Press* 1958e; Kegley 1960). Section 16 of the Shell-Cunningham Act established "no-drilling" sanctuaries from Cuyucos to ten miles south of Pismo Beach state park–essentially the length of the county's coastline—and in Santa Barbara county from Ortega Hill at Summerland to the University of California campus—an eighteen mile zone that included the town of Montecito and the city of Santa Barbara (Lima 1994: 231–232). Map 9 depicts these zones.

From 1945–62, exploration and production activity at the tri-county and state levels charted parallel paths, in that activity at both levels accelerated from 1946 until the mid-1950s, and declined thereafter. Relative to statewide production, the tri-county region—Ventura county in particular—performed above average from 1946–59, increasing its share from 14.5 percent to 22.2 percent, as tables 2 and 3 suggest.[19] State crude oil output in 1953 of 1,000,013 barrels per day (b/d) set an early postwar record. State production slid thereafter to a nineteen-year low of 809,291 b/d in 1962. Thereafter state and tri-county production—excluding federal OCS activity—diverged significantly, with state production reviving and rising to record levels in the early 1980s, and local production remaining stable or gradually declining.

Tri-county activity also followed national trends. Encouraged by rising demand for petroleum products and increasing crude oil prices, U.S. production expanded some 50 percent between 1945 and 1959, from 1.7 billion barrels to nearly 2.6 billion. At the same time, total demand for all products of the U.S. oil industry increased by some 80 percent, from 1.9 billion barrels to 3.5 billion. In California, the average price per barrel of Signal Hill 27˚ API gravity oil roughly doubled during this period, from $1.50 to $3.06 (Williamson *et al.* 1963: 804–815).

Table 3. Crude Oil Production by County for Selected Years

		(Thousands of barrels)	
Counties	**1959**	**1980***	**2000***
Los Angeles & Orange	103,057	86,767	33,688
Ventura	43,770	17,511	9,074
Santa Barbara & San Luis Obispo	24,853	17,469	4,481
Kern	92,917	204,172	209,033
Fresno, Kings	31,937	11,100	8,411

Note: * – Federal OCS production excluded

Source: California Division of Oil and Gas 1960, 1981; California Division of Oil, Gas, and Geothermal Resources 2001

In real terms, prices in the immediate aftermath of the war represented a return to 1920 levels, and spurred record levels of exploration and development. Immediately after the war, however, the cost of operations rose faster than prices. In June 1946, the Office of Price Administration removed ceilings on crude oil prices. Shortages of materials continued through 1947, and eased only gradually, keeping prices of requisite inputs to drilling projects high. Sporadic shortages occurred as well. Operators had to compete with other industries for cement and other oil field materials. Yet the overwhelming postwar demand for oil more than compensated for these difficulties. In 1949, for the first time, consumption of oil and gas exceeded that of all other energy sources. From June 1946 to December 1947 alone, the price of crude oil increased by more than 150 percent. Exploratory well drilling reached all-time highs nationally in 1947–48. After 1948, the pace in the increase of demand for oil tapered

[19] Note that table 3 does not include all California production, while table 2 is inclusive. Most notably, excluded from 1959 production is the more than 11 million barrels of oil produced in the giant San Ardo field of Monterey county (discovered in 1947, and the 13th largest in the state to date).

off, enabling supply to catch up with demand, as the tri-county experience illustrates (Olien and Olien 1984: 87–89).

Technological Advances, 1941–65

As in the 1900–41 period, technology supplied part of the supply solution. By the mid-twentieth century, operators were routinely achieving onshore drilling depths of 20,000 to 30,000 feet with rotary rigs. In the early post–World War II period, deep drilling campaigns, which achieved significant increases in production at the Ventura, San Miguelito, and Oxnard fields, typically involved wells drilled in the range of 9,000 to 14,000 feet. Indeed, Kegley (1952k, 1952l) proclaimed that Ventura county was "a deep driller's paradise." Shell, Continental, Tidewater, Lloyd Corporation, and others had twenty-five rotary rigs active in Ventura and San Miguelito fields, all of which were set to drill to depths of at least 9,000 feet (Kegley 1952j). Union Oil used deep drilling to discover new zones of production in old Ventura county fields, such as Torrey Canyon, and to find new fields in the vicinity, such as Oakridge (Pederson 1990: 108–109). (By comparison, Richfield's well in the Russell Ranch and Cuyama South fields averaged 3,500 feet and 4,500 feet, respectively [*Petroleum World* 1950].) For the year to April 1953, operators statewide completed thirty-one wells at depths of more than 10,000 feet (Kegley 1953b). In 1954 exploration wells drilled to depths below 10,000 feet accounted for the discovery of 80 percent of California's new oil reserves (Stormont 1955).

Operators confronted increases in costs that often were not rewarded with greater returns. Deep drilling increased costs significantly. A 10,000-foot well could cost three times as much as a 7,000 foot well. Owing to hard formations, high temperatures, extreme pressures, and equipment limitations, a 14,000 well could cost ten times as much. By one estimate, finding oil in 1947 cost six times as much as it did in 1935 (Olien and Olien 1984: 96). For California, the problem was particularly acute. Deep drilling campaigns helped to make the California production costs the highest in the nation in 1955, at 71 percent above average. Yet the wellhead value of the California's crude oil was seven percent below the national average. By 1955, it cost $124,000 to drill the average-depth well of 5,162 feet (*Santa Barbara News-Press* 1956b). The situation for wildcatters was even more problematic. During the first nine months of 1957, for instance, twenty exploratory wells drilled in Ventura county at an average depth of 10,000 feet cost operators an average of $325,000 (*Ventura County Star-Free Press* 1957a). In addition, average wages in the petroleum industry increased—by 36 percent in the 1948–51 period alone. During the same period the cost of tubing, casing, and drill pipe increased 30 percent (Olien and Olien 1984: 96). In California, average annual wages in the petroleum industry rose from $3,916 to $6,048—a 54 percent increase at a time during which the consumer price index increased only 23 percent (VC II: 5.5–5.6). Since average crude oil prices did not keep pace with costs, the industry began lose its incentive to replace the reserves that they depleted: one reason that onshore exploration and primary recovery of oil across the tri-county region diminished significantly during the late 1950s (see figures 4 and 5).

Operators employed a variety of approaches to cut costs and increase efficiency. Slant drilling, or "whipstocking," was perfected during the 1930s and came into widespread use during the 1940s along the California coast (Pederson 1990: 99–101; *Petroleum World* 1934). The technique enabled operators to drill half a dozen or more wells from a single drilling site, and became especially important in the offshore era, when the deployment of platforms in the Santa Barbara channel was limited by political action. The practice of contracting drilling operations and other services to specialized firms, a trend that began during the depression, accelerated during the postwar period, both to control costs and to stay current with the latest technology (Olien and Olien 1984: 107–108, 119–124). Firms also devoted resources to keeping dry holes to a minimum. To that end, large operators utilized seismic surveys to aid in the search for oil. From the mid-1950s, operators such as Union Oil used improved fracturing techniques to boost production and, to cut costs, they invested in improved drilling muds and more efficient casing programs (Pederson 1990: 99–101).[20]

During the 1940s and 1950s, tri-county operators began to experiment with secondary recovery methods, including waterflooding, steam cycling, steam flooding, and gas injection, in order to maintain production in maturing fields. As A. C. Rubel, Union Oil's vice president in charge of exploration and production, explained, "Without any question, there is still a lot more oil to be found in Santa Barbara County. We haven't run out of oil, only out of the tools to find [and produce] it" (Quoted in *Santa Barbara News-Press* 1953a). The challenge, according to Rubel, was technological. Operators had to improve their methods of recovery, since traditional approaches were recovering only 20 percent of a field's reserves. Widespread use of, and significant results obtained from, secondary recovery techniques in the tri-county region awaited the mid-1960s, and therefore are discussed in greater detail in Part II. During the postwar oil boom, operators relied overwhelmingly on primary recovery, that is, drilling and pumping, to extract crude oil from the area's fields. Yet significant projects were undertaken from the late 1940s, with the expectation of perhaps tripling recovery of a field's reserves. Among the three counties, waterflooding projects commenced at Lompoc in 1948 and Shiells Canyon in 1949. The Lompoc program proved to be ineffective, and Union Oil, its operator, shut it down in 1956. The Shiells Canyon project enjoyed more success, and it was still active in the 1970s. Gas injection to maintain reservoir pressure was employed successfully in the Newhall-Potrero field of north Los Angeles county between 1946 and 1952, and Union subsequently undertook gas injection projects at Torrey Canyon and Santa Susana fields in Ventura county (Richardson 1972: 6). Indeed, by 1957, Union was participating in some thirty-five secondary recovery projects, including efforts in Cat Canyon, Guadalupe, and Orcutt fields (Pederson 1990: 108; Welty and Taylor 1958: 229). Until the 1960s, however, secondary recovery techniques remained experimental.

[20] Fracturing involves the pumping of fluids under high pressure into productive geological formations, creating fissures that increase the flow of oil to the well bore.

Industrial Activity: Buying and Leasing Land

Patterns of public and private land ownership played an integral role in shaping the structure of the tri-county oil industry, and directly affected the shape and character of the development of particular fields. These patterns of ownership intersected with the timing of oil development to influence field development in terms of number of operators and wells, unitization[21], levels of production, and other measures of field development. For a number of reasons, land ownership in California has been an extremely complicated affair. In this section, we consider seven oil and gas leasing situations: (1) onshore leasing of rancho lands that passed essentially intact from Mexican to American ownership, (2) onshore leasing of private, rural lands that were either homesteaded or divided and sold by Mexican or American owners of rancho lands, (3) onshore ownership of private lands in fee, (4) onshore leasing of town lots in urban areas, (5) onshore leasing on federal lands, (6) beachfront leasing on public lands, and (7) offshore leasing of state parcels. Offshore leasing of federal OCS lands is deferred to Part II of this study. The second and third cases applied to the bulk of the development of the region's fields during the exuberant era, whereby oil operators leased or purchased outright ranch and agricultural lands from interested private parties.

Comprehensive details on offshore leases may be found in Lima (1994), Sollen (1998), and is available from MMS. However, prior work performed no systematic analysis of onshore leases. Thus the discussion in this section is illustrative and systematic, depending on the type of leasing involved. Three themes are stressed: (1) land ownership influenced leasing patterns, and therefore the number of operators in a given field, (2) leasing patterns determined the extent to which field development was cooperative or competitive, and (3) leasing patterns were sustained over time. Fragmented patterns of lease ownership emerged in most of the tri-county area's onshore fields. The discovery of oil on a block of land gave adjacent landowners the incentive to contract to drill one or more wells on their property. Thus a cluster of three or four wells might sit next to a major field. Once such a patterns was established, there was little economic incentive historically for the dominant operator to consolidate producing properties, since oil as an asset depleted in both the physical and accounting senses of the term. Integrated firms that leased much of the region's oil lands during the twentieth century were unwilling to invest resources in consolidating leases that did not justify the returns on investment that shareholders expected. Independents sold their depleting assets to other independents rather than to the leading firm or firms in the field (Clawson 1998; Hall 1998; Simonson 1998).

An example of this fragmentation may be seen in Ventura county's Oxnard field.[22] Developed during the 1950s, Standard (Chevron) dominated operations and the leasing pattern, but other companies, including Texaco, Getty, Lloyd Corporation, and Chase Production, had operations in the field. Getty leased 131 acres in the field during a period when the limits of the field had yet to be determined. For competitive reasons, the firm never allowed Chevron to drill on the property. Further, Getty chose not drill on the lease until it

[21] Unitization involves the management of all of the leases in a field as if they were a single lease.

[22] The authors wish to thank Cliff Simonson for offering this example as an illustration.

had to under the terms of the contract, and then it drilled only the offset wells that the lease required—a total of seven wells. Getty operated the lease until 1977. Thereafter, it remained intact through several iterations of ownership and, as of December 31, 2000, is operated by Bentley-Simonson, a small Ventura independent that acquired it in 1987.

With the decline of the extractive region and withdrawal of integrated majors from most of the area's fields, however, some of the path dependency in leasing patterns has been overcome. As Part III discusses, both large and small independents with an interest in the tri-county area have moved to consolidate ownership on field-by-field-basis.

Operators had to gain access to oil and gas reserves from the surface.[23] To do so, they bought or leased the mineral rights from interested landowners, public and private. If the operator purchased both the surface and mineral rights, then the concern owned the land in fee. Operators generally did not acquire the surface rights (and could not do so in the case of national forests and offshore lands). Further, operators generally did not even acquire the mineral rights. Rather, they signed oil and gas leases that specified a period of time during which landowners gave them the right to drill wells and produce the oil and gas reserves that they could reach. (Owing to the law of capture, the oil and gas need not to be located directly below the surface.) Operators often paid a cash bonus on a per acre basis to the lessor, and they paid annual rental fees for a specified amount of time until they either surrendered the lease or drilled one or more wells. The lease specified when the operator had to drill test or development wells, and how many wells they had to drill. It also provided for the royalty payment that the lessor received, expressed in terms of a percentage of production, from the conventional one-eighth to as much as one-half, as was the case with some Signal Hill leases during the frenzy produced by the discovery of the field in 1921 (Beaton 1957: 174–178).

Leases could be complex agreements, as the February 1920 agreement between Associated Oil, on one hand, and Joseph B. Dabney and Ralph B. Lloyd, landowners, and State Consolidated Oil, on the other, illustrates ("Tentative Agreement," 1920; Lloyd 1920b; Lloyd 1920c). Lloyd and Dabney gave Associated an option to lease 1,500 acres in the as-yet-unproven Ventura field. Associated paid State Consolidated $30,000 for the option, and extended a $20,000 credit to State Consolidated for the materials and labor expense it was incurring in redrilling Lloyd No. 3 its during the option period, one of four wells that State Consolidated had drilled in the field since March 1915 (Vander Leck 1920: 13–15). When Associated took up the option, it paid another $200,000 for a lease that provided for a one-fifth royalty plus 30 percent of the oil produced. The 30 percent provision began once Associated produced enough oil to recover the $250,000 that it paid out for both the option and the lease. From that point on, Associated paid a one-half royalty to Dabney-Lloyd and State Consolidated until 30 percent of the oil produced from the lease equaled $500,000 at market value. Thereafter, Associated paid only the one-fifth royalty in kind or in cash. For its part, Associated agreed to keeps two sets of tools operating on the leased property continuously. It was required to complete no more than two wells per year, but it could drill as many wells as it liked. In this way, Lloyd and his partners brought in a major operator with

[23] This discussion summarizes Wheeler and Whited (1981: 71–74).

the resources to develop the so-called Lloyd lease—which proved to be one of the most lucrative in the field.

A number of implied covenants were embedded in leases. One of them that is of interest to our discussion of both onshore and offshore development was the requirement that operators drill offset, or protection, wells, to prevent drainage from adjacent, competitive wells, or surrender the lease within a reasonable time (Wheeler and Whited 1981: 77–79). This covenant explains much of the drilling that occurred during the depths of the depression, for instance. It implies that both landowners and operators had the incentive to acquire blocks of leases to provide for the orderly development of fields. In the tri-county area, this task often was facilitated by the large of amounts of oil that could be accessed from rural lands. Though Los Angeles-style town lot drilling was the exception in the tri-county, competitive drilling still arose, however, both within fields and among adjacent ones. Competitive drilling also occurred in state tidelands areas under the leasing regime that was in place prior to passage of the 1955 Shell-Cunningham Act. Finally, as Lima (1994: 285–302) has observed, the 1965 resolution of the demarcation of state and federal offshore lands enabled federal leasing for offset development to proceed in order to prevent drainage from state leases. Further, this consideration motivated California lawmakers in the environmental era to make exceptions to prohibitions on development of state leases.

Leasing Rancho Lands

At the time of California statehood, Santa Barbara county encompassed all three counties under study. Most of the area was divided into ranchos—large land grants that were bestowed by the Spanish and Mexican governments—which were devoted primarily to cattle raising. For instance, there were eighteen major grants in modern Ventura county. Two of them—Conejo and Simi—were bestowed by Spain. The rest were granted from Mexico City—fifteen of them between 1834–46 (Hutchinson 1965a: 65fn1). As Cleland (1941: 3–5) observed, the ranchos remained the controlling factor in the state's land settlement for almost fifty years, and the timing of their gradual conversion into towns, ranches, and farms in large measure shaped the character of onshore oil development in the tri-county area. Generally, rancho lands were either acquired peacemeal by homesteaders or in whole by Americans who divided the tracts for sale to ranchers and farmers. Oil exploration came later, with interested concerns leasing land from landowners or buying it in fee.

Many of the ranchos that showed potential for petroleum development after the Civil War, however, were purchased intact by oil concerns or their agents. During the 1860, 1870s, and 1880s, these firms invested substantial sums of money in developing the crude oil that often seeped from rock formations on these lands. When most of these endeavors failed to develop commercial quantities of oil, the proprietors turned to real estate agency, dividing the lands for resale to farmers or ranchers. At the same time, these interested parties sometimes retained the mineral rights on many tracts, to ensure access to possible future production. Operators—most prominently the predecessor firms of Union Oil—often held lands in fee, if they were producing oil in the late nineteenth century. This situation typified much of Ventura county, the "cradle of the California oil industry." During the twentieth century, oil companies

typically leased land from property owners who were not connected directly to these early oil interests.

The Santa Barbara area contained perhaps the most intriguing land ownership situation, as far as leasing and development in the exuberant era is concerned. There were large landowners, to be sure, and they controlled leasing onshore. Yet the district's substantial oil reserves were accessible from public beaches and were therefore subject to entry under placer laws passed during the 1870s, until passage of the 1921 Mineral Reservation Act. As has been noted, Santa Barbara was also the site of the tri-county area's most notable and extensive case of town lot drilling during the exuberant era.

Confusion, fraud, and a poor institutional framework characterized transition from Mexican to American ownership. Under the Secularization Act of 1933, the Mexican government restored the mission lands to the public domain, and subsequently issued hundreds of land grants. Surveys of these lands were relatively ill defined, by U.S. standards. For instance, the survey for the Rancho Sespe in Ventura county was performed "with tolerant disregard for anything even remotely resembling a scientific survey of its boundaries" (Cleland 1941: 37). With the introduction of the U.S. legal system, ranchos became a source of protracted dispute, which generated serious social and economic conflict and dislocation for more than a generation after the U.S. annexation of Alta California. Surveyors, claimants, and courts were often unable to determine the original boundary lines of many ranchos, resulting in numerous squatter controversies and widespread litigation (Cleland 1941: 28–42).

Under the federal Land Act of 1851, landowners' holdings were subject to review by a board of land commissioners, based in San Francisco. The burden of proof was placed on land grantees. Defending claims was made difficult by lost or defective documents, haphazard surveys, poorly defined boundaries, unfulfilled conditions, travel distances, unfamiliarity with U.S. law and the English language, and excessive litigation fees and charges. The land commissioners heard over 800 cases, involving some 12 million acres of California lands. It approved 520 claims and rejected 273. Scores of claims were spurious or fraudulent. John S. Hittell, a contemporary observer, estimated that 10 percent of bona fide landowners in Los Angeles county were bankrupted by the policy, and at least 40 percent of the land owned under Mexican grants was alienated to meet the costs of compliance with the act (Cleland 1941: 46–62).

The act caused endless confusion and litigation, even after most of the Spanish-Mexican grantees had been eliminated from ownership. It provoked the ire of squatters who were conditioned by traditional U.S. land policy, which was dedicated to transferring land from the public domain to the private domain as cheaply as possible. Conflicts between landowners and land seekers raged for many years. Nevertheless, from 1851–70 most of the ranchos passed into American hands. T. Wallace More, for instance, owned these tri-county properties: 26,640 acres at Rancho Sespe, 17,760 acres at Rancho Santa Paula y Saticoy, and half an interest in Rancho de Lompoc (24,420 acres) (Cleland 1941: 135–183).

Significantly for the character of onshore oil development in the tri-county area, economic development in southern California lagged the north. During the 1860s, the economy based on cattle ranching collapsed, owing to drought, floods, and overinvestment during the boom created by the gold rush. Until the coming of the railroads, the region was isolated economically. Owing to the sparse population in the south, the state government showed little interest in appropriating funds for roads or other public works. Money and credit were scarce, and the banking system was inadequate. Economic stagnation, combined with the muddled status of land titles, ensured that ranchos remained essentially intact until after 1865. Indeed, in terms of economic development, the tri-county area significantly lagged the Los Angeles basin, whose growth in the 1870s accelerated the process of converting ranchos into vineyards, orchards, grain fields, and town lots. Ranching continued to dominate the tri-county landscape. Towns remained small, agriculture was stunted, and industry was non-existent. Railroads did not link Santa Barbara and Ventura to San Francisco or Los Angeles until the 1880s (Cleland 1941: 213–242). Today, this relative lack of development may be seen as one of the initial conditions that has contributed to the preservation of the attractiveness of the coastal region. During the exuberant era, contemporaries generally saw the situation in a negative light.

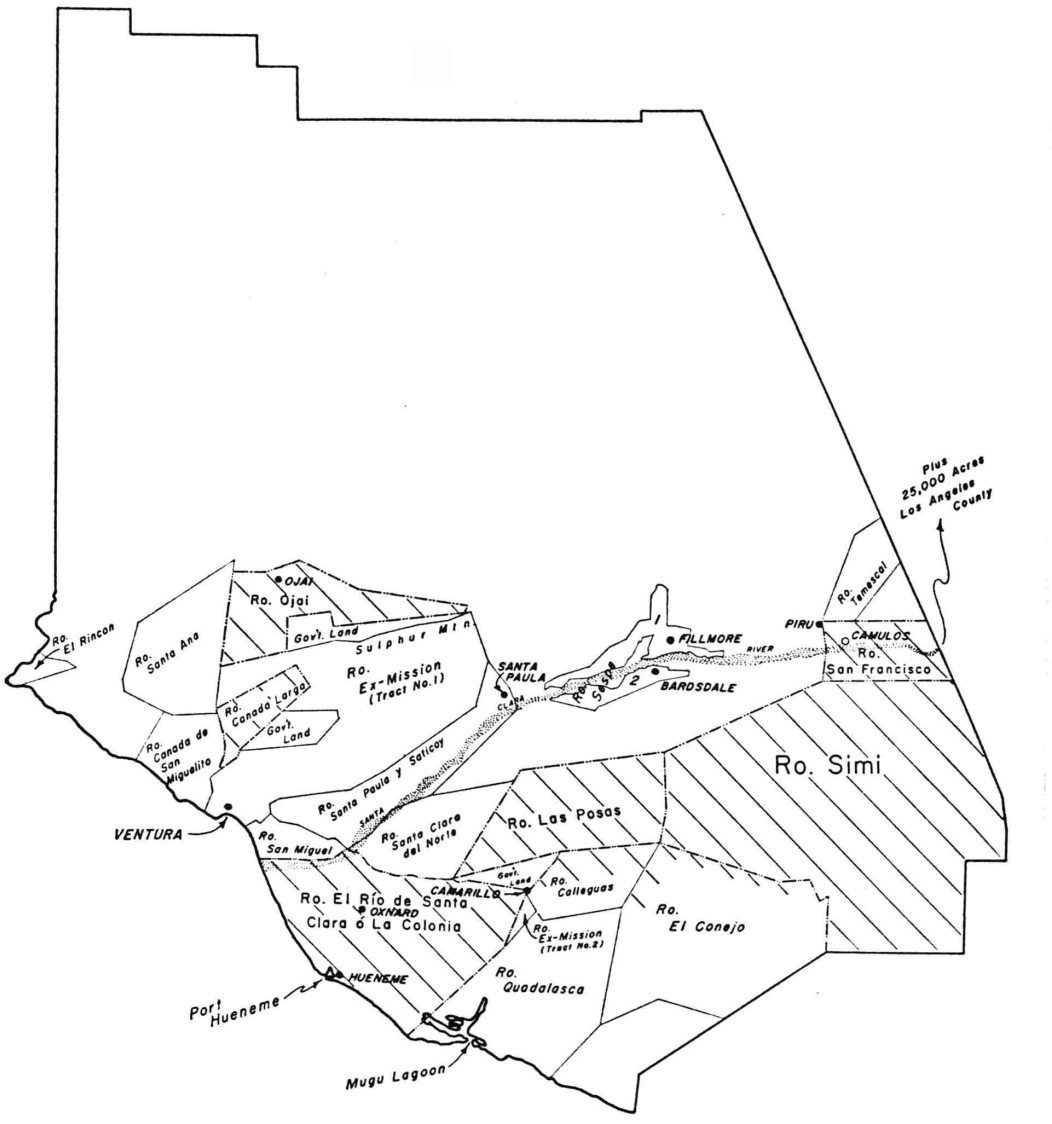
In this environment, oil entrepreneurs from the east and capitalists from San Francisco bought up rancho lands in all three counties during and immediately after the Civil War for the purpose of finding and producing crude oil, though they concentrated their development efforts on the area between Ventura and Newhall. They also staked claims to government lands in Ventura and Los Angeles county. Many of these lands contained oil, but few concerns actually produced it. Hence they sold most of these lands, either to ranchers and farmers or to other oil entrepreneurs, most notably Lyman Stewart and Wallace Hardison, who together with Thomas Bard founded Union Oil Company in 1890 (Pederson 1990: 9–15).

The experience of Thomas A. Scott illustrates the point. Scott, a railroad operations manager who became vice president of the Pennsylvania Railroad in 1860, got rich by speculating in the Pennsylvania oil fields and in other companies. In 1864, a Scott-financed expedition that was investigating mineral resources adjacent to a proposed Pacific railway route turned its attention to oil in southern California. With eastern oil prices surging from $3─4 per barrel to $14 per barrel during the first half of the year, Scott's assistants, John Wyeth, a Philadelphia chemist, and Levi Parsons, an ex-judge and land promoter from San Francisco, investigated and bought into the Ojai district interests of Edward Conway and Company. Conway had acquired 100,000 acres east of the city of Ventura, including the oil rights to ranchos Santa Paula y Saticoy and Sespe, and 48,800 acres of the Rancho Ex-Mission San Buenaventura. Parsons and Wyeth then took advantage of the legal confusion and economic problems that plagued claimants to Spanish- and Mexican- era land titles by buying some 275,000 acres on all or part of seven ranchos in what was is now Ventura county: all of ranchos Las Posas, Cañada Larga, Ojai ,and Simi, and parts of ranchos Calleguas, San Francisco (much of which lay in Los Angeles county), and La Colonía (see map 4). Parsons also purchased one-quarter of the San Buenaventura townsite, for which he planned facilities for shipping crude oil produced at Ojai. Finally, he leased thousands more acres, including 75,500 acres that lay between the town of San Luis Obispo and the Pacific ocean, La Goleta and part of Los Dos

Pueblos (4,500 acres), and 4,460 acres at El Rincon. All of these leases, however, expired before any oil exploration or development took place (White 4–19; Hutchinson 1965a: 54–57, 65–75).

Scott engaged Thomas Bard to protect his interests in these potential oil lands and supervise their development (Hutchinson 1965a: 43–47). However, by the late 1860s Scott's ventures had failed to secure or sustain commercial production. Indeed, the first California oil boom consisted more of promotion and hype than actual oil production, even as it proved that oil was present (White 1962: 19–24; Cleland 1959: 202–203). As a result, Bard soon emerged as a prominent land agent in what is now Ventura county. During the 1880s, he became associated with Hardison and Stewart, who by then were the leading wildcatters in the area.

Map 4. Ventura Ranchos Acquired for Oil Development Purposes
Note: Shaded area indicate ranchos acquired by Parsons in whole or in part.
Source: Hutchinson (1965a: 66). Copyright © 1965 by the University of Oklahoma Press. Reprinted by Permission.



In 1865 Scott set up three companies to develop his lands: California Petroleum (CPC), which operated on 18,000 acres in the Ojai district, Philadelphia and California Petroleum (P&CPC), which focused on 187,000 acres on ranchos Simi, San Francisco, and Las Posas, and Pacific Coast Petroleum, which was supposed to explore southern San Luis Obispo county, yet did not move beyond the drawing board, as it were. Both of the going concerns experienced a succession of failure, owing to extremely difficult terrain and geological formations that overwhelmed Scott's Pennsylvania drillers and the technology that they used. By 1868 Scott shut down his operations, having spent some $200,000 on California Petroleum's seven dry wells in the Ojai area alone (White 1962: 7–13; Hutchinson 1965a: 103–132).

At the behest of Bard, Scott and his associates divested of their tri-county holdings in parcels that would attract farmers. Bard became the land agent for Scott and both CPC and P&CPC. On land sales in the Ojai and the Simi districts, Bard retained or acquired the oil and mineral rights to the property. In March 1873 Bard sold 2,700 acres of P&CPC holdings, including parts of ranchos Simi and San Francisco that straddled Oak Ridge and the major part of Torrey Canyon, in which Bard was keenly interested for their oil potential. R. G. Surdam, the buyer, sold the land for sheep range, while retaining the mineral rights, one-third of which were conveyed to Bard, and one-third to W. S. Chaffee. The three became tenants-in-common in Simi Petroleum Company (Hutchinson 1965a: 103–132, 235–241). These oil rights eventually comprised the core holdings of the early Union Oil Company (Pederson 1990: 15). Bard also acquired the oil rights on 5,911 acres of the Upper Ojai from the now-defunct CPC, which through Bard had disposed of its Ojai holdings to some two dozen landholders. Bard also bought 414 acres in fee at Coche Canyon in the southeast corner of the Ojai. In the wake of the panic of 1873 that devastated Scott's financial empire, however, Bard disposed of Scott's Rancho Cañada Larga property, including the mineral rights (Hutchinson 1965a: 241–248). Eventually, the families that acquired tracts for ranching purposes benefited handsomely from the development of the Ventura Avenue field, which lay at the heart of Scott's property.

The timing of oil activity in Ventura county thus delayed the division of rancho lands into smaller parcels. Climate, geography, and the lack of urbanization and industrialization, however, ensured that many of the ranch holdings on which oil exploration and production took place during the twentieth century remained substantial.

Leasing Government Lands

Leasing onshore government lands was also an important factor in tri-county oil development throughout the exuberant era. California's 1852 Possessory Act, which allowed claims of only 160 acres and was designed to offer protection for agricultural and grazing, rather than mineral, rights, proved inadequate for purposes of oil exploration. Oil entrepreneurs gradually began to proceed on the basis of mining claims that followed the practice of gold claims. Oil seekers formed mining districts in northern Los Angeles and Ventura counties, replete with codes, by-laws, and elected mining recorders to keep track of claims. In Ventura county, where much of the rugged canyon terrain was government land, a group of oil seekers set up the Sespe Petroleum Mining District in 1876. The federal government cooperated by

withholding the lands that these districts encompassed from agricultural entry and treating them solely as mineral lands. The federal government then validated this approach to acquiring claims to oil bearing lands with the passage of placer mining acts of the early 1870s. Because it limited an oil patent to 160 acres and required that oil be discovered to secure a patent, the placer laws were unsatisfactory to oil prospectors and developers. Operators compensated by filing claims through so-called dummy locators on adjacent lands while they drilled for oil. This legal regime remained in place until the Taft administration (White 1962: 7–13, 28–30, 44–45, 52–53, 66–67, 434–435). The system provided the basis for claims filed on the beach and tidelands at Summerland in the late 1890s (Gilbert and Siemon 1933).

Between 1909–20, in the context of the national debate on the conservation of oil and gas reserves, discussed in further detail below, U.S. public policy substituted leasing for patenting of oil claims. By 1909 most of the nation's oil reserves were in private hands. The majority of the known reserves that were accessible from public lands lay in California. On the recommendation of the U.S. Geological Survey and the Department of the Interior, both of which were concerned that the U.S. Navy would lack the fuel oil it needed for its ships, given rates of depletion, President Taft withdrew 2.9 million acres of public lands from entry, 94 percent of which lay in California. In 1912 the Taft administration established naval oil reserves at Elk Hills (38,969 acres) and Buena Vista Hills (29,341 acres) in the San Joaquin valley. The action had little direct effect on the tri-county area, but it created great uncertainty among the firms that held unpatented acreage. It took a decade of wrangling among conservationists and oil producers to address the issues of opening withdrawn lands and providing relief for operators who had entered withdrawn lands legally prior to 1910. Along the way, Congress passed the Picket Act (1910) and Assignment Act (1911), neither one of which provided for a satisfactory solution to the issue. In February 1920 President Wilson signed into law the Mineral Leasing Act that, as amended, provided for the leasing of onshore federal lands (White 1962: 433–459).

The original provisions of the 1920 act retained the spirit of homesteading, providing for comparatively small leases that limited operators to one lease per field and three fields per state, for corporations, partnerships, and proprietorships alike. It provided for fixed leases of twenty years and required exploratory drilling to begin within six months of the acquisition of the lease. Royalties were based on rates on private land, and were set at a minimum of one-eighth. As passed in 1920, 52.5 percent of the revenues from the act would go toward retiring land in its virgin state, 37.5 percent was pegged for state roads and education, and the remaining 10 percent went to the U.S. Treasury (along with the filing fees). In 1921 the state of California passed the Mineral Reservation Act. Patterned on the federal law, it paid particular attention to tidelands leasing (Bradley 1996: 266–271).

As passed in 1920, the Mineral Leasing Act promoted continuous and competitive drilling, which prompted the conservation-minded president Herbert Hoover to close the public domain to federal leasing in March 1929. In March 1931, in the interest of conservation, Congress amended the 1920 act to exempt unit operations and others forms of cooperative development from the acreage limitations. Under amendments passed in August 1935, the Secretary of the Interior acquired the authority to required unit or cooperative arrangements

among interested parties as a condition for obtaining lease rights. Congress also introduced five-year noncompetitive leases in areas within known geological structures and standard ten-year competitive leases. Acreage limitations over time increased from 2,560 acres to 246,080 acres by 1960, as the emphasis in public policy shifted again toward the promotion of domestic production (Bradley 1996: 266–271). In the tri-county area, leasing of onshore federal lands comprised part of the exploration and production story in Ventura county and the Cuyama valley after World War II.

Leasing Private Rural Lands

In addition to large ranches, there were numerous smaller farming tracts in the tri-county areas, which were the result of homesteading government lands, squatting on rancho lands, or the subdividing of rancho lands on the part of large landowners. During the exuberant era, onshore tri-county oil activity took place in rural areas on lands whose owners more often than not demonstrated their willingness to benefit economically from leasing their property to entrepreneurs seeking oil.

Among tri-county operators, Union Oil's practice of owning land in fee stands out. Again the practice owes much to the location and timing of oil exploration and development. As a result of the success that Hardison and Stewart enjoyed in finding oil during the 1880s, Union Oil and related interests retained considerable fee property in Ventura county. Further, path dependency in land ownership was evident during the twentieth century. As late as 1959, for instance, Union Oil still owned in fee a 14,000 acre block on what had been the Rancho Ex-Mission San Buenaventura (Kegley 1959c). In north Santa Barbara county, Union Oil bought and leased substantial tracts of land during the early 1900s under "an aggressive policy for acquiring oil lands" in order to meet Lyman Stewart's goal of acquir[ing] enough of these lands to control the market" (Quoted in Welty and Taylor 1958: 84, 237). In 1902 Stewart secured options on 72,000 acres in the unproven, but geologically promising, Lompoc and Santa Maria valleys, which he was able to obtain at grazing-land prices. With Union having drilled the discovery well in the Lompoc field in July 1902, the firm added 43,000 acres in the area to its portfolio, mostly in fee, and leased 4,800 areas in the Santa Maria valley. In 1904, Union acquired 75,000 acres in Santa Barbara county, 35,000 acres of which it purchased in fee. Union now had 60,000 acres in the area that contained the giant Santa Maria field (Welty and Taylor 1958: 91–94, 237). In 1918, Union was producing 60 percent of its overall output from lands held in fee (Welty and Taylor 1958: 238). As of August 1927, Union held 81,761 acres in fee or under lease in north Santa Barbara county (Matier 1927).[24]

Majors that engaged in aggressive leasing to gain a competitive advantage were sometimes willing to let others perform the risky exploratory work that might prove the producing potential of the holdings. Owing to changing in market conditions, majors were also sometimes left with too much property on their hands. In the early 1900s, for instance, Union's Stewart recognized that his firm had acquired more territory in north Santa Barbara county than it could operate for the foreseeable future (White 1962: 267–268). In such cases,

[24] The sequence of transactions that would reconcile this figure with the acquisitions of the early 1900s remains unclear.

leaseholders often "farmed out" leases. Majors would turn over leases to small and intermediate independents, reserving a proportion of whatever oil was produced from the property. If oil were found, it would prove up the majors' adjoining acreage (Olien and Olien 1984: 69–77).

The pattern in north Santa Barbara with respect to the Santa Maria Valley field differed from the Orcutt and Lompoc cases of the early 1900s, owing to the timing of the discovery relative to the economic development of the area. Union Oil discovered the field in July 1934 on "a straight wildcat" (Welty and Taylor 1958: 166, 241). Moreover, the area now contained numerous farms that sustained a vibrant agricultural sector. Several other operators, including Hancock and Bush, a joint venture, Echo Oil, E. H. Moore, Fred E. Cole, G. & B. Oil, Robert S. Lytle, Sed, and S.-M. Oil, soon obtained leases and joined Union in defining the limits of the field (Frame 1938). Union owned 3,500 acres in the field, 2,000 acres of which accessed proven reserves (Welty and Taylor 1958: 242; *Santa Maria Daily Times* 1940). Yet operators extended the limits of the field throughout the period. Hence, as of January 1, 1939, the proven area of the field encompassed 4,760 acres. Operators drilled 147 wells between July 1934 and January 1939; 134 of them produced oil. Union remained the leading operator. Yet twenty-five other firms had producing wells, five of which had at least five producers. The Beacon area of the field, comprising a mere eighty acres, was particularly congested. Fifteen operators had leases that supported twenty producing wells (Frame 1938).

Thus when Union moved to increase its holdings in the field, the firm had to pay more than "grazing land prices" for the privilege. In an October 1940 deal that also illustrates land holding patterns in the Santa Maria district at the time, Union spent an estimated $1 million to acquire the leases of E. H. Moore on some 4,000 acres of land owned by half a dozen concerns. The transaction included nine wells with a total production of 2,567 b/d. At the same time, Union acquired 420 acres on three smaller leases that Shell had relinquished. Together with the purchase of 400 acres from Ohio Oil earlier in the year, the deals gave Union more than half of the proven acreage in the field (*Santa Maria Daily Times* 1940).

Since none of the earlier studies (SLO I, SB I, VC I, SLO II, SB II, and VC II) performed a systematic intensive analysis of leaseholders, and since the scope of this study precludes such an undertaking, we do not have a detailed picture of the pattern of land ownership and mineral rights at the turn of the twentieth century, which marked the beginning of intensive oil development in the coastal region. During late nineteenth and early twentieth centuries, many of the lands that promised to be, or eventually proved themselves to be, oil bearing were acquired by ranching or farming families who also obtained the mineral rights (cf. Percy 1968; *Ventura County Star-Free Press* 1949g). Through the nomenclature that uses lease names to identify oil wells, there is potential visibility to these ownership patterns, but, again, no systematic analysis was done at this level in previous work. Nevertheless, from anecdotal evidence, we can get a sense of the onshore ownership patterns that oil companies faced as they developed the tri-county region's oil and gas reserves.

Storke (1958: 208–210), for instance, observed that the first lease registered in Santa Barbara county (in March 1901) was on land owned by the Careaga family in the Santa Maria valley.

Much of the surrounding area was held by ranchers or farmers in smaller tracts, recently acquired from the U.S. government, and many of them benefited economically once the late-1904 completion of Union's No. 1 well on its Hartnell lease proved the Santa Maria field as a giant producer. The Careagas, Bells, Bradleys, Brookshires, Fox's, Hartnells, Hobbs's, and Newloves were among the agricultural families who benefited from leasing their Santa Maria area holdings to oil firms, and whose names are attached to the wells on their lands (cf. Simon 1990: 21–22). The Bells, for instance, benefited from E. L. Doheny's investment in the tri-county area when, in 1916, Pan American Petroleum Investment Company paid $2 million to lease 10,000 acres on the their ranch (Ansell 1998: 144). In another case, from 1901–11 Western Union, Union Oil of Delaware's California property, developed the Careaga lease. Union of Delaware further developed it by drilling another twenty wells at a cost of $2 million, yet production of 1,400 barrels per day in 1921 remained below expectations. In 1922 Shell renegotiated the lease with the Careaga heirs after it merged with Union of Delaware in February, and thereafter developed it on a non-strategic basis (Beaton 1957: 222). (The original lease conceded the right to drill new wells for only twenty years.) In Ventura county, the McGrath (5,000 acres), Borchard, and Livingston families owned large tracts on the Oxnard plain, the Janss family's ranch on the Conejo plain contained 10,000 acres, and half a dozen or so families owned the land on which the Ventura Avenue field was developed, including the Frasers, Gosnells, Hartmans, Lloyds, Maulhardts, McGonigles, Sextons, and Taylors. In the Cuyama Valley, the huge 50,000-acre ranch of H. S. ("Hub") Russell encompassed the Russell Ranch field (Jones 1972: 244–247).

Homesteaders have received much less attention in studies of the early California oil industry than the entrepreneurs who acquired huge amounts of acreage from beleaguered owners of ranchos. As far as oil leasing patterns in the tri-county area is concerned, homesteading is an important part of the story, especially in the Santa Maria valley, into which the rancho system did not extend—or, rather, shunned, owing to the lack of water and other conditions that made the area unattractive for either ranching or farming. Hence, land ownership patterns did not emerge until the late nineteenth century, when settlers acquired lands from the U.S. government.

None of the research under review in this study, however, offered any quantitative data on the extent of homesteading in the area. Yet, crucially, those who acquired lands through homesteading gained title to both surface and mineral rights, as the case of the family of James Shiells illustrates (Scott 1984). Shiells's antecedents acquired property in Ventura county in the late nineteenth century, raising in turn cattle and oranges prior to their leasing it to Montebello Oil, which initially developed the field, known as Shiells Canyon, during the early 1900s. The Texas Company, which acquired the lease in its purchase of California Petroleum in 1928, invested in the field's development into the 1980s. At the time of the May 1995 sale of its interests in nine California oil fields to Vintage Petroleum, Texaco had 326 wells in Shiells Canyon field (Vintage Petroleum Company 1997).

SB I, SLO I, and VC I all stress the compatibility of oil and agriculture. Land owners received royalty checks that stabilized their incomes, provided capital for expansion, or even made them rich. Oil also provided seasonal employment for farm hands. James Shiells confirmed,

for instance, that the relationship among orange growers and oil firms was "congenial." Oil companies might take one or two acres of a grove for exploration and development purposes, he noted, but they compensated the grower, who received a royalty if he or she retained the mineral rights—his family did (Scott 1984).

In many tri-county fields, then, oil companies dealt with a few large, rural landowners, which created the possibility for cooperative field development. The Santa Maria Valley example suggests, however, that patterns of land ownership were also related to economic development. As the tri-county area developed agriculturally, individual land holdings became smaller and more numerous for a given field. As the example also illustrates, an equally important factor in field development was the actual leasing pattern that evolved as exploration and development defined the limits of a field. Across the extractive region, there was diversity among fields in terms of size, geology, leasing patterns, and geography, including proximity to water or rugged terrain. Few individual landholdings were large enough to contain fields of even moderate size. Thus leasing, rather than land ownership, patterns often dictated the character of field development, unless landowners themselves cooperated rather than competed with respect to field development.

Competition for leases in unproven areas was often as keen as the exploratory drilling activity that ensued. The 1950 discoveries of the minor Taylor Canyon and Morales Canyon fields, for instance, were sufficient to sustain a period of frenetic leasing in the north Cuyama valley (Kegley 1950c, 1950e, 1950g, 1950h, 1950l, 1950o, 1950r, 1950s, 1950u). In the early 1950s, moreover, majors such as Richfield, Shell, and Standard leased thousands of acres of across Ventura county in hopes of securing reserves that were becoming harder to find (Kegley 1952m, 1954a). The farmers on the Oxnard plain seem to have fared well financially from various lease campaigns. According to Kegley (1951q), they received higher payments for prospective oil lands in the early post–World War II period than "any other group of farmers in the country."

Still, small operators often used connections with such farmers or other land owners to beat majors to one or more parcels once the latter began leasing land for exploration purposes (Off 1998). It was difficult for a single operator to lock up an entire field through leasing, excepting perhaps the areas in Ventura county that were developed on unbroken rancho lands by Union Oil interests during the nineteenth century. During the late 1940s, Richfield came close to leasing up the entire Cuyama valley. Its 150,000 acres comprised 87 percent of the potential production across five fields (Jones 1972: 240–244).[25] More typical was the case of the Goleta valley of south Santa Barbara county, which was leased up from the Santa Barbara city limits to Gaviota, some thirty-five miles to the west, during the late 1920s. Shell and Standard acquired a majority of the leases, but as the *Santa Barbara Daily News* (1929b) reported, there were "many smaller companies holding leases." Many fields remained in the hands of one or more large operators. Yet as the limits of fields expanded, new leases, and often, new firms, were brought into the productive area. Thus large fields, such as Ventura

[25] From the discovery of the Russell Ranch field in January 1948 through March 1950, Richfield paid out $10 million to landowners and royalty holders (*Petroleum World* 1950).

Avenue, Cat Canyon, and Santa Maria Valley, which were initially (and remained) dominated by a few firms, eventually supported a dozen or more operators in a given year.

Landowners could benefit from the possibility of the discovery of additional oil reserves, even if actual results fell short of expectations. In February 1951, for instance, seismic tests conducted by Union and Western Gulf near Orcutt purportedly made a deep zone pool discovery between Orcutt and Cat Canyon fields, creating a demand for leases across several thousand acres. Landowners reportedly received one-sixth royalties with large cash bonuses, plus $15–20 per acre annual rentals in lieu of drilling, from at least ten companies (*Santa Barbara News-Press* 1951a, 1951b, 1951c). Ultimately, Western Gulf made only a minor discovery at the southeast end of Orcutt field (Division of Oil and Gas 1953: 66). Thus landowners failed to receive royalties that appeared so promising the year before.

Cooperative and Competitive Leasing: Three Cases

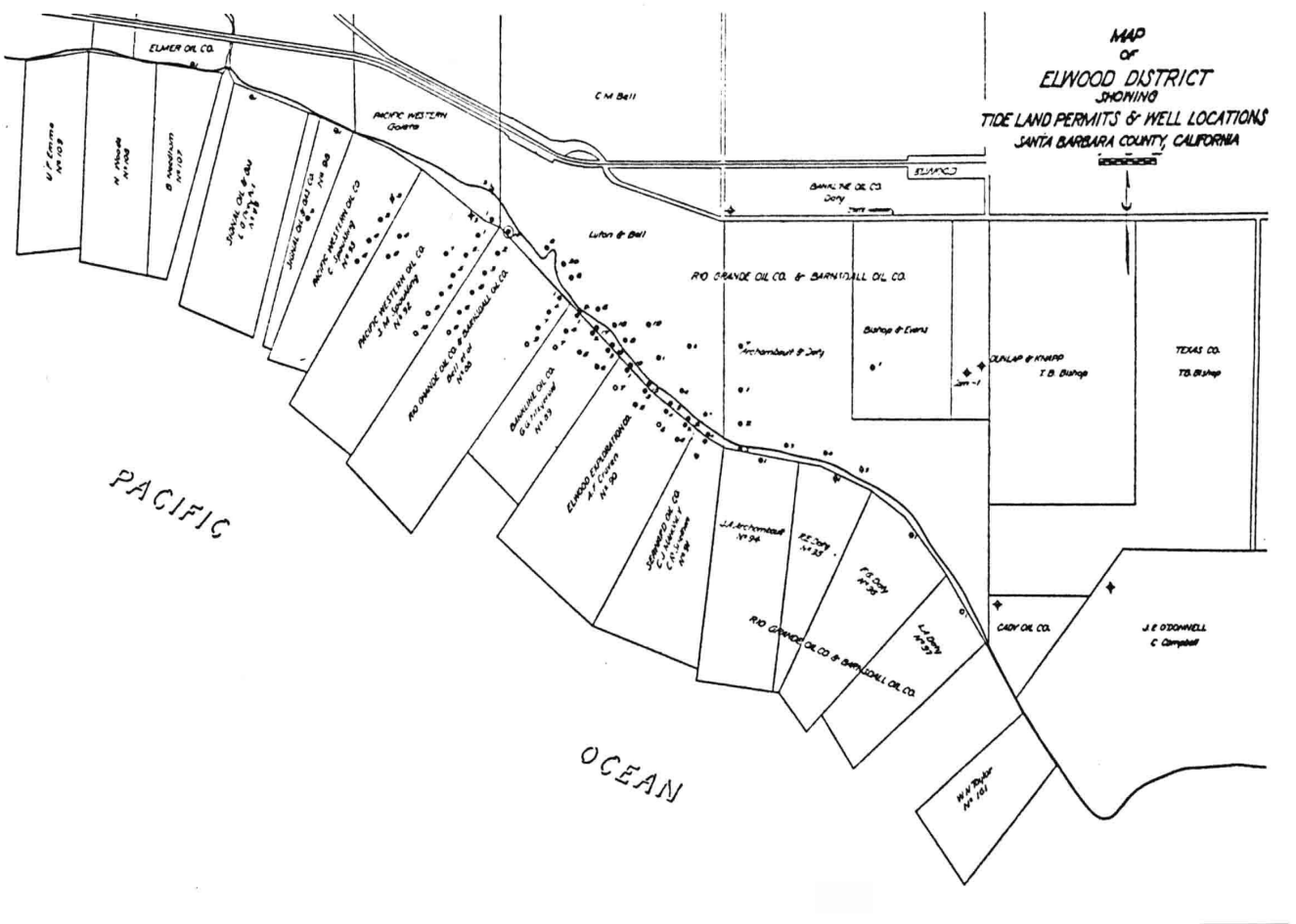
Three cases illustrate the relationship between land ownership and leasing patterns, on one hand, and the character of field development, on the other. In both the Ventura Avenue and Elwood fields, the number of landowners was small. By contrast, the number of operators on the Santa Barbara Mesa, the site of the most extensive town lot drilling among the three counties, was high. At Ventura, landowners cooperated through Ralph B. Lloyd, who, in partnership with Joseph Dabney, persuaded E. J. Wiley's State Consolidated Oil Company to develop the field. State Consolidated was able to prove the existence of oil in the field, but it did not have the resources to develop it.[26] Thus Lloyd and Dabney, with the cooperation of Miley, turned to majors with the capital and expertise to address the geological challenges that defeated State Consolidated. At Elwood, development at the outset was controlled by two firms. However, the resolution of a leasing issue allowed operators access the field from tidelands locations. Competitive development ensued. Circumstances were similar in the Mesa field, where, as Dolman (1938a: 14) put it, "Like most town-lot fields, there are 10 wells where one would have sufficed."

Initial development at Elwood was controlled by Rio Grande and Barnsdall. Concerned with conservation at a time when supplies of crude oil were overwhelming the market, the joint operators adopted a ten-acre spacing plan and otherwise developed the field in an orderly manner. With all of California's oil fields subject to voluntary curtailment, *Petroleum World* (1930: 61) reported that production at Elwood was "well controlled" and had "recently shown that [it was] in good hands by the prompt and effective manner in which [the] operators have concurred in curtailment," which was set at 57 percent of potential output.

[26] Formed in March 1911 and capitalized at $1.25 million, State Consolidated had rather more success in Kern county, where it operated thirty-three producing wells at the end of 1920. For his part, Dabney was one of the most prominent small operators of the Los Angeles basin, with interests in Dabney Oil Company, incorporated in May 1901 and capitalized at $1 million, and Joseph B. Dabney and Company, a Los Angeles partnership. Between them they had seventeen producing wells in Kern county as of December 31, 1920 (California State Mining Bureau 1923). In 1927 California Petroleum took over these properties (Moody's Investor Service 1929: 1657). In April 1927 Dabney and several associates incorporated the Goleta Oil Dome Company, and capitalized it at $1 million, for the purpose of exploring the Tecolote district in the Goleta area of south Santa Barbara county (*Santa Barbara Daily News* 1927a).

However, the leasing of tidelands adjacent to the Rio Grande-Barnsdall tract opened the field up to other independents, including Bankline, Honolulu, Pacific Western, and Signal (see map 5). Controlled production from the onshore Luton-Bell lease, held by Rio Grande and Barnsdall, gave way to competitive drilling to capture the onshore and offshore reserves (*Petroleum World* 1931d; Goble 1930a; Goble 1930b). As Lima (1994: 150–168) observes, development at Elwood tested public policy regarding tidelands drilling. According to Charles S. Jones (1972: 51), Richfield's chairman from 1962–66, the consequent reduction in the field's producing potential demonstrated the need for conservation in California's oil fields. In the late 1940s, his firm sought to prevent a repeat of the Elwood experience in the Cuyama valley by leasing as much of the area as it could and by unitizing operations (Jones 1972: 256–266).

Map 5. Elwood Leases, 1931
Source: *Petroleum World* (1931d).

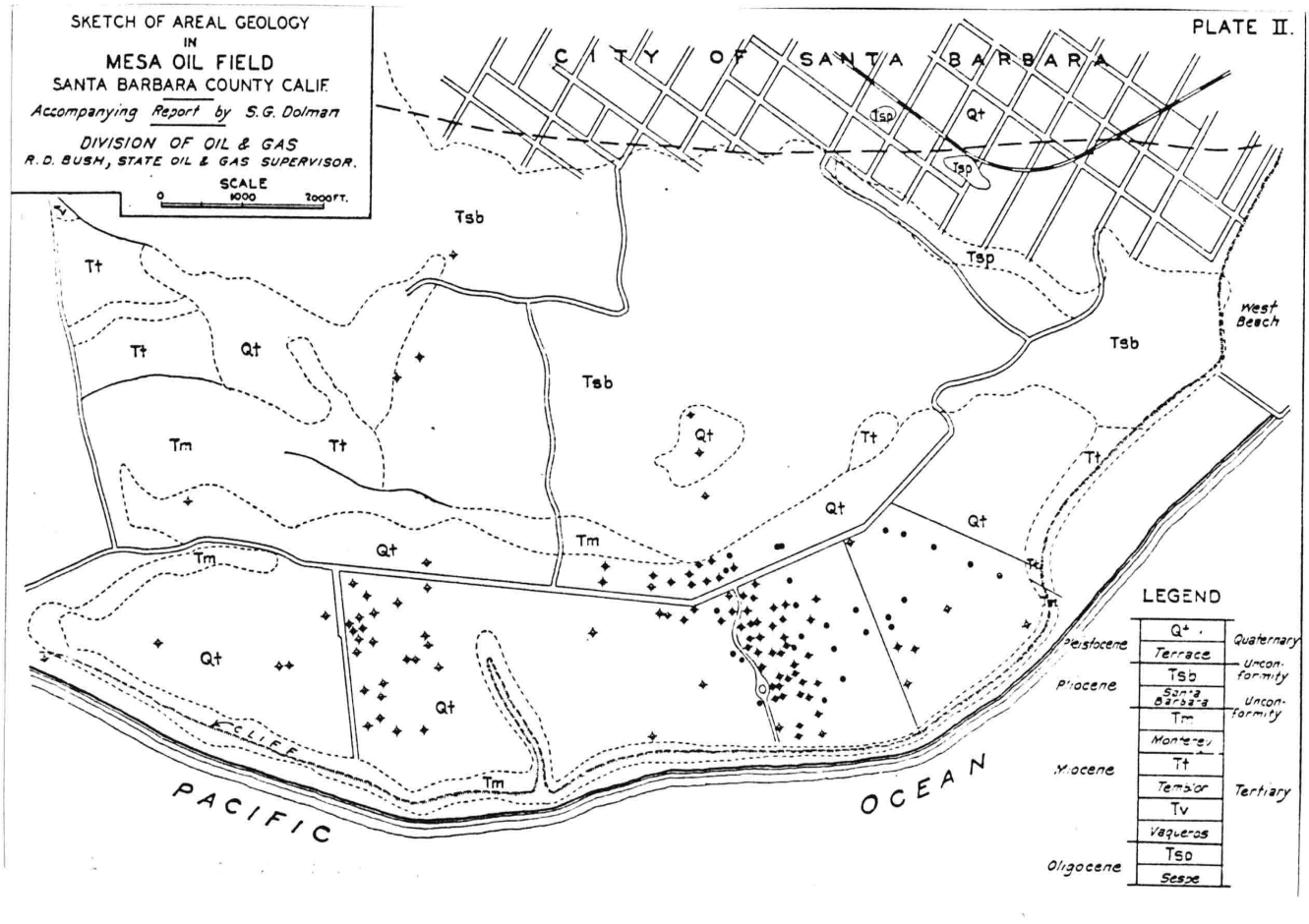


As described by Jones (1972: 49–50), the competitive situation arose, owing to the failure of Rio Grande to secure the four tidelands parcels that lay seaward of upland holdings of the owners of the Luton-Bell lease. The lease was part of the land holdings of the four grandchildren and heirs of Nicholas Den, who in 1842 secured a land grant from the governor of California. They included Catherine Bell Luton, Charles Bell, Katherine Bell Cheney, and

Mary Bell Cheney. On behalf of the Bell, Cheney, and Luton families, Rio Grande filed on four tidelands leases in July 1927. The posting of the filing notices on the parcels was done improperly, however, enabling others to post their own notices a year later when the original filing expired. The Bells, Cheneys, and Lutons challenged the filings, but the courts ruled that they were entitled to preferential rights to only one of the four parcels. The individuals who gained possession of the other three parcels leased them to Bankline, Elwood Exploration, and Seaward. With Honolulu and Signal eventually acquiring the latter two parcels, three substantial independents held competitive positions in the field. The situation intensified when the owners of the Tecolote ranch immediately to the west of the Luton-Bell lease (see map 5), secured their preferential rights to the tidelands parcels adjoining their property, and leased them to Pacific Western, an emerging independent over which J. P. Getty gained control by the end of 1931 (Jones 1972: 51).

Owing to the lack of urbanization in the tri-county area prior to World War II, town-lot drilling was uncommon. Interestingly, it occurred most conspicuously in the city of Santa Barbara, whose character was incompatible with industrial development. A minor field by any standard, it experienced periodic development from 1922–34. Three areas of production were discovered: Palisades (1929, abandoned a year later), Vista del Oceano (1930), and Fair Acres (1934). The area designated as the Mesa field by the Division of Oil and Gas was two miles in length and about 3,100 feet wide, comprising some 800 acres (see map 6). It lay south of the Santa Barbara downtown area, and was bounded on the north by Lavignia Hills, and on the south by the ocean. Only 115 acres proved to be productive (Dolman 1938a: 5). During the first phase of development, majors held much of the area under lease, but relinquished their leases to small operators, who completed all of the discovery wells. In all three areas of the field, 107 wells were completed by the end of 1938, with an average depth of 2,000 feet and an average cost of $10,000 (Dolman 1938a: 8). As at Signal Hill, Huntington Beach, and Santa Fe Springs, drilling occurred in a congested area, though on a much smaller scale. In late 1934, for instance, thirty-four independent firms, most of them small, were operating fifty-four wells on thirty-five leases, with the largest operator, Fred E. Cole, operating only six wells (Powell 1934). Wells were characterized by good initial output and rapid depletion. Production rose from 19,000 barrels in 1929 to 1.1 million barrels in 1935, but diminished to 41,000 barrels in 1941. As Dolman (1938a: 14) concluded, “It is doubtful if the field has returned in dividends the money invested [in it].”

Map 6. Santa Barbara Mesa Field, 1938
Source: Dolman (1938a: 6).

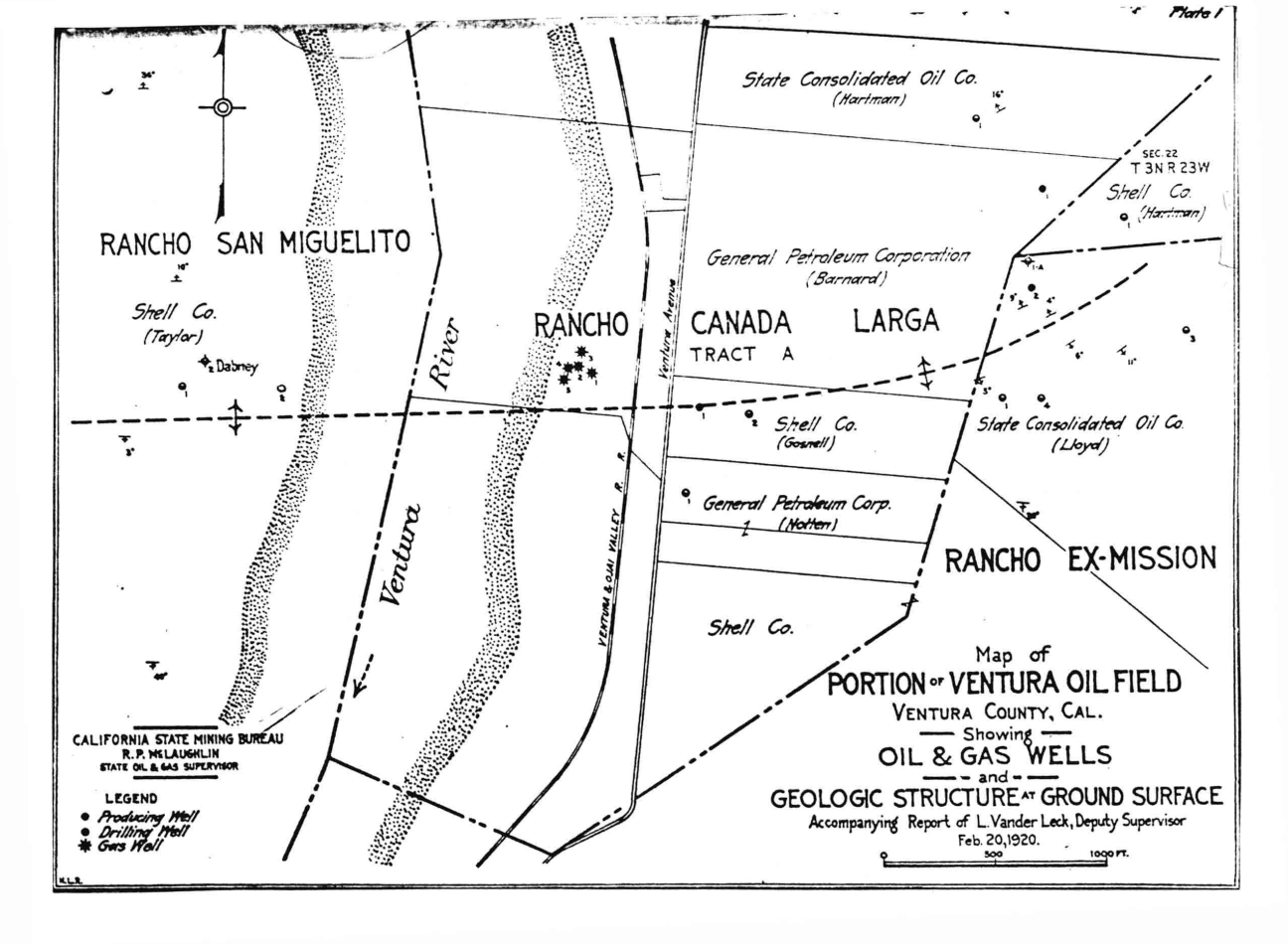


By contrast, the development of the Ventura field proceeded in an orderly fashion on a cooperative basis. Much of the credit owes to Lloyd and Dabney, who gained the cooperation of the owners of the lands that straddled the Ventura river east of the city of Ventura, and who bought in Shell and Associated to develop the field (see map 7). Lloyd was based in Los Angeles (as were his partners), where he engaged in the management of both oil and commercial properties.[27] The Lloyd family had owned about 4,500 acres of grazing land in the area, and had sold it at five dollars per acre to a sheep rancher while Lloyd was attending the University of California. At Lloyd's behest, the family retained the mineral rights (Associated Oil Company 1926b). Upon his graduation in 1898, Lloyd mapped the Ventura anticline, above which had sat the family ranch. From 1911–14, Lloyd and Dabney leased much of the area that they considered to be possibly oil-bearing land, with the exception of two properties (Beaton 1957: 107–108). Lloyd and Dabney signed leases with several landowners and the Ventura Land and Water Company, in which the Lloyd family had a one-

[27] As Lloyd (1934c) detailed for the benefit of the Bank of America, as of September 1934, the Lloyd Corporation owned a large amount of oil lands in Ventura and Los Angeles counties, a large amount of rural real estate in these two counties, and city real estate in Portland, Los Angeles, and Beverly Hills.

third interest. During 1915–20, State Consolidated drilled four wells on leases acquired from the Lloyds and Louis Hartman (Lloyd Corporation 1935a). As Lawrence Vander Leck (1920), deputy supervisor for the California State Mining Bureau, reported in February 1920, none of these wells sustained production, but the effort demonstrated the possibilities of the field.

Map 7. Ventura Leases, 1920.
Source: Vander Leck (1920: 21).



In June 1916 Lloyd reached a general understanding with Shell Company of California president B. H. van der Linden that provided for the basis of developing the field in an orderly manner with the expertise and resources of the firm that he considered the best company "to solve the problems necessary to be solved in conquering this territory" (Lloyd 1921c). Through Lloyd and Dabney, Shell obtained 13,000 acres on leases from local landowners, who contracted to receive the standard one-eighth royalty. Lloyd and his partners were to receive an additional, overriding royalty determined by the price of crude oil, which Shell had the option of buying out at a later date (Beaton 1957: 108–109).

Based on a June 1915 oral agreement with van der Linden's predecessor, it was Lloyd's understanding that if Shell were interested in any Ventura field properties, he would attempt to acquire the mineral rights and lease them to the company. Lloyd thus felt that he was

Shell's exclusive agent in the field. He also sought the agreement of land owners to refrain from leasing their property until Shell either was prepared to invest in drilling the lease or indicated that it was not interested in the property (Lloyd 1919d; Lloyd 1919j). For its part, however, Shell denied that it had entered into an exclusive principal-agent arrangement with Lloyd. In its view, the contract defined a buyer-seller relationship in which Shell purchased from Lloyd and his partners the privilege to have mineral rights purchased from the parent lessors by the latter (B. H. van der Linden 1919; Shell Company of California 1919; Shell Company of California 1920). The arrangement worked until Shell directly acquired a lease from Southern California Edison. This motivated Lloyd and Dabney to turn to Associated for the development of the Lloyd lease, which proved to be the most productive area in the field during the interwar period (Lloyd 1920a; "Tentative Agreement," 1920; Lloyd 1920b; Lloyd 1920c).

In the meantime, Lloyd worked on several properties, acquiring three leases, one property outright, and the oil and mineral rights to the Joseph Sexton and William Sexton ranches to the east of the proven area of the field. Shell was not interested in any of them. GP picked up the Barnard lease, and began drilling it in 1917 (Lloyd 1919d; Lloyd 1919j; Lloyd Corporation 1935b). As of April 1919, the Ventura field portfolio of the Lloyd interests included more than 6,000 acres of oil rights, and leases on as many other acres. Lloyd owned oil rights and leases to 4,000-5,000 acres, with Ventura Land and Water Company holding the balance (Lloyd 1919f).

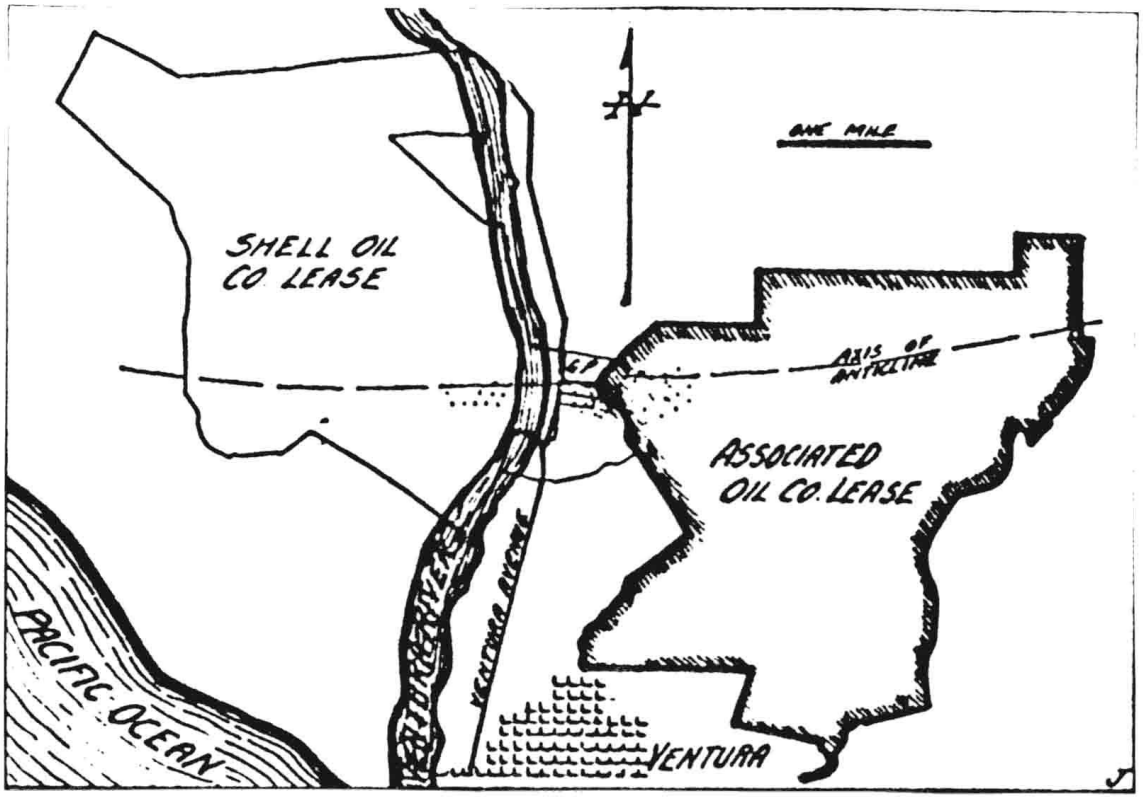
Shell invested some $3 million in the field from June 1916 to the end of 1921. Progress was slow, owing both to the surface terrain and subsurface geology. Cable tools proved insufficient to overcome the high-pressure gas and water that the drilling team encountered at shallow depths. In late 1919 Shell surrendered the difficult McGonigle lease, which Associated picked up in December 1922. In 1921 Shell's internal assessors fixed the value of the firm's interest in the field at only $1 million. The firm enjoyed better success on the Gosnell lease, but among Shell managers and engineers, few shared van der Linden's and Lloyd's enthusiasm for the field's potential. In 1924 Shell considered selling its interests in the field to Associated for $3 million. It did not do so, but it surrendered the Hartman lease, which Associated acquired through Lloyd, in January 1925 (Beaton 1957: 109–114; Lloyd 1919h; Lloyd Corporation 1935b).

The sale of the Sexton Ranch rights to Milham Exploration in 1925 completed the letting of all 13,000 acres controlled by Lloyd *et al.* in the Ventura Avenue field. Associated now had some 5000 acres, Shell a little more than 4000 acres, and Milham Exploration some 4000 acres (Lloyd 1925a). GP, the only other operator in the field at the time, owned the Barnard and Notten leases in the middle of the productive area (see map 8). When Milham Exploration relinquished the Sexton Ranch leases, Lloyd and Dabney retained them. In the mid-1930s, Lloyd Corporation began push the limits of the field eastward on this property, largely on its own account, but also in association with Shell (under a 1934 agreement) and Standard of California (under a 1959 deal).[28] Thus, an agent acting on behalf of landowners

[28] Lloyd 1934a; Lloyd 1934c; Lloyd 1934d; Lloyd 1934e; Humphery 1934; Lloyd 1934f; Lloyd 1935a; Jenkins 1935a; *Ventura County Star-Free Press* 1949; Kegley 1953d; Kegley 1959c.

realized a leasing pattern that facilitated orderly development and maximum production through the efforts of a few substantial operators.

Map 8. Ventura Avenue Field, 1926
Source: Associated Oil Company, *The Record*, September 1926, p. 3.



Despite the dispute with Shell, which prompted Lloyd to bring another major operator into the field, Lloyd stayed on good terms with the company, and helped to guide the development of the field in the role of adviser and dispenser of information to, and coordinator of, activity among both Shell and Associated. As numerous letters in the Lloyd Corporation archive at the Huntington Library attest, Lloyd also advised lessors, acted as their agent, and managed their properties. As indicated, field production since 1925 has been prolific, and Ventura remains the largest onshore field in the tri-county area.

Dealing in Leases

The activities of Dabney and Lloyd as managers of and dealers in leases points to an aspect of the business that had little visibility in prior studies, which were charged with tracking the firms that actually drilled wells in the tri-county area. As Olien and Olien (1984) have noted, however, the purchase, packaging, and resale of leases offered a way for small firms to break into an oil producing area or sustain themselves in business. For Dabney and Lloyd, lease

management and land ownership in the Ventura Avenue field provided the capital that enabled the Lloyd Corporation to sustain substantial drilling campaigns there and elsewhere from the mid-1930s to the late 1950s. In 1925, for instance Shell paid Lloyd *et al.* $1.2 million for the overriding royalty interest on the Taylor lease (Beaton 1957: 111). Lloyd and Dabney also earned a substantial amount of money from the one-fifth royalty on the Lloyd lease. For instance, Associated's Lloyd No. 9-A wells generated $378,000 (in total) in its first two months of production (Lloyd 1925a). As of September 1934, the year in which it began to drill for its own account, Lloyd Corporation had paid-in capital of $5 million and a surplus of $467,175. From 1927–34, the firm had net earnings of $4.07 million from commercial real estate and oil properties. Net earnings for Ventura Land and Water Company, of which Lloyd Corporation owned 30 percent, totaled $8.3 million for the same period (Lloyd 1934c).

Given his reputation and success, Ventura landowners often approached Lloyd with possible lease opportunities. At the same time, Lloyd and his partners played the role "rainmaker," querying landowners regarding their interest in leasing potentially oil-bearing lands. After confirming the potential of a property, Lloyd tried to interest Shell or Associated in it. Invariably the two majors declined to pursue the offer, preferring instead to focus on the Ventura field. This was the case with several properties in the Conejo, Camarillo, Fillmore, Moorpark, Ojai, and Simi areas soon after World War I.[29] Between 1919–26, however, Lloyd acquired and resold at least four leases in Ventura county (Lloyd Corporation 1935b). Lloyd Corporation also held leases in Inglewood field in Los Angeles county, which generated good returns with the early-1930s discovery of a deep zone in the field (Lloyd 1934c).

Oil firms that never drilled a well or operated a producing property were not identified in Adamson and Bergstrom (1998). Such was the case with the Santa Paula y Saticoy Oil Company. As detailed by the Ventura County Historical Society staff (1957), its principals included Edward Haskell, Burdette Haskell, his son, Anthony Hellmann and William Morrow. In December 1864, the elder Haskell had purchased the 17,333-acre Rancho Santa Paula y Saticoy, including both surface and mineral rights, from George Briggs, who had acquired it two years earlier from the More brothers. Per Briggs's wishes, Haskell broke up the tract into small farm-sized holdings, but he retained the oil and mineral rights. The original deeds, however, contained nothing regarding exceptions to rights, and thus became the object of subsequent lawsuits. At the same time Haskell tried unsuccessfully for thirty-seven years to interest outside capital in finding the oil that he was convinced lay under the land in large amounts. In March 1903, the Santa Paula y Saticoy Oil Company was incorporated to exploit Haskell's oil rights. At the time, about 3,000 people resided on the former rancho, and many of them wanted to purchase the oil rights.

In 1913 Ventura county began assessing the company for the value of its oil and mineral rights, on the basis that landowners were willing to pay for these rights. Though the firm was capitalized at $100,000 (California State Mining Bureau 1917: 265), Santa Paula y Saticoy Oil had no cash flow to speak of, and soon defaulted on its property taxes. In 1924 it sold the oil

[29] See, for example, Lloyd 1919a; Donlon 1919a; Lloyd 1919b; Donlon 1919b; Lloyd 1919c; Lloyd 1919e; Lloyd 1919g; Shell Geological Department 1919; Lloyd 1919f; Lloyd 1920d; Lloyd 1920e; Lloyd 1920f; McLaughlin 1920a; McLaughlin 1920b; Lloyd 1920g; Lloyd 1921a; Lloyd 1921b.

and mineral rights on the western two-thirds of the property to the Ventura Refining Company for $10,000. Ventura Refining sold these rights to landowners for $2 per acre, clearing title to 11,500 acres (and making $13,000 in the deal).

There matters stood until 1940, when the firm offered landowners the opportunity to buy back 50 percent of the oil rights at $10 per acre, with the firm retaining the right to lease. Some landowners took up this offer. In 1941 Shell leased 3,000 acres and drilled a test well. Santa Paula y Saticoy Oil then withdrew the rights offer. Since landowners again clamored for the opportunity to acquire the oil rights to their land, the firm agreed to sell 50 percent of the rights at $20 per acre. A few more landowners took up this offer. With the outbreak of World War II, shortages of steel prompted Shell to abandon the test, and they quitclaimed the lease.

In 1947, Santa Paula y Saticoy Oil leased the western portion of the 6,200 acres to Superior, a leading independent, which assigned a portion of its interest to GP, which in turn drilled an unsuccessful test well in the early 1950s. Shell reentered the picture, acquiring this interest and drilling SPS No. 2. Completed in May 1955, this well discovered the Saticoy field, on which more than thirty wells were producing as of November 1957. In July 1956 the Santa Paula y Saticoy Oil Company sold its interests and assets to GP.

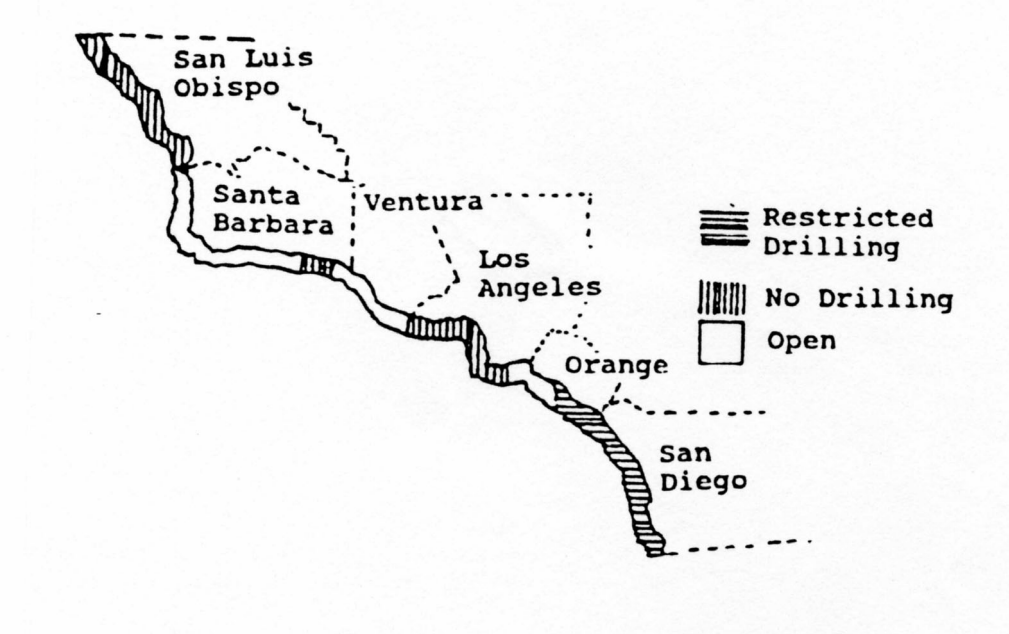
Though it never was never able to develop the oil reserves under the lands that it held, the firm played an important role in the eventual development of an oil field. The number of tri-county business concerns that dealt strictly in leases—that is, without ever operating any lease—is unknown, but the number likely dwindled over time, as exploration and development expanded the area of proven reserves. Both the Lloyd and Santa Paula y Saticoy Oil Company cases illustrate how onshore leasing often proceeded, including the role of the small firm in interesting both landowners and large companies in developing a field, and the interest of landowners in profiting from the exploitation of the mineral wealth that lay below their property.

Offshore State Leasing After 1955

The leasing of tidelands areas by the state of California was a different matter altogether. From 1957–68 the state leased forty parcels, twenty-seven of which lay seaward of Santa Barbara county and seven of which extended from Ventura county (Sollen 1998: 240–242). All of the successful bidders were majors or consortiums of majors and/or large independents.

As Lima (1994: 260–269) notes, the Shell-Cunningham Act addressed leasing from Oceano in San Luis Obispo county to Newport Beach, and allowed for a no-drilling sanctuary in state waters from the University of California campus to Summerland. It also restricted or established no drilling sanctuaries along portions of the Los Angeles and Orange county coastlines (see map 9). Path dependency in land use was embedded in the act, which ensured that leasing would occur only in areas that already had experienced offshore development—areas likely to hold additional reserves and have infrastructure in place to support development.

Map 9. State Tidelands Leasing Areas Under the Shell-Cunningham Act
Source: Lima (1994: 230). Reprinted by Permission of the Author.



As Krueger (1958: 466) argues, the 1955 act was a well-drafted effort for comprehensive tideland development," constituting "a satisfactory compromise between the demands of the oil industry for a workable scheme of leasing and those of coastal municipalities who were concerned with a possible impairment of more traditional uses of their seacoast." At the same time, prominent lawmakers in Sacramento opposed its royalty and bidding provisions for leases.[30] The 1938 State Lands Act had given the SLC discretion regarding royalty and bidding. The 1955 act amended the act, providing for a fixed one-eighth royalty for unproven leases, while permitting the SLC to retain its practice of royalty scale bidding for proven areas, with a minimum one-sixth royalty. The act required cash bonus bidding in all cases. The oil industry backed the amendment, alleging that the change in the law was needed to ensure the development of California's unexplored tideland areas (Krueger 1958: 460–461).

The royalty and bidding provisions marked a departure from both the 1938 act and national and industry norms. The fixed one-eighth royalty for unproven leases was low by national standards, and was less than operators were willing to pay to develop the potentially producing properties. The definition of a wildcat (unproven) property was also broader than the term was commonly used in the industry. Moreover, the distinction between proven and unproven properties under the act was administratively difficult to apply and was susceptible to legal challenge. Finally, independent operators and lawmakers who believed that state revenues would be maximized by royalty-scale bidding opposed cash bonus bidding. Majors and lawmakers who were interested in maximizing short-term revenues favored the approach (Krueger 1958: 461–465).

[30] The act stipulated that leases would extend twenty years "and so long thereafter" as production continued (Krueger 1958: 451–452).

The act's opponents believed that many of the lands classified as unproven areas under the 1955 act were promising enough to warrant leases that stipulated sliding scale royalties. Many of the interested oil firms disagreed. In mid-1956 a committee in the state assembly recommended that the SLC lease no unproven areas until lawmakers reconsidered the 1955 act. Nonetheless, in January 1957 the SLC opened bids on a 5,500-acre wildcat lease at Summerland, awarding the tract to Standard and Humble, which offered a $7.5 million cash bonus. This was the only lease that the SLC awarded under the 1955 act. Local and state officials criticized the SLC for holding the sale. In response to a resolution issued by the state assembly, the SLC suspended plans to lease six unproven parcels along the Santa Barbara and Ventura county coasts (Krueger 1958: 464–465; *Santa Barbara News-Press* 1957a, 1957b, 1957c).

In 1957 Sacramento lawmakers amended the royalty and bidding provisions of the 1955 act, instructing the SLC to apply the sliding scale royalty approach to leasing both proven and unproven areas: the general practice that the SLC had adopted under the 1938 act. Thus lawmakers eliminated the fixed royalties stipulated under the 1955 act. A minimum one-sixth royalty was stipulated for all leases. As amended, the SLC also had discretion to choose among royalty and bonus approaches to determine bid winners, which, again, had been its practice under the 1938 act (Krueger 1958: 466–469).

Many operators were critical of the sliding scale royalty plan (Krueger 1958: 471). Nonetheless, with the amendments in place, leasing resumed in 1958, when the SLC awarded leases on five tidelands parcels between Point Conception and Elwood fields. The total bonus paid by firms equaled $55.5 million (*Santa Barbara News-Press* 1958d). Successful bidders included consortiums headed by Phillips and Texaco (Division of Oil and Gas 1959: 116; Kegley 1958e). From 1961–68, the SLC leased most of the remaining tracts that the Shell-Cunningham Act designated as unrestricted (Lima 1994: 221 [tables 6-1]). It received $148.1 million in bonus payments and, from 1955–70, received an additional $241.6 million in royalty payments (Lima 1994: 272 [tables 6-2]). With the inception of federal offshore leasing, however, oil companies turned their attention to OCS development (Lima 1994: 285–302; *Oil and Gas Journal* 1966f).

The amendments to the 1955 act provided for more state discretion over the leasing process and (under another amendment) more transparency from firms, as far as information regarding the location of reserves was concerned. To paraphrase Lima (1994: 265–266), Sacramento demonstrated its desire to nurture and encourage offshore activity while ensuring a fair return on its natural resources to the treasury. State officials wanted to maximize income in a manner compatible with oil and gas conservation—an approach that was generally acceptable during the exuberant era.

Industrial Activity: Exploration and Production

For the 1950–95 period, Adamson and Bergstrom (1998) detailed all of the concerns that explored for oil or operated producing assets, both onshore and offshore, including federal OCS leases.[31] By including operators only, this approach did not capture all investors in the local industry. That is, there was a lack of visibility regarding both firms' interests in production where they were not the operator and the royalty interests of landowners.[32] The former included joint drilling ventures, "bottom-hole money" (a commitment by owners of nearby leases to pay an operator if he or she drilled to an agreed-to depth), "dry-hole money" (a commitment by owners of nearby leases to pay an operator if the well failed to produce oil), overrides (an interest in the revenue produced from the sale of a well's production), and other means by which operators spread the risks of drilling for oil. Royalty interests, discussed above, involved numerous landowners and the state and federal governments. Developing a comprehensive inventory of such interests would entail a project much more involved than that which produced the list of operators in the region over time, and was not attempted in any project to date.

For this study, the information presented in Adamson and Bergstrom (1998) was updated through the year 2000. No attempt was made to produce an inventory of operators for the period 1915–1949 for which well records are available in the district offices of the Division of Oil, Gas, and Geothermal Resources of the California Department of Conservation. There is some visibility to the pre-1950 period in Adamson and Bergstrom (1998) in that the researchers included the entire oil field résumé dating back to 1915 for any operator that had tri-county production as of December 31, 1949. For this study, a list of operators was generated from published sources for the years 1916, 1929, and 1941. Given the state of the research, this discussion works both backward and forward in time to construct a picture of how the industry evolved in the tri-county region prior to 1950, before it turns to the 1950–65 period, for which it relies largely on the findings produced in SLO II, SB II, and VC II.

Bain (1944) offers a comprehensive appraisal of the California petroleum industry as of 1940. The inventory of tri-county operators for the years 1916, 1929, and 1941 provides tri-county specific detail in support of Bain's findings and suggests the pace and character of tri-county industry activity and development during the period. The theme stressed here is that the industry expanded in a series of "bursts" throughout the pre–1945 period, accommodating entry on the part of all types of operators. At the same time, turnover in terms of operators was high, as significant merger and acquisition activity occurred, particularly during the

[31] The upstream segment of the oil industry comprises (1) exploration, or the search for new reserves in places where entrepreneurs, promoters, landowners, or scientists believe them to exist, (2) development, or the installation of production facilities to extract newly discovered oil, and/or the additional drilling needed to maximize the output of a field (or pool within a field), and (3) operation, or the management of the production of a developed area, including the maintenance of wells and employment of secondary recovery methods to extend the productive life of proven reserves.

[32] In the case of federal leases, all interests are made explicit in the leasing records kept by MMS, and therefore are accounted for in the data regarding the number of operators. The earliest auction of federal leases in the Santa Barbara channel was in 1968.

1920s. This activity was not necessarily atypical for an industry in which the "endgame" for operators often involves selling properties that they develop. However, the merger and acquisition activity of the 1920s constituted the first of three movements that significantly affected the structure of the tri-county industry, foreshadowing events of the 1960s and 1980s.

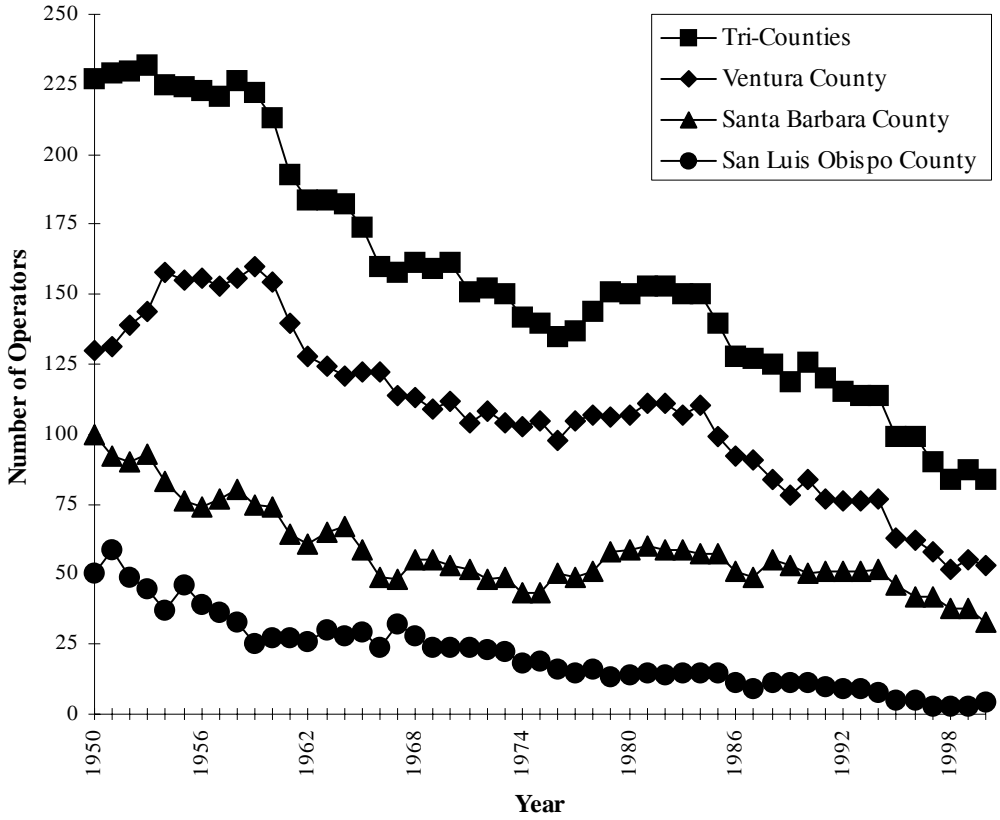
To provide context for these data, this section uses studies of the structure of the early California industry. Andreano (1970) addresses the period from 1895–1911, while Bain (1944) covers the interwar period, 1919–41. Johnson (1970) and Williamson *et al.* (1963) set the California industry within the context of national trends. The discussion in this section also fits tri-county-specific material within the statewide framework, utilizing biographies of individual firms or entrepreneurs with a presence in California (Ansell 1998; Beaton 1957; Jones 1972; Lenzer 1985; Miller 1986; Pederson 1990; Tompkins 1964; White 1962), oil field histories found in trade journals, company publications, and the annual reports of the state of California oil and gas supervisor, and, finally, the anecdotal evidence produced in SLO I, SB I, and VC I.

Adamson and Bergstrom (1998) found that the region's crude oil reserves supported a competitive, three-tiered upstream industry structure of integrated firms (majors), large independents (or principal minors), and small independents (including proprietorships, partnerships, and corporations).[33] Seven firms dominated the coastal industry from 1950–84: General Petroleum, a Mobil subsidiary, which was folded into the parent in 1959, Richfield (ARCO after its 1966 merger with Atlantic Refining), Shell, Standard of California (Chevron), the Texas Company (Texaco), Tidewater (acquired by Getty in 1967), and Union. During the onshore era, Humble Oil and Refining, the production arm of Standard of New Jersey (later Exxon), became a significant integrated operator in the area. At the same time, more than 1,050 entities operated in tri-county fields, including offshore state and federal leases, from 1950 through 2000. Exploration and production sustained more than 220 operators in the field annually between 1950–59. With the declines in onshore exploration, the number of operators dropped off rapidly thereafter to a new level of operators that ranged from 135–150 until the mid-1980s. The number of firms operating in the region diminished substantially with the collapse in oil prices in 1986 and the stalemated offshore development process. Yet the region still supported more than eighty operators at the end of 2000 (see figure 7). The structure of the upstream industry included three "generations" of large independents, the last of which remains a key factor in the tri-county industry as of 2000. There was some overlap among the personnel of small firms, which were generally organized around an individual drilling project or producing property. Nevertheless, with majors and large independents comprising no more than 50 of up to 230 operators in the field in any given year, the number of small entrepreneurs engaged in the upstream segment of the industry was significant.

[33] Independents are non-integrated companies, large and small, whose income derives almost wholly from oil or natural gas production at the wellhead. That is, they operate exclusively in the exploration and production segment of the industry, and own no retail outlets or refineries. Thus they are price takers who sell their output to firms that operate in the so-called downstream segment of the industry. The term has evolved historically. It once referred to any non-Standard Oil Trust concern. Hence, Union Oil Company, saw itself as "the largest independent" for a number of years.

Bain (1944: 42–47) found that the seven majors above already dominated the California oil industry by 1940, and that among them, Standard was the only firm not to have established a coastal presence. Relying on data produced by *Petroleum World* in its annual review issue (1941: 81–114b), Bain summarized the market structure of the industry by three regions: the coastal area (mainly Ventura and Santa Barbara counties), the Los Angeles basin, and the San Joaquin valley. Here we summarize these data, before examining how the industry, at both the California and the tri-county levels, evolved to the eve of World War II.

Figure 7. Tri-County Oil Well Operators, 1950-2000



Source: California Division of Oil, Gas, and Geothermal Resources, Districts 2 and 3, Index of Well Records

In 1940 there were 1,233 producers of crude oil in California. They operated 15,359 producing wells; another 4,826 potentially producing wells were shut in. Sixty-two companies, including the seven majors already cited, produced at least 300,000 barrels of crude oil, and accounted for 84 percent of the state's output. The median production of the remaining 1,171 small producers was about 9,000 barrels. The seven majors accounted for about half of California's output. Bain designated twenty producers as "principal minors," two of which had production equal to that of the smaller majors (see table 4). With production ranging from 7.2 million to 32.9 million, these firms produced about 25 percent of the state's production. The remaining 35 independents with at least 300,000 barrels of output comprised

nine percent of the state's total. According to Bain's segmentation of the industry, then, 1,206 firms had one-fourth of the state's production, which was equal to the share of the twenty "principal minors."

To give some idea regarding the distortions that potentially can arise when ranking producers simply by the number of producing wells, which was the approach taken with respect to tri-county production in SLO II, SB II, and VC II, Bain (1944: 43) observes that the seven majors had only 43 percent of the producing wells and 50 percent of the potentially producing wells. The respective figures for the twenty principal minors were 18 percent and 17 percent; for the next 1,206 producers the figures were 39 percent and 33 percent, respectively. That the small independents had only one-fourth of the state's output from two-fifths of its producing wells is indicative of the large number of stripper wells that they operated. For this study, rankings of tri-county operators for the years 1950, 1965, 1980, and 2000 have been recalculated on the basis of output, resulting in a significant reshuffling of firms within the tables.

Table 4. Firms with At Least One Percent of California Crude Oil Production, 1940

	Production (thousands of barrels)	**Percentage of State Total**
1. Standard Oil Company of California	32,957	14.8
2. Shell Oil Company	21,270	9.5
3. Union Oil Company	17,013	7.6
4. General Petroleum Corporation	12,612	5.7
5. Tide Water Associated Oil Company	12,313	5.5
6. Kettleman North Dome Association*	7,911	3.6
7. Union Pacific Railroad Company	7,682	3.4
8. Richfield Oil Corporation	7,609	3.4
9. The Texas Company of California	7,219	3.2
10. Superior Oil Company	4,492	2.0
11. Chanslor-Canfield Midway Oil Company	3,699	1.6
12. Belridge Oil Company	3,158	1.4
13. Continental Oil Company	2,846	1.3
15. Long Beach Oil Development Company	2,527	1.1
16. Robert S. Lytle, Operator	2,423	1.1
17. Honolulu Oil Corporation	2,230	1.0
Total Seven Majors (General Petroleum, Richfield, Shell, Standard, Texas, Tide Water, Union)	110,993	49.7
Total California	223,882	100.0

Notes: * – Kettleman North Dome Association was a unitization program whose participants included General Petroleum, Seaboard, Shell, Tide Water Associated, Petroleum Securities, Standard Oil of California, L. G. Helm and S. L. Gillan, Amerada Petroleum, Union, Standard Oil of Texas, and Honolulu.

Source: Petroleum World, Annual Review issue (1941), reconstructed from tables presented in Bain (1944: 44)

As Olien and Olien (1984: 2–3) have observed, however, the focus on production distorts the contribution that independents make to the upstream segment of the industry. Because independents historically assumed higher risks and lower potential returns than the majors, they have been integral to the exploration function (which Bain's data exclude, but which was included in the research done for SLO II, SB II, and VC II). Independents have drilled most of the prospect wells for both crude oil and natural gas, and have made many important discoveries. Nationally, for instance, they drilled almost ten times as many wildcat wells in 1934 than the twenty largest majors (Williamson *et al.* 1963: 564–565). This trend persisted into the post–World War II era. From 1968–78, for instance, independents drilled almost nine times as many wells as the sixteen largest integrated companies, and drilled 89.5 percent of new field wildcats and made 81.5 percent of all oil and gas discoveries (Olien and Olien: 1984: 2–3). In the tri-county area, independents drilled the discovery wells in the Casmalia, Cat Canyon, Elwood, Oxnard, Russell Ranch, Rincon, Shiells Canyon, and Summerland fields. (Of course, strictly speaking, all of the nineteenth-century coastal field discoveries were made by "independents," including those made by the predecessors of Union Oil.) Moreover, it is important to bear in mind that statistics on independents do not necessarily reflect the total amount of their activity, for, as Olien and Olien (1984) also note, they often originate projects only to pass them on to majors with the resources to develop them, as was the case with the Ventura Avenue field.

Within the three groups of producing areas, the coastal area in 1940 was more concentrated in the hands of majors than elsewhere (see table 5). This reflected the dominance of Shell and Tide Water Associated in the gigantic Ventura Avenue field, which contributed 46 percent of the tri-county area's output in 1940, and the predominance of Union Oil in the Santa Maria district, whose five fields produced another 30 percent of the area's crude oil for the year. As table 6 indicates, these majors were by far the leading producers for the area in 1940. There was also wide variation in the extent to which tri-county production made up a firm's production statewide. Tide Water Associated, the coastal area's leading producer in 1940, relied more than any other firm on its coastal production, at 47 percent of its California production, followed by Shell at 26 percent and Union at 19 percent. Whereas Shell and Union each had a strong presence in the Los Angeles basin, as a result of the boom of the 1920s, Tide Water Associated did not. Also note the relative absence of Standard in the coastal area prior to World War II, even though the firm was the leading producer in the other two areas, and for the state as well. Small firms thrived best in the Los Angeles basin, where town lot drilling was often the rule: further evidence that land ownership patterns in the rural tri-county area discussed in the previous section had an impact on the concentration of the coastal industry.

Table 5. Relative Position by Group of Producer by Area, 1940

	(Percentage of California Production)			
	Coastal Area	**San Joaquin Valley**	**Los Angeles Basin**	**All Areas**
7 Majors	59	53	45	50
20 Principal Minors	21	31	23	25
1,206 Independents	20	16	32	25
Total Production (Thousands of barrels)	28,558	87,283	108,041	223,882

Source: Petroleum World, Annual Review (1941), reproduced in Bain (1944: 45 [table 3])

As table 5 shows, the coastal area also had significantly less output in 1940 than either of the other major producing areas of the state, and therefore supported fewer firms with production. For instance, 135 operators in the tri-county area had production during 1941—a minority of the firms with production statewide. Another thirty firms drilled exploratory wells, while another ten firms that were based in the tri-county area filed notices to drill, had production in other areas of the state, or operated idle or shut-in wells in the area. Including all 165 firms with activity in the tri-county area, all seven majors were present, as were 14 principal minor firms, and 144 small concerns. Thirty-four of these firms were based either in San Luis Obispo, Santa Barbara, or Ventura counties; 111 were based in the Los Angeles area, 11 were based elsewhere in California, and four were from out of state. Of the forty-four firms with headquarters in the tri-county area, eighteen were located in the city or county of Ventura, seventeen were ensconced in Santa Barbara or Summerland, six were based in the Santa Maria area, and three made their home in the city of San Luis Obispo.

Yet the 135 operators that had tri-county production during 1941 represented a significant increase over the 76 firms that operated producing or potentially producing wells during 1929, and the 41 firms with production in 1916. Thus, even during the depression, oil companies continued to complete wells, even if many were often shut-in, owing to conservation practices or market conditions. Indeed, tri-county oil activity and the number of firms that engaged in it expanded through the 1950s. More than 1,100 wells produced oil in the tri-county area as of February 1940, according to *Petroleum World*, reflecting development in all three of the area's major producing regions during the late 1920s and 1930s. Only 305 of these wells were located in the Ventura Avenue field. The fields of the Santa Barbara district contained 148 producing wells; the Santa Maria district another 224, leaving almost half of the producing wells spread among the many fields of Ventura county. No one of these areas was dominated to extent that Shell and Tide Water Associated controlled the Ventura Avenue field. As a result, numerous independents were operating producing assets on the eve of World War II.

Table 6. Production of Major Producers by Area, 1940

	Coastal Area		San Joaquin Valley		Los Angeles Basin	
Company	**Production (thousands of barrels)**	**Percentage**	**Production (thousands of barrels)**	**Percentage**	**Production (thousands of barrels)**	**Percentage**
Tide Water Associated	5,811	20	3,703	4	2,800	3
Shell	5,582	20	8,299	9	7,389	7
Union	3,211	11	3,217	4	10,585	10
General Petroleum	945	3	4,028	5	7,639	7
Texas	795	3	2,357	3	4,067	4
Richfield	463	2	3,376	4	3,770	3
Standard	69	0	20,868	24	12,020	11
All Others	11,682	41	41,435	47	59,771	55
Total Production	28,558	100	87,283	100	108,041	100

Source: Petroleum World, Annual Review issue (1941), modified from table 4 in Bain (1944: 46)

By 1940 the structure of seven majors, large independents, and numerous small firms, which SLO II, SB II, and VC II detailed for the early post–World War II period, was in place. For California, production was slowly increasing from its depression lows, but at 223.9 million barrels, it had yet to return to the levels of early 1920s. For the tri-county area, the year marked a pause in the steady expansion of the industry that would continue through the war. At 27.3 million barrels, production was significantly higher than the 6.9 million barrels produced in 1924, but it had not recovered its previous peak of 35.2 million barrels, reached in 1929. Yet the post–World War II boom would boost tri-county output to a record 86.1 million barrels in 1953, a year in which 230 firms were exploring or producing oil in the area. The industry structure would expand accordingly, with all three groups of producers benefiting from the increase in activity. Clearly, by 1940, much had happened in terms of the development of structure of the oil industry in California and the tri-county area. With this survey of the industry at this point in time in mind, we review how the state and tri-county industry reached this point.

Tri-County Exploration and Production, 1865–1941

We cannot really talk in terms of a California or tri-country structure of industry until the late 1890s. Prior to 1890, dozens of firms searched for oil in California, mostly in the Newhall-Ventura area, and mostly without success. The oil boom of the 1860s, for instance, produced much more promotion and hype than oil, as promoters targeted eastern sources of capital (Cleland 1959: 202–203). For the state overall, some seventy-five firms sought oil during this first boom. Most of them were going concerns on paper only, and those that recovered oil produced refined products of unsatisfactory quality, and were marketable only during the extraordinary environment created by the Civil War, which had limited eastern supply and raised prices. The postwar jump in crude oil production in Pennsylvania drove prices down

and caused operators to shut-in the California industry for all intents and purposes (White 1962: 13–19).

In the next four decades, many firms tried their luck in California. Few succeeded. Among them were Pacific Coast Oil (PCO), formed by San Francisco capitalists Charles Felton and Lloyd Tevis, and its affiliate, California Star Oil Works (CSOW), both of which were predecessors of Standard Oil of California, and the three firms that merged in 1890 to form Union Oil: Hardison and Stewart Oil, Sespe Oil, and Torrey Canyon Oil. The industry in the 1870s revived in the Newhall area and spread to Ventura county. It was fueled by local (Los Angeles and Ventura) capital until San Francisco capitalists began to invest in developing resources to meet the demand for illumination in their city. Yet refiners did not keep pace with the producers, who enjoyed moderate success in the Newhall-Ventura region (White 1962: 19–57).

In the mid-1880s, Hardison and Stewart came to the forefront of the California industry, still centered in the Newhall-Ventura region. The pair were recruited from Pennsylvania by Isaac Blake, a Denver marketer who addressed the distribution problems that California producers were having in the late 1870s with the design of a rail tank car to ship product by bulk. Blake formed Continental Oil & Transportation Company in 1877, to supply tank cars to CSOW and handle its distribution. Hardison and Stewart first developed the Rancho Ex-Mission San Buenaventura lands acquired by Blake's Mission Transfer Company (MTC)—a venture partially financed by Felton and Tevis. They turned to the Sespe and Pico-Newhall areas, and acquired leases there on the condition that they would sell the oil they produced through companies controlled by Felton and Tevis. After failing to develop the reserves that they were expected to under the lease arrangements, relations between PCO and Stewart and Hardison soured. The latter sought and obtained leases outside the control of Fulton and Tevis, at Torrey, Sespe, and Coche canyons, on the Simi rancho, and in Carpinteria. The Ojai area, where Thomas Bard remained interested in developing his extensive holdings, and had a network of important southern California landholders and capitalists to help him do so, proved to be a fruitful area for Hardison and Stewart, who in June 1885, reached agreement with MTC for the exclusive development of the Ex-Mission lands for forty-seven years. The arrangement allowed them to develop oil wherever they found it on the lease, given that they directed the production to MTC, which PCO still controlled (White 1962: 106–120).

In the late 1880s and early 1890s Stewart and Hardison developed productive leases across the Newhall-Ventura area. Thomas Bard offered them an Ojai lease, and acted as their agent in helping them acquire one-third of the oil rights to the Chaffee ranch in Torrey Canyon. In July 1886 the pair filed twenty-four oil claims in the Sespe, and induced Bard to join them in creating Sespe Oil Company, which subsequently took a one-half interest in MTC. A dispute that arose when Stewart and Hardison's Ex-Mission production ran up against a 6,000-barrel monthly production limit imposed by MTC motivated Hardison and Stewart to extend their operations into transport, refining, and marketing. These actions persuaded PCO executives to allow Stewart and Hardison to buy half of MTC, if they used it to transport and market their Ventura production. Stewart and Hardison agreed, and the Ex-Mission lease was modified to raise the monthly production ceiling to 30,000 barrels. But Hardison wanted to expand

production, while PCO executives feared supply outrunning demand for their refined products. The outcome was the Hardison and Stewart Oil Company, incorporated in December 1886, in which Bard participated as a partner. The partners then took control of MTC, expanded their production program, and made plans for a Santa Paula refinery, more tank cars, a tank ship, and marketing outlets in southern and northern California. With its sale of MTC, PCO left Ventura county (White 1962: 120–131).

Union Oil incorporated as a California corporation in October 1890, with its headquarters in Santa Paula. Capitalized at $50,000,000 (California State Mining Bureau 1917: 269), the firm was soon active in Ventura, Santa Barbara, Orange, and Los Angeles counties. During the 1890s and early 1900s, it was the state's leading producer, and was virtually unchallenged until other operators successfully developed fields in Los Angeles county and the San Joaquin valley, beginning in the late 1890s. The newly formed firm had 26 producing wells yielding 231 barrels per day—about one fourth of California's production. The firm aggressively bought or leased up potential oil lands in Ventura county, and its 1892 production of 180,000 barrels was more than half of California's production. Most of this production came from Torrey Canyon on lands that Thomas Bard originally controlled (Pederson 1990: 15).[34] With its dominance of leasing and production in the Santa Maria area early in the twentieth century, Union secured its position as the coastal region's leading operator, a position that it held until the development of the Ventura Avenue and other fields in Ventura and south Santa Barbara counties during the 1920s.

Overall, the structure of the California industry from 1895–1911 was dominated by three integrated firms: Union, Standard Oil of California, and Associated Oil (Andreano 1970: 184–192). Standard came about as the result of a 1906 merger of PCO and Standard of Iowa, a move precipitated by Standard of New Jersey executives. In an environment of new field discoveries and expanding production and new firm entry during the 1890s, PCO had gone into decline. In December 1900 Standard of Iowa—formed in 1885 through the merger of Standard of Ohio's western properties and CO&T—bought out PCO shareholders, essentially the Tevis family, Charles Felton, and Felton's son. Under Iowa Standard management, PCO made new investments that enabled the Standard Oil trust to break into the west coast fuel oil trade, and enabled PCO to look to new fields for sources of crude oil, including Fullerton in Orange county, Kern River in Kern county, Coalinga in Fresno county, and Santa Maria in Santa Barbara county. With PCO manufacturing refined products, and its success in the field enabling it to become Iowa Standard's principal supplier, Jersey Standard executives in New York decided to merge the two companies (White 1962: 208–214, 249–280). Capitalized at $100,000,000 (California State Mining Bureau 1917: 267), the firm, which became an independent company based in San Francisco with the breakup of the Standard trust in 1911, was the only integrated firm in the Standard group of companies (*Oil and Gas Journal* 1954).

Associated, also San Francisco-based, was formed in 1901 under the direction of Charles Canfield, an associate of E. L. Doheny. Canfield, who ran his own Canfield Oil Company, was motivated to control production in the Kern River field in the San Joaquin valley, where

[34] By 1900 Bard had sold out his interests in the firm, which relocated its headquarters to Los Angeles the next year.

there were numerous independent producers. The formation of Associated followed the September 1900 failure of the so-called Kern River Cooperative. In the fall of 1901, five large independent producers, including Canfield Oil, merged to form Associated. Capitalized at $40,000,000 (California State Mining Bureau 1917: 246), the firm subsequently took in dozen of small operators. Canfield became Associated's first president and soon brought in Los Angeles-based CCMO (also incorporated in 1901), in which Canfield had a large interest and which controlled the Midway field, into the cooperative (though CCMO retained its corporate identity). Associated soon became the major supplier of fuel oil to the railroads, and soon captured 70 percent of the market (Ansell 1998: 89–92; Associated Oil Company 1922b).

A 1903 dispute over shipping charges with the Southern Pacific Railroad (SP) cost Associated some control of its business. Associated contemplated building pipeline from Bakersfield to San Francisco to avoid what Canfield believed to be exorbitant railroad fees. E. H. Harriman, the new head of the SP, negotiated a new long-term contract with Associated in return for 40 percent of its stock. Harriman offered double the market price for the shares and, in return, received a contract to ship 10 million barrels of oil at 25¢ per barrel. In similar fashion, CCMO came under the control of the Santa Fe Railroad (Ansell 1998: 92–95).

By 1911 Associated, Standard, and Union were dominating the transportation, refining, and distribution functions of the state's industry (Andreano 1970: 190–191). However, they were producing only about one-quarter of its crude oil—down from one-third in 1907 (White 1962: 576 [table III]). As Canfield explained to the U.S. Bureau of Corporations, which had launched an investigation of the Standard Oil trust, the integrated firms could do little to prevent entry into the upstream segment of the industry on the part of independent operators:

> There are too many fields easy of access to market that can be developed by individuals every day. There are thousands of them in the state today which can be opened up and every one of them are a menace to the market and you can't stop them. The water ways belong to everybody, and many of those fields are right adjacent to tidewater. Every man that has a piece of land with oil on it can drill a well, as they have been doing throughout the state. I think there are easily a hundred operators who are ready to sell oil on the market, and people are going to buy oil where they can get it cheapest (Quoted in Ansell 1998: 91).

The formation of Associated, for instance, did nothing to solve the problem of overproduction in the San Joaquin valley, where hundreds of companies continued to produce oil. Indeed, successive discoveries kept the California market depressed, until World War I spurred a huge increase in the demand for fuel oil. Associated, Union, and Standard tried to capture and store as much oil as they could. But oil was too easy to find. From 1907–12, 92 percent of all wells drilled in California produced oil, compared to 73 percent nationally (Ansell 1998: 95–97). Though the industry was consolidating downstream functions into the hands of three firms, many operators remained active in the upstream segment, which remained far from

concentrated (Johnson 1970: 158–160). Some of these operators were significant producers, including the Kern Oil and Trading Company, a SP subsidiary, the Santa Fe Railroad, the Independent Oil Producers Agency (IOPA), a marketing association formed in 1904 by seventeen independents operating in the San Joaquin valley, and the producing companies that Doheny formed between 1908 and 1910. The latter included American Petroleum, centered at Coalinga, Niles Lease Oil, located in Los Angeles, and Midland Oil and Midland Oilfields, both of which focused on the Midway-Sunset field (Andreano 1970: 184–185; Ansell 1998: 95–97, 132–133).

Associated and Standard were active in the Santa Maria area during the early 1900s, and again in the late 1910s, but no firm challenged Union's position in the region until after World War I. Indeed, as of June 1916, Union was the only integrated company with production in the area (California State Mining Bureau 1917: 245–271). From anecdotal evidence produced in prior studies and information on firms provided in the *First Annual Report of the California Oil and Gas Supervisor*, however, we know that dozens of other companies were active in all three counties from 1895–1911.

In 1907, for instance, Union controlled some 75 percent of the production in the Santa Maria field. The discovery of oil in the Santa Maria valley motivated the formation of numerous independent firms that were keen to exploit the area's reserves. Some of these firms were linked to Union Oil. California Coast Oil, formed in September 1903 and capitalized at $200,000, and Newlove Oil, incorporated in April 1906 and capitalized at $1,500,000, were headed by William L. Stewart, son of Union Oil founder Lyman Stewart, and W. W. Orcutt, Union's chief geologist, respectively. Both firms were leading tri-county producers, at least in terms of producing wells, as of June 1916 (California State Mining Bureau 1917: 248, 261). By 1922 California Coast had become a subsidiary company of Associated (Associated Oil Company 1922b: 12). The other significant independent operating in the Santa Maria valley with links to Union Oil was the Western Union Oil Company. Organized in April 1900 and capitalized at $1,000,000, the firm held the Careaga and Harris leases in the Santa Maria field, where it had thirty-nine producing wells as of June 1916 (Beaton 1957: 222; California State Mining Bureau 1917: 270).

A number of other independents were active in the Santa Maria field during this period. They included Brookshire Oil of San Luis Obispo, formed in 1902 and capitalized at $500,000, New Pennsylvania Petroleum, incorporated at Santa Maria in August 1904 and capitalized at $500,000, Santa Maria's Pinal Oil and Dome Oil, which merged in June 1912 (capitalized at $4 million), Radium Oil, established in April 1904 and capitalized at $250,000, Recruit Oil, formed on May 4, 1903 and capitalized at $1 million, and Santa Maria Oil Fields, a British concern that was incorporated in California in June 1911 with a capitalization of $4,860,000. All of these firms, except for Radium and Recruit, operated producing wells in the district as of 1916, with Pinal Dome the second leading operator in the district behind Union Oil (California State Mining Bureau 1917: 245–271).

At Cat Canyon field, a number of other independents joined Union Oil in developing the field, including Palmer Union Oil, which discovered the field in 1908 and incorporated in

December 1910 with a capitalization of $10,000,000, Brooks, incorporated in October 1908 and capitalized at $500,000, Gato Ridge Oil, formed in June 1910 with a capitalization of $1,000,000, Pinal, and New Pennsylvania (SB I: 16–17; California State Mining Bureau 1917: 247, 253, 262). In Ventura county, there were numerous independents, some of which were quite successful. For instance, San Francisco-based Montebello Oil, incorporated in May 1909 with a capitalization of $1,000,000, developed the Shiells lease near Fillmore, setting off a real estate and building boom in the small town. By June 1916, the firm operated eighty-five wells in Ventura county, second only to Union Oil (California State Mining Bureau 1917: 260; Scott 1984; Triem 1985: 110). Among the many independents that established production in Ventura county between 1895 and 1911 were (with year of incorporation; capitalization): Bard Oil and Asphalt (August 1900; $2,000,000), Bardsdale Crude Oil (June 1900; $200,000), Capitol Crude Oil (April 1894; $3,000,000), Empire Oil (February 1909; $200,000), Modelo Oil (April 1898; $250,000), Ojai Oil (June 1900; $750,000); Pyramid Oil (October 1909; $2,000,000), South Pacific Oil (a partnership), and White Star Oil (February 1909; $1,000,000) (California State Mining Bureau 1917: 245–271). Ojai and Pyramid remain going concerns as of this writing.

In San Luis Obispo county, local, small concerns joined Union in drilling wildcat wells during the late 1890s and early 1900s. As we have indicated, none of these firms found oil in commercial quantities. From 1905 a number of operators, including Crystal, La Point, Logan, Mohawk, Perpetual, and Tiber oil companies, drilled for oil in the promising Arroyo Grande area. These were small ventures, generally organized to drill one or more wells, and typically capitalized in the range of $10,000 to $20,000. As the anecdotal evidence presented in SLO I suggests, the search for oil interested many people. As W. H. Smith, editor of the *Arroyo Grande Herald-Recorder*, observed in May 1921, by 1907 "every other citizen [in Arroyo Grande] was an important officer in an important oil company that was just on the verge of bringing in an important oil well, the other citizen was a stockholder … oil stocks were the chief industry of every able-bodied man and woman" (Quoted in SB I: 14). Small business owners and bankers were prominent among the individuals who invested in oil ventures. That local newspapers could report that the number of people engaged in the search for oil in south San Luis Obispo county in the early 1900s was "remarkable," with "astonishing sums of money changing hands in stock transactions" reflects the cultural enthusiasm that oil prospecting generated, and remains a topic that deserves additional study.

As of June 1916, there were 403 producing wells in Santa Barbara county, 318 producing wells in Ventura county, and no producing wells in San Luis Obispo county (California State Mining Bureau 1917: 34). Forty-one companies were operating producing wells in the area. Union, with 116 producing wells in Santa Barbara county and another 88 wells in Ventura county, was easily the leading firm. Thirteen companies had ten or more producing wells. Montebello was the only operator other than Union to have fifty or more producing wells. Thirteen firms were drilling prospect wells locally, including Standard in the Santa Maria valley and State Consolidated at Ventura, while another thirty firms were based in the tri-county area, had filed notices to drill, had production in other areas of the state, or operated idle or shut-in wells in the area. Thirty-six firms were based either in San Luis Obispo, Santa Barbara, or Ventura counties; thirty-two were based in the Los Angeles area, and seventeen

were based elsewhere in California: a distribution of locally based firms that was not repeated until the 1990s. Of the firms with headquarters in the area, eleven were based in Santa Maria, Orcutt, or Lompoc, seven made their home in San Luis Obispo, four had offices in Santa Paula, another four were based in Oxnard-Hueneme, three were ensconced in Santa Barbara, and only one was located in Ventura (California State Mining Bureau, 245–271).

The period from 1911–18 was characterized by increasing competition. Two majors—GP and Shell Company of California, both of which remained part of the California and tri-county oil industry structure (in various corporate forms) throughout the twentieth century, entered the state and tri-county industry. Thus by World War II, five of the seven leading firms among California and tri-county operators from 1940–84 had emerged. During this period, E. L. Doheny also made a bid to gain control of the California oil market. Though he ultimately failed in the attempt, for almost two decades, Doheny's companies had a significant impact at the state and tri-county levels. In addition, Standard of California emerged as the state's leading producer. On the strength of its Santa Maria properties, Union remained the area's leading producer. Developments at Ventura and South Mountain from the mid-1910s, however, foreshadowed the interwar boom that shifted the focus of activity to the Ventura district, enabling Shell and Associated to become area's leading producers. Independents also made important contributions to tri-county oil field development. Some merger and acquisition activity took place among tri-county operators as well, though it was muted relative to the 1920s.

The Royal Dutch/Shell Group, an Anglo-Dutch conglomerate, entered the Pacific coast petroleum market in 1911, when it began to sell imported gasoline through Seattle-based American Gasoline Company. That same year, the group also founded Roxana Petroleum to seek and produce oil in the Mid-Continent region. The excess supply of crude oil in the California market motivated Royal Dutch/Shell executives to produce oil domestically rather than import it from the Dutch East Indies. In 1913 it acquired California Oilfields, a British-owned concern, which at the time produced 4.5 percent of the state's 97.8 million-barrel supply from operations in Coalinga field. In 1915 Royal Dutch/Shell changed the name of American Gasoline Company to Shell Company of California and moved its headquarters to San Francisco. It incorporated in California on July 30, 1915 with a capitalization of $35,000,000 (California State Mining Bureau 1917: 266). By 1920 Shell had acquired or developed production in the Belridge, Mount Poso, McKittrick, and Midway-Sunset fields as well. It was having much less success at Ventura (Beaton 1957: 67–104).

Los Angeles-based General Petroleum began its corporate existence on March 30, 1910 as Esperanza Consolidated Oil Company (California State Mining Bureau 1917: 253). Capitalized at $50,000,000, the firm reorganized in 1916 after experiencing financial problems. Like Shell, its initial center of operations was the San Joaquin valley. It shipped production through company-owned pipelines to Los Angeles, where it owned two "topping" plants (Johnson 1970: 159; Ansell 1998: 276fn24). Thus, of the five majors operating in California on the eve of World War I, all but Union had first established themselves in the San Joaquin valley. As we have seen, GP was drilling at Ventura as of 1917.

The most serious challenge to the five leading firms during the 1910s and 1920s came from E. L. Doheny. With revolution threatening the long-term viability of his wildly successful operations in Mexico, the California market again became the focus of Doheny's attention and resources. The tri-county industry was directly affected. Doheny began in September 1912 with the recapitalization of his California businesses under the umbrella of a Virginia holding company, California Petroleum (Calpet). Since he established Calpet during a period of glut, however, Doheny found it hard to meet his objectives. Hence, throughout the mid-1910s, there was talk of a Doheny-led megamerger of Union, Associated, Calpet, and GP, which as of December 1915 would have yielded a firm with $214.8 million in assets, more than twice the $98.5 million asset value of Standard of California. Nothing came of it, however, by the time that demand caught up with production by the end of 1915. In the wake of this failed effort, in February 1916 Doheny formed the Pan American Petroleum and Transport Company, capitalized at $150 million, to consolidate his operations (Ansell 1998: 130–139).

Three months later Doheny resigned as president of Calpet and sold his stock in the company, though he retained a seat on the board. This freed him to focus on new oil areas to develop. He created Fairfield Petroleum to operate wells in Kern county and new production in Texas. Also in 1916, Doheny formed Pan American Petroleum Investment Company, which as we have seen, leased the Bell ranch in the Santa Maria valley, and the Pan American Petroleum Company of California, which acquired 6,000 acres and 30 producing wells in the Ojai district from Bard Oil and Asphalt. He also set up Doheny Pacific Petroleum, which discovered the Casmalia field in 1917 and operated properties in Los Angeles and Ventura counties. In March 1919, Doheny folded this firm into Pan American, which at the end of 1920 had seventy-seven producing wells in Ventura county and forty-six producing wells in Santa Barbara county (Ansell 1998: 144; California State Mining Bureau 1923; Moody's Investor Service 1921: 831–832).

Between 1911 and 1918, Standard displaced Union as California's leading producer. With only 3.8 percent of the state's market in 1911, its 1918 average production of 71,415 b/d made it easily the leader, at 25.8 percent of production. Yet its tri-county presence remained small. During 1916–17, the firm drilled five dry holes in the Santa Maria valley at a cost of some $500,000. The SP's Kern Trading and Oil came second at 9.4 percent; Union was third at 8.9 percent. Associated's market share was 8.8 percent; Shell's 6.7 percent, GP's 4.0 percent and the Santa Fe Railroad's 3.7 percent. This left almost 24 percent of the market to everybody else (White 1962: 406–432, 576 [table 3]).

In this environment, Calpet lagged. Doheny created the firm explicitly to challenge Associated, Standard, and Union. As of July 1913, Calpet was the fifth largest producer in the state. Thereafter it retained a weak, albeit steady, market share behind the three majors. Further, over time the gap widened. Calpet remained an independent producer while Associated, Standard, and Union developed into strong, integrated majors. Calpet's assets rose only three percent from 1914–19, its net earnings were up 82 percent, and its return on assets (ROA) averaged seven percent. The respective figures for Associated were 21 percent, 314 percent, and 13 percent; for Union 67 percent, 429 percent, and 16 percent; and for Standard 253 percent, 465 percent, and 22 percent. Calpet's poor earnings owed to an

unfavorable long-term contract that it entered into with the IOPA and declines in its Kern county production from water seepage. Its share of the state's production fluctuated, from 4.8 percent in 1914, to 3.4 percent in 1917, to 5.8 percent in 1919 (Ansell 1998: 145–146). During the interwar period, Calpet increased production and refining capacity through acquisition, but never threatened to join the ranks of the majors prior to its 1928 acquisition by the Texas Company.

The 1911–18 period saw both the entry of new independents and a measure of consolidation. In terms of tri-county producing wells as of December 31, 1920, the most significant new entrants included (with date of incorporation; capitalization) the San Francisco-based Casmalia Syndicate (March 1916; $1 million), by 1928 a wholly-owned subsidiary of Associated, Los Angeles-based Calumet Oil (April 1911; $1 million), Oak Ridge Oil (January 1911; $2.5 million, increased to $5 million in August 1911), Santa Paula Oil (July 1914; $500,000), and Timber Canyon Oil (August 1918; $100,000). At the end of 1920, these firms operated fifty-one wells in the region (California State Mining Bureau 1923). Success in the field often makes independents targets of majors, and the 1910s were no exception. Pinal Dome, which as of June 1916 had forty-two producing wells in Santa Barbara county and another nine in Kern county, plus a network of twenty service stations and 350 employees, was acquired in 1917 by Union, its Santa Maria district rival, for $3.6 million (Welty and Taylor 1958: 130–131).[35] Further, the May 1914 incorporation of Ventura Consolidated Oil Fields, a holding company, eventually brought a number of tri-county operators under a single corporate roof. From 1914–27, it acquired a total or controlling interest in the Montebello, Gato Ridge, Oak Ridge, and Santa Paula oil companies and bought the Ventura Refining Company, whose Fillmore facility processed the crude oil from Montebello's Shiells Canyon lease (Moody's Investor Service 1929: 1657–1658; Scott 1984).

As Olien and Olien (1984: 13–14) have observed, the 1920s constituted a decade of unprecedented exploration and speculation: big firms got bigger, small firms proliferated, and wildcatters of all sorts searched for oil, principally for the purpose of meeting the soaring demand for gasoline. The boom did much to shape the structure of the California and tri-county industry as it stood in 1940. From 1918–21, thousands of companies were formed nationwide. For the quarter ending May 31, 1918, for example, 270 companies incorporated with capitalizations exceeding $100,000. In November 1919, 141 oil firms with a total capitalization of almost $500 million were formed (Olien and Olien 1990: 27). Numerous corporation, partnerships, and proprietorships established during this time operated in the Los Angeles basin. Many of the successful concerns expanded their activities to the tri-county area during the interwar period. Further, many more firms were established during the stock market boom of the mid- to late 1920s, a time that saw many mergers and reorganizations

[35] Union had opened its first gas station at Sixth and Mateo in Los Angeles in 1913 (Pederson 1990: 53). As Beaton (1957: 272–279) notes, company-owned service station networks began to show up in 1914 in Los Angeles and San Francisco, and expanded rapidly during the interwar period. In urban areas, especially in Los Angeles, it was not uncommon for small producers to be integrated concerns, operating their own refineries and service stations. In the case of Pinal Dome, the company had relied on Union's infrastructure to store and transport crude oil. E. W. Clark, founder of Pinal Oil Company and manager of the Pacific Coast Railway that connected San Luis Obispo to the oil fields of the Santa Maria area, went on to serve as general manager and executive vice president of Union. In 1930 he was elected chairman of the board (Pederson 1990: 71, 73).

occur as well. This activity affected all types of firms and, by making capital available for exploration and development, helped to promote an increase in activity in the region.

A series of transactions, involving the major operators, established the position of the seven firms that Bain observed. In 1922 Shell Company of California and Roxana Petroleum merged with Union Oil of Delaware, a company created in 1919 from a block of Union Oil shares, to form a holding company called Shell Union Oil Corporation (Beaton 1957: 206–217). The Royal Dutch/Shell Group held about two-thirds of the shares in the new company. In 1939 Shell Oil Company of California, a subsidiary of Shell Union, merged with Shell Petroleum to create Shell Oil Company. The company maintained its San Francisco offices until 1949, when it consolidated operations into its New York headquarters (Schusteff 1991).

GP became a subsidiary of Standard of New York (Socony), which acquired it in 1925 to supply its markets in the Far East. A new firm was incorporated in Delaware in May 1926 with a capitalization of $60 million. Socony subsequently purchased Vacuum Oil in 1931, forming the Socony-Vacuum Corporation, which changed its name to Socony-Vacuum Oil in 1934. At this point, the firm was the second largest oil company in America in terms of sales, trailing only New Jersey Standard (which had no tri-county presence prior to World War II). Socony-Vacuum also acquired Los-Angeles-based Gilmore Oil, which had twelve producing wells in the Santa Maria district at the end of 1929, but primarily served as a marketing subsidiary of the larger firm (Bain 1944: 28–29; Martin 1991; State of California Division of Oil and Gas 1937).

Several related transactions involved Associated and Standard. In December 1920, Pacific Oil was created for the purpose of acquiring the oil interests of the SP, which wished to separate its oil and railroad properties, and which retained a controlling (58 percent) interest in Associated and a one-third interest in Associated Pipe Line Company. Associated benefited from having access to the 259,000 acres of oil lands that Pacific Oil controlled (Associated Oil Company 1922b: 13). In 1926, however, Standard acquired Pacific, and Associated was linked to Tide Water Oil Company. In February Standard incorporated in Delaware as Standard Oil Company of California, and, in March, acquired all of the assets of Pacific. A new holding company, Tide Water Associated, was created, which acquired control of both Tide Water and Associated. Freed from SP control, Associated maintained a measure of corporate independence until 1936, when management fully merged it with Tide Water. Through the 1940s, the Associated division of the merged enterprise operated the firm's Pacific coast properties. Tide Water Associated also acquired Summerland-based Seaside Oil, which became its sales arm along the coastal area (Bain 1944: 28–29; Moody's Investor Service 1929: 1660–1663, 2920; State of California Division of Oil and Gas 1937).

The dismantling of Doheny's California oil empire at the end of the 1920s constituted a significant moment in the tri-county region's industrial history by facilitating the entry of one of the seven majors into the tri-county area and boosting the assets of another (and, not incidentally, contributing to its bankruptcy). In 1928 the Texas Corporation, a holding company incorporated in Delaware in January 1927 with a capitalization of $150 million, purchased Calpet, and renamed it the Texas Company of California (Ansell 1998: 236–237;

Shannon 1991). In October 1925, Calpet had acquired Ventura Refining Company, Ventura Consolidated Oil Fields, and the latter's affiliated companies in a $12 million stock deal (*Petroleum World* 1925e). With this and other acquisitions, the firm moved into the San Francisco and Los Angeles retail markets. At the time of the Texas deal, Calpet controlled sixteen subsidiary firms and had five affiliated companies. It also held many of the San Joaquin valley and Los Angeles basin assets that Doheny had controlled. Through acquisition, Calpet's crude oil production jumped from 4.3 million barrels in 1921 to 16.7 million in 1927 (Moody's Investor Service 1928: 1657–1658). With its purchase of Calpet, Texas became a major California and tri-county operator.

The other piece of Doheny's holdings that fell into the hands of a major operator was Pan-American Petroleum. By 1928 the firm was controlled by Pan-American Western Petroleum, a holding company that Doheny created after he sold Pan-American's eastern U.S. assets to Standard of Indiana in 1925. Pan-American Petroleum had producing, storage, transportation, refining, and wholesale distribution facilities in California, including 85 wells in the Ventura district, 31 wells in Casmalia field the Santa Maria district, and a 4,500 b/d capacity cracking plant at Casmalia. Overall the firm employed 2,268 people. Its California production reached 6.7 million barrels in 1926, but the firm was embroiled in the controversy surrounding its lease of the naval reserve at Elk Hills in the San Joaquin valley, which the Supreme Court cancelled in February 1927. In May 1928 Doheny disposed of Pan-American to Richfield, which had incorporated in August 1926 to acquire the stock of a number of firms. The price was $7.5 million in cash another $2.5 million in shares. Richfield thought the deal would catapult it to the ranks of the majors. Instead, it replicated many of its holdings, and the firm ended up in receivership two years later (Ansell 1998: 231–237; Moody's Investor Service 1929: 2528–2533). The assets of the firm that emerged in 1936 as Richfield Oil derived largely from Rio Grande, one of the firms that discovered Elwood field (and which, as of 1927, had 2,000 acres under lease in Ventura county and 992,493 barrels of production overall) (Jones 1972: 133–145, 336–337; Moody's Investor Service 1929: 2151; Dubovoj 1991)).

At the end of 1929, seventy-six companies operated producing wells in the area. Another seventy-three firms drilled exploratory wells during the year, reflecting the frenzy stimulated by the discovery of Elwood field. Yet another twenty-nine firms were located in the tri-county area, and had filed notices to drill, had production in other areas of the state, or held non-producing properties in the region. Six of the seven majors in Bain's survey were represented among the 149 firms with exploration or production activity in the tri-county area, as were 19 firms that may be classified as principal minors, and 123 small concerns. With respect to bases of operation, there was a marked shift from the 1916 distribution. Only eighteen of firms were based either in San Luis Obispo, Santa Barbara, or Ventura counties; 82 were based in the Los Angeles area, 13 were based elsewhere in California, and five were located out of state. Of the forty-seven firms with headquarters in the area, nineteen were based in Santa Barbara or Summerland; seven were in San Luis Obispo; six were in Santa Maria or Lompoc; and six were in Ventura or Oxnard. The rest were scattered among a number of smaller towns. Twenty-five companies (30 percent) on the 1916 list still existed in

1929, though many of these firms do not appear to have been active concerns. Thirty-four, or 19 percent, of the concerns on the 1929 list remained active or based in the area during 1941.

For the tri-county area, Associated and Shell certainly dominated production, since the Ventura Avenue field alone comprised 60 percent of the 35.2 million barrels of crude oil produced in the region during 1929. Shell was also enjoying success in developing the Capitan field. With much of its Santa Maria production shut in, Union lagged far behind in terms of output, though it operated 329 producing or potentially producing wells in the area. Standard, which had had production in the Santa Maria district prior to World War I (White 1962: 267–273), had no tri-county production in 1929. GP, with 35 producing wells at Ventura Avenue and Rincon, and the Texas Company, having taken over Calpet's South Mountain and Shiells Canyon production—seventy-nine producing wells in all—were strong operators. Large independents with a presence in Elwood and Rincon fields, including Barnsdall, CCMO, Continental, Pacific Western, and Rio Grande, had a significant and growing share of the region's output, as these two fields accounted for 30.3 percent of the area's production for the year. This was certainly the case as of December 1933. Associated and Shell led coastal operators, with 17,994 b/d and 12,402 b/d production, respectively. Union was a distant third, at 3,834 b/d production. The next four leading producers all had interests at Rincon and/or the Elwood area: Pacific Western (3,107 b/d), Barnsdall (2,800 b/d), Honolulu (2,082 b/d), and GP (1,698 b/d). On the strength of its acquired Calpet holdings, the Texas Company was eighth at 1,632 b/d (Lloyd 1934b).

By the end of the 1920s, much of the "first generation" of large independents of the post–World War II era was already active in the tri-county area. Many of these firms were based in Los Angeles, where they enjoyed success during the 1920s. They were now turning their attention to the coastal region. They included Bankline, incorporated in May 1912 and recapitalized at $1 million in December 1922, Barnsdall, established in 1915, but subsequently incorporated in Delaware in 1916 with a capitalization of $20 million, Bolsa Chica, incorporated in Delaware in May 1927 with a capitalization of $5 million, Exeter (June 1926; $2 million), Pacific Western (November 1928; $50,000), Signal, which went public in July 1928 after enjoying great success at Signal Hill in the early 1920s (Tompkins 1964: 1–38), Western Gulf, the Pacific coast subsidiary of Gulf, which incorporated in California in March 1929, and Wilshire, which incorporated in California in May 1919 (State of California Division of Oil and Gas 1937). A number of Los Angeles-based independents that were not active in the area prior to 1945 were also established during the interwar period, including Douglas (September 1935), Oceanic (June 1921; $1 million), and Universal Consolidated (May 1922; $10 million) (State of California Division of Oil and Gas 1937). Thus San Francisco-based Honolulu (April 1910; $5 million), and the aforementioned CCMO were atypical among large independents that were active in the tri-county region in that they first operated in the San Joaquin valley before expanding into the coastal region. Two Oklahoma-based companies, Continental and Sunray Mid-Continent, rounded out the list of "first generation" large independents of the post–World War II era that were already active in the tri-county area by the end of 1929.

Throughout the exuberant era, there was large turnover among small firms. Nonetheless, as the Division of Oil and Gas directories of operators for 1929 and 1941 suggest, small firms—like the large independents, based predominantly in the Los Angeles area—maintained their presence in the industry during the depression and World War II. Firms such as Empire, Santa Maria, Rice Ranch, Pyramid, Ojai, Palmer Union (which incorporated in January 1932 as Palmer Stendel [Moody's Investor Service 1935: 255]) sustained or expanded operations throughout the first half of the twentieth century. During the 1930s, Bell Petroleum, Commander Oil, Lloyd Corporation, and Merchants Petroleum were among the new small-firm entrants that sustained operations into the postwar era.

As Olien and Olien (1984: 23–26) have shown with respect to the Permian Basin of west Texas, oil exploration and production during the 1920s was often characterized by cooperation among independents and majors in new producing regions. In the tri-county area, such cooperation was demonstrated by the development of the Ventura Avenue field by Associated in cooperation with Lloyd and his partners. As we have seen, differences of opinion among Lloyd and Shell prompted the former to lease the Lloyd property to Associated in 1920. In turn, Associated's success in developing the lease generated the capital that enabled Lloyd Corporation to initiate its own drilling program in the field during the 1930s.

Under general superintendent A. E. Warren, Associated used rotary rigs to prove the field. Amazon Drilling Corporation, whom Warren employed as drilling contractors, completed the first major well, Lloyd No. 5, in October 1922 (Associated Oil Company 1922a, 1926b). Not without difficulty: in June, Associated's general superintendent in the field asked for, and received a sixty-day lease extension from Lloyd *et al.* in order to complete the well, owing to "the character of drilling" (King 1922). (Under the terms of the February 1920 lease, Associated was to have completed Lloyd No. 5, Lloyd No. 6, and Lloyd No. 7 by the end of June 1922.) The well's initial production, at 1,800 b/d, coupled with favorable geological reports, convinced Associated to commit capital to an extensive program, which involved the construction of twenty-five miles of roads at grades of up to ten degrees, the deployment of rotary rigs for every well, and the use of special muds to contain high gas pressures (Associated Oil Company 1926b, 1928b). Lloyd (1922) wrote to Shell's van der Linden that Lloyd No. 5 was "additional proof of the correctness of your judgment in regard to this field."

The breakthrough in production came in early 1925 with the completion of Lloyd No. 9–A and Lloyd No. 16, which boosted daily production in the field from 11,000 barrels to more than 21,000 barrels (Associated Oil Company, 1925a, 1925b; *Petroleum World* 1925b). Through July 1926, total production for the field reached 17 million barrels, and the firm was estimating the "ultimate value" of its property in the field at $200 million (Associated Oil Company 1926b). As an indication of the costs and challenges that operators confronted in developing the field, by mid-1927, Associated was producing crude oil from twenty-three wells at depths of a mile or more (Associated Oil Company 1927). Associated's success on the Lloyd lease motivated Shell and GP to develop their leases in the field (Beaton 1957: 189–190).

With Ventura Avenue production averaging 16.2 million barrels per year from 1926–33, landowners on the production leases were well rewarded. Thus by the 1930s Lloyd Corporation had the capital to drill in the field itself. In 1934 it began to do so in response to the incentives of the statewide conservation regime in place. In extending the limits of the field during the 1930s, Lloyd demonstrated how small firms with leases in productive areas could compete with majors. Its drilling campaign also provides more evidence of the extent to which upstream activity persisted during the depression.

Lloyd Corporation planned to drill four or more wells in Ventura Avenue field at a cost of $250,000 each, so that it might maintain its position to produce crude oil with the state's Central Proration Committee, which as the coordinator of the state's conservation program, was threatening to constrain Ventura Avenue producers because of heavy development activity at Kettleman Hills (Lloyd 1934a). Lloyd made the most of the situation by designing a program aimed at defining the eastern limits of the field (Lloyd 1934a; Lloyd 1935d).

As indicated, Lloyd Corporation was in financial position to embark on the campaign. (Also participating in the effort were Joseph Dabney's South Basin Oil and the Ventura Land and Water Company.) Nevertheless, to the consternation of Associated, Lloyd Corporation sought and secured the cooperation of Shell in this effort. After drilling well No. 3 on the Dabney-Lloyd lease for seven months, Lloyd entered into a working agreement with Shell that involved the Dabney-Lloyd, Joseph Sexton, and William Sexton leases on the eastern end of the field (Lloyd 1934e; Lloyd 1934f). Shell agreed to participate with Lloyd and his partners in their development effort and also to process the crude oil they produced once the Dabney-Lloyd lease demonstrated its commercial potential. It also provided some cash up front. The deal left Associated president William Humphery (1934) "tremendously disappointed." Nonetheless, Lloyd assured Associated vice president J. H. Jenkins that his firm sought Associated's cooperation as well, since the two firms leased adjoining properties across much of the field. Indeed, as designed, Lloyd's exploratory drilling effort aimed to meet Associated's spacing program on its Ventura Land and Water Company lease to south of the Dabney-Lloyd lease line. Moreover, both Shell and Lloyd urged Associated to assume responsibility for completing the Dabney-Lloyd No. 3 well (Lloyd 1935a). For his part, Jenkins (1935a) promised to cooperate "in the extent to which cooperation [was] possible."

Olien and Olien (1984: 23–26) found that during the 1920s majors often encouraged independents to demonstrate through drilling the acreage that might be profitably developed in a field. At the same time, independents looked to majors for cash in the form of dry-hole or bottom-hole money, investments in drilling ventures, income from crude oil sales, or the sale of producing properties. Such cooperation often dissipated with the overproduction of the late 1920s and early 1930s. As the Lloyd-Shell working agreement illustrates, however, Lloyd and his partners were in position to maintain cooperation among operators at Ventura Avenue under difficult, if improving conditions, during the 1930s.

With the completion of Dabney-Lloyd No. 3, renamed Shell-Lloyd Lease A No.1, in March 1936, Lloyd was determined to push his exploration program further east, on to the Joseph

Sexton lease, where he expected to drill wells at depths of 12,5000 or more.[36] In October, he queried Shell to ascertain their interest in exploring this area of the field with Lloyd: "We have never lost faith in ultimately proving the eastern end of the field to be of great value from a productive standpoint; hence our desire to have as much time as possible to perfect other arrangements in the event you should not wish to carry on" (Lloyd 1936b). Shell demurred, precipitating the modification of the December 1934 working agreement. Under the new agreement, Shell reassigned of its interest in the east Ventura leases to Lloyd Corporation, except for the nearly eight acres that surrounded the Shell-Lloyd A–1 well (Lloyd 1936c).

From the late 1930s until the end of World War II, Lloyd Corporation drilled more than a dozen wells in the field at a cost of some $200,000 each. In the early postwar period, Lloyd invested in projects to further extend the productive limits of the Ventura Avenue field, and began drilling at Oxnard. At the end of 1949, his firm had twenty-eight, mostly "deep zone" producing wells in Ventura field, making it the field's third largest operator by volume, with more than three times the output of General Petroleum. Further, Lloyd financed exploratory work in the Montalvo West field, where Standard discovered and developed the field's onshore area during the 1940s and acquired a state lease in June 1952 for the development of the offshore portion. He also put dry-hole money into drilling projects near the town of Montalvo (State of California Division of Oil and Gas 1950; Conservation Committee of California Oil Producers 1951; Kegley 1953d; *Ventura County Star-Free Press* 1949g).

Tri-County Exploration and Production, 1941–1965

World War II brought an uneven improvement in conditions for the oil industry. In May 1941 President Roosevelt created the Office of Petroleum Coordinator for National Defense, which in 1942 became the Petroleum Administration for War (PAW). Petroleum Administrator Harold Ickes initially used his authority to achieve the conservationist goal of the interwar period: keeping oil in the ground. Ickes capped uncontrolled production in California and Illinois, and imposed allowables on production, using the U.S. Bureau of Mines practice of suggesting maximum allowables and enforcing them. Order M-68 imposed a 40-acre spacing rule on all production, regardless of local conditions. To obtain a waiver from the order, an operator had to negotiate a tangle of red tape, which majors were better prepared to address than independents. Wildcat wells were defined at a minimum of two miles for proven production. PAW regulations were enforced through the War Production Board, which had control over access to materials such as casing and machinery. Acquiring controlled materials also required filling out many forms. Majors either employed people to fill them out or drew down inventories. Small independents turned to used equipment dealers and the black market. There were also shortages of skilled and unskilled labor with which operators had to contend (Olien and Olien 1984: 82–86).

With initial U.S. involvement in the war, the oil industry contracted in size, despite the strategic need for petroleum. Owing to price controls, materials shortages, inefficient

[36] After Joseph Dabney died in 1935, his estate interests indicated that they wanted remain in the background on business transactions. Shell and Lloyd agreed to rename the properties in the eastern end of the field Shell-Lloyd Lease A, B, C, and so on, with wells numbered sequentially on each lease (Lloyd 1936a).

regulation, and transportation bottlenecks, the number of oil well completions nationally fell by more than half during 1941–42, after rising by almost 20 percent from 1939 to 1941 (Williamson *et al.* 1963: 779–781). Adjustments in the regulatory regime, expanding production of steel and other materials that were crucial to the drilling process, and increased effort on the part of the oil industry produced a marked increase in drilling during 1944 and 1945. Production also increased nationally to record levels, but in 1944 the amount of new oil found also was the lowest in a decade. Red tape and shortages slowed activity, increasing costs and lowering returns for independents especially. Payout time lengthened, reducing the number of projects that could be executed. Prices remained frozen by OPA at October 1941 levels, squeezing operators (Olien and Olien 1984: 82–86; Olien and Olien 2000: 238–241).

The decade following the war was a prosperous one for the industry. Demand for petroleum was unprecedented; prices returned to 1920s levels in real terms, spurring record levels of exploration and development. (See figures 4 and 6 for the impact on the tri-county area.) OPA price caps ended in June 1946. However, shortages of materials continued through 1947, and eased only gradually, keeping prices high; sporadic shortages occurred as well. Operators had to compete with other industries for cement and other oil field materials. With new oil discoveries depending more and more on "deep drilling," exploratory well drilling plummeted immediately after the war. Across the region, the number of prospect wells drilled fell by more than half. Production fell for the first time since 1934. Yet postwar demand for oil was overwhelming, and soon sustained high levels of activity through the mid-1950s. In 1949, for the first time, consumption of oil and gas exceeded all other energy sources. From June 1946 to December 1947, the price of oil increased more than 150 percent. Exploratory well drilling reached all-time highs during 1947–48. After 1948, the increase in demand for oil tapered off. Now supply began to catch up (Olien and Olien 1984: 87–89).

In this environment, both the state and the tri-county upstream industry expanded greatly from 1941 through the mid-1950s. At the state level, the upstream industry remained about as concentrated as it was in 1940. Counting the majors' interest in unit operations, the seven major firms accounted for about half of the output and just under half of the state's producing wells in 1950 (see table 7). Large independents were well represented, with about 30 percent of California's production. Numerous small firms operated more than 30 percent of the state's wells, but only one-sixth of the state's production. Tri-county production was even more concentrated than it was in 1940, with the seven majors accounting for two-thirds of the area's output for 1950. This increase in concentration owed primarily to the discoveries in the Cuyama valley, which Richfield dominated, enabling that firm to rise to the top of the table among tri-county operators (see table 8). It also reflects the soaring output of the Ventura field (officially renamed as of 1950). The "first generation" of large independents is evident in the table of leading tri-county operators, with eight Los Angeles-based firms that were formed during the interwar period represented. Sixteen small independents produced 50,000 or more barrels of crude oil in the tri-county area, five of which were among the twenty-five leading tri-county operators.

Table 7. California Crude Oil Production, 1950

	Producing Wells, December 1950	1950 Average Production (b/d)	Percentage of State Total
1. Standard Oil Company of California	4,341	98,403	11.0
2. Shell Oil Company	1,838	65,955	7.4
3. Union Oil Company	1,764	53,219	5.9
4. Richfield Oil Corporation	745	48,960	5.5
5. City of Long Beach	515	42,142	4.7
6. Tide Water Associated Oil Company	1,675	36,988	4.1
7. Union Pacific Railroad Company	557	35,222	3.9
8. General Petroleum Corporation	1,645	34,889	3.9
9. Southwest Exploration Company	239	26,675	3.0
10. Signal Oil & Gas Company	301	20,675	2.3
11. The Texas Company	875	17,331	1.9
12. Continental Oil Company	187	14,507	1.6
13. Superior Oil Company	228	11,832	1.3
14. Chanslor-Canfield Midway Oil Company	910	10,864	1.2
15. Barnsdall Oil Company*	219	9,429	1.0
16. The Hancock Oil Company of California	113	9,352	1.0
17. Western Gulf Oil Company	148	7,927	0.9
18. Pacific Western Oil Corporation	408	7,392	0.8
19. Universal Consolidated Oil Company	208	6,913	0.8
20. Honolulu Oil Corporation	306	5,975	0.7
21. Jergins Oil Company	198	5,151	0.6
22. Lloyd Corporation	34	4,643	0.5
23. Amerada Petroleum Corporation	95	4,074	0.4
24. Kern Oil Company	458	3,712	0.4
25. Belridge Oil Company	206	3,448	0.4
Total Seven Majors (General Petroleum, Richfield, Shell, Standard, Texas, Tide Water, Union)	12,086	355,745	39.7
Principal Minor Companies	6,658	267,364	29.8
Unit Operations	1,000	119,241	13.3
All Other Companies	8,329	145,736	16.2
Total California	27,073	897,552	100.0

Notes: * – Sunray Oil Corporation acquired Barnsdall as of August 1950: Barnsdall producing wells are for July 1950.

Source: Conservation Committee of California Oil Producers 1951

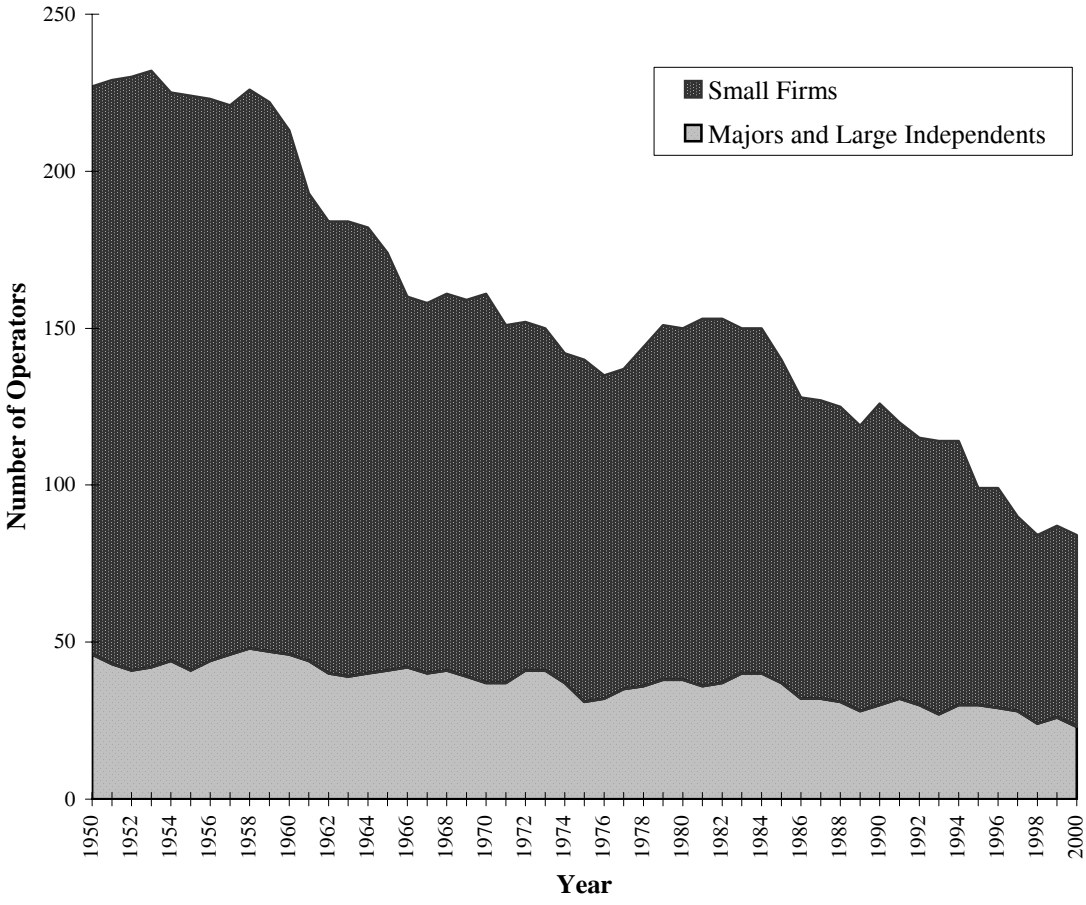
Table 8. Tri-County Crude Oil Production, 1950

	Producing Wells December 1950	Production (Mbbls)	Percentage of Tri-county, Total
1. Richfield Oil Corporation	298#	12,888	19.2
2. Shell Oil Company	416	10,285	15.3
3. Tide Water Associated Oil Company	273	9,378	14.0
4. Union Oil Company	752	7,699	11.5
5. Continental Oil Company	96	3,735	5.6
6. General Petroleum Corporation	141	2,600	3.9
7. Signal Oil and Gas Company	68	2,223	3.3
8. The Texas Company	251	1,803	2.7
9. Chanslor-Canfield Midway Oil Company	102	1,577	2.3
10. Lloyd Corporation	31	1,576	2.3
11. The Hancock Oil Company of California$	36	1,470	2.2
12. Superior Oil Company	29	1,420	2.1
13. Sunray Oil Corporation	65	1,003	1.5
14. Pacific Western Oil Corporation	141	979	1.5
15. Standard Oil Company of California	36	768	1.1
16. F. E. Fairfield	48	683	1.0
17. Bell Petroleum Company	17	643	1.0
18. Wilshire Oil Company	9	547	0.8
19. British-American Oil Producing Company	16	510	0.8
20. Douglas Oil Company of California	15	446	0.7
21. Southern California Petroleum Corporation	18	305	0.5
22. Havenstrite Oil Company	15	269	0.4
23. Bankline Oil Company	18	267	0.4
24. Jack Herley and Paul Kelley	13	228	0.3
25. Exeter Oil Company	9	187	0.3
Total Seven Majors (General Petroleum, Richfield, Shell, Standard, Texas, Tide Water, Union)		45,421	67.5
Total Tri-County Region		67,303	

Notes: # – Includes all 102 wells in Russell Ranch Unit.
$ – Does not include wells or production in Russell Ranch Unit from 9/1/50.
Source: Conservation Committee of California Oil Producers 1951

Despite the concentration at the top, tri-county oil discoveries during the late 1940s to mid-1950s sustained a record number of operators in the field (see figure 7). Actual field discoveries attracted operators of all types in search of new reserves. Indeed, though small firms were often unsuccessful wildcatters, many firms operated one or more producing wells. In all, 124 firms operated producing properties as of December 1950. As figure 8 shows, for most of the 1950s, roughly 40 large independents and 175 small firms shared the tri-county upstream market with the majors.

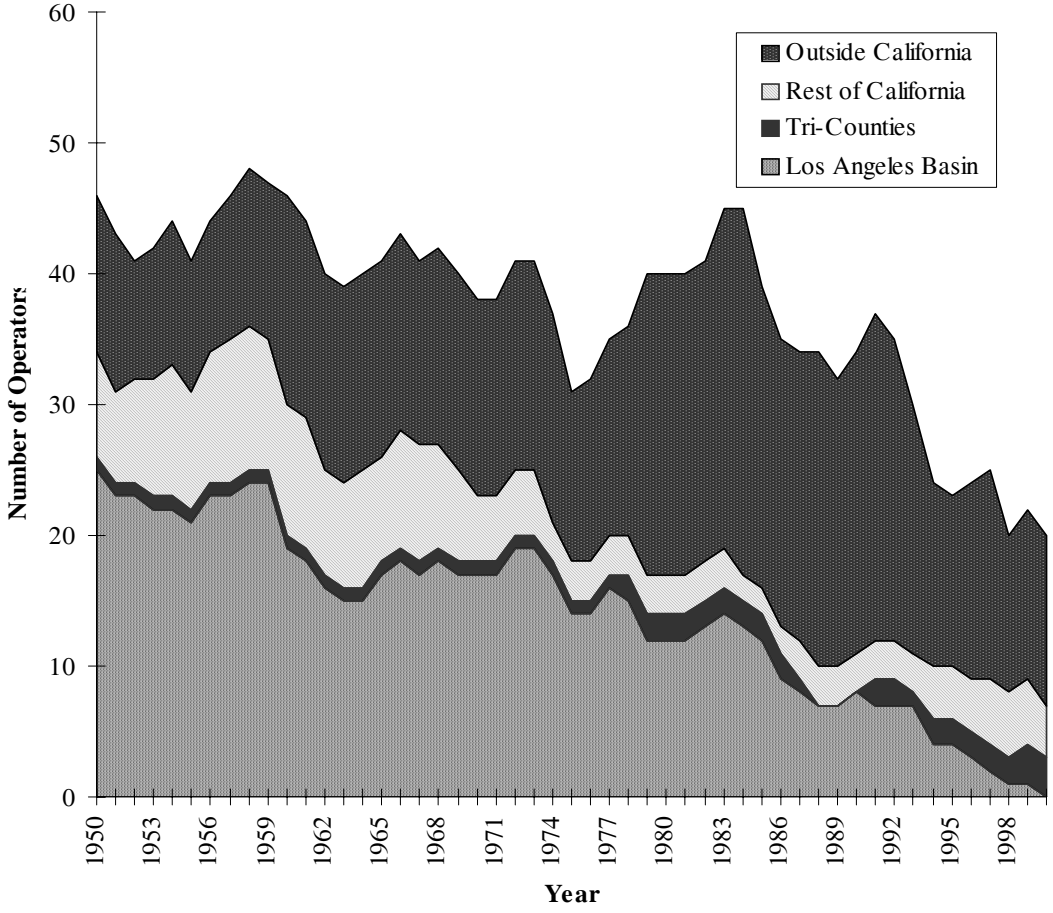
Figure 8. Tri-County Oil Well Operators By Type, 1950-2000



Source: California Division of Oil, Gas, and Geothermal Resources, Districts 2 and 3, Index of Well Records

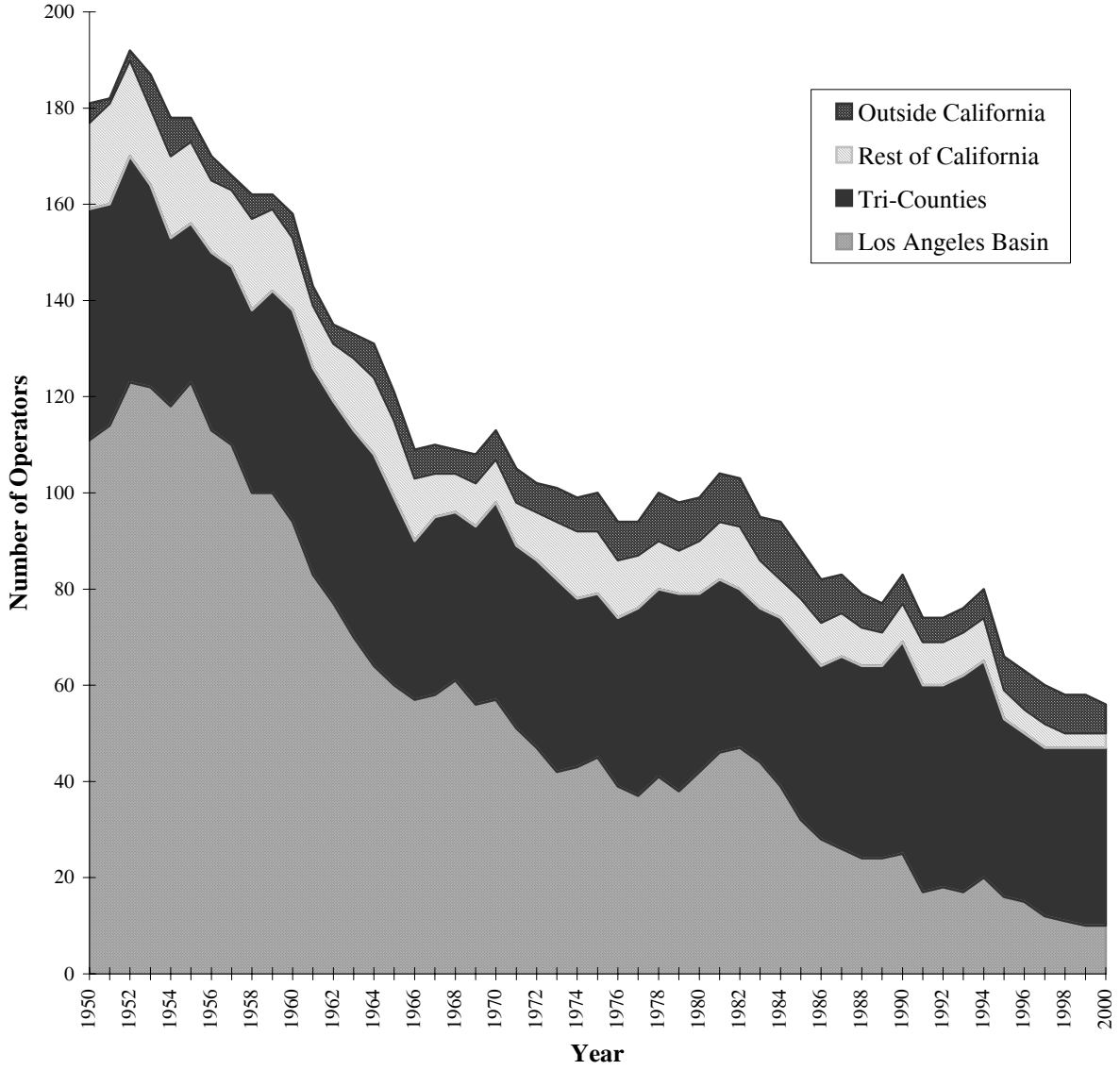
Tri-county operators, both large and small, remained predominantly Los-Angeles based in the immediate post–World War II period (see figures 9 and 10). Among small firms, the high proportion of venture capital coming from the Los Angeles basin coincides with the peak period of exploratory activity. F rom the mid-1950s, the number of Los Angeles-based small firms declined, as wildcatting declined and small independents turned increasingly to operating producing properties. Still, the largest proportion of small firms remained based in Los Angeles. With respect to majors and large independents, Los Angeles-based firms accounted for roughly half of those operating in the tri-county area during the early postwar period. In contrast to geographical situation of small firms, however, the relative and absolute number of out-of-state large companies was much higher, and increased over time. Few majors or large independents were based in the tri-county region, reflecting the upstream focus of the local industry.

Figure 9. Large Tri-County Oil Well Operators By Location,



Source: California Division of Oil, Gas, and Geothermal Resources, Districts 2 and 3, Index of Well Records

Figure 10. Small Tri-County Oil Well Operators By Location, 1950-2000



Source: California Division of Oil, Gas, and Geothermal Resources, Districts 2 and 3, Index of Well Records

From 1947─60, the aggressive development of established and underdeveloped fields, coupled with the discoveries of new fields, made the Ventura group the tri-county area's, and one of California's, leading districts for exploration and production from 1947–60. Operators' success in the field across the basin over time fueled expectations that further discoveries would be made. These expectations sustained at least 130 operators in the field through 1961 in Ventura county.

In 1950, two of the three leading regions in California for exploration activity were in Ventura county: the area between Castaic and Santa Paula, and from Big Sespe to southeastern Cuyama valley (see map 1) (Kegley 1951b). Further, the Ventura field was one of the three most active areas in the state in terms of drilling. Motivated in part by the demand created by the Korean war, Shell scheduled a fifty-well drilling program (Kegley 1951n). Tidewater[37], General Petroleum, and Lloyd were also actively engaged in the field's development.

Increases in actual output during the early 1950s fueled rising operator expectations, and thus their numbers, even after production peaked. For instance, despite the fall in output in Ventura and San Miguelito fields after 1954, successive field or pool discoveries at Fillmore, Saticoy, and South Mountain, and the ongoing development of the Oxnard plain, sustained both actual output and operator expectations, which in turn sustained a high level of operators in the field. Further, all types and sizes of operators could be found in the industry structure. Only after operators large and small had explored and re-explored the whole of the basin did the number of operators fall off dramatically. With expectations regarding further field discoveries now diminished, the number of operators adjusted to the level of actual output.

By late 1951, Continental, GP, Humble, Shell, Standard, Union, and Texaco were drilling aggressively in the established fields of Ventura county (Kegley 1951v). At the same time, these and other firms looked elsewhere in the county for "new and substantial producing areas" that might yield substantial payoffs (Kegley 1951r). For instance, during much of 1951, some twenty operators exploited the area extending from Castaic Creek and Del Valle fields in north Los Angeles county to the Simi and Santa Paula districts in Ventura county (see map 1) (Kegley 1951e, 1951g, 1951h, 1951i; 1951p, 1951s).

The continuing brisk drilling campaign in Ventura field enabled operators there to establish record daily production of 73,000 barrels. Union's mid-1952 discovery of a deep pool in the Torrey Canyon field sparked extensive exploratory work by prominent operators throughout southern Ventura county. As Pederson (1990: 109) noted, it prompted Union's geologists "to take second looks at every old field owned or leased by the company." Potentially substantial returns on investment enticed operators to subject much of the area from Castaic to Oxnard to exploration. As a result, the number of operators in Ventura district increased to 140 (Kegley 1952e, 1952f, 1952g, 1952h, 1952n, 1952p, 1952q).

Shell's development of the so-called D-8 zone in Ventura field enabled the latter to reach a record high of 90,000 b/d in 1953, up from 56,500 b/d just three years earlier. Extension of the Ventura pays into San Miguelito field set off a competitive drilling campaign between Shell and Continental, with each firm keeping up to ten rigs busy along a common border for

[37] J. P. Getty, who controlled Pacific Western and would soon change its name to Getty Oil, acquired control of Tidewater Associated's board of directors in 1951 and shortened its name. In 1932 Getty began buying the shares of Tide Water Associated, the ninth largest oil firm in the country. As he saw it, Tide Water Associated was the only California major that needed his crude oil for its downstream operations, and it was the one major that he had a reasonable chance of acquiring. However, Tide Water Associated's management resisted the takeover attempt with a variety of financial maneuvers, including the 1936 reorganization that yielded a fully merged firm. Once Getty won control of the board of directors, the firm was known simply as Tidewater (Miller 1985).

a six-month period. Shell's "deep drilling" was part of a five-year, 200-well campaign to increase its Ventura field production, which for Shell in December 1950 was some 24,000 b/d from 335 wells. Deep drilling in the field peaked in 1954, with Shell, Tidewater, Lloyd, and others employing an average of forty rigs. The pace slackened during 1955, owing to the poor performance of wells and technical difficulties with their completion. Yet Ventura remained the group's most active and prolific field (Kegley 1950m; Stormont 1954; Stormont 1955; State of California Division of Oil and Gas 1955: 89).

By October 1953 the area around the city of Ventura was in the throes of feverish field activity. Not all of it entailed "deep drilling," but much of it did. In addition, there were several discoveries in the county of "ordinary size," as Kegley (1954a) put it, attracting the interest of many venture capitalists. Yet the 14 percent increase in the Ventura group's production—to 47.9 million barrels—owed mostly to developments in existing fields, carried out by majors (Kegley 1953g, 1953i; State of California Division of Oil and Gas 1954: 65–69).

As Lloyd Corporation demonstrated, however, a well-positioned small independent could remain more than competitive in the postwar era. With more than 1.5 million barrels of production in 1950, Lloyd ranked tenth among tri-county firms (Conservation Committee of California Oil Producers 1951: 40), and was generating the capital that it needed with carry on its drilling campaign in Ventura field during the early 1950s. It also had the resources to invest in expensive "deep drilling" at Oxnard, which proved to be a geologically challenging field.

Throughout the 1950s, Lloyd continued to fund Ventura field projects. In doing so, it sustained more or less continuous drilling activity in the Ventura basin from 1934–59. During 1950, for instance, Lloyd had up to nine rigs in operation in the Ventura field and was completing wells below 13,000 feet at a cost of $300,000 each, in order to develop the eastern end of the field. Over the next two years, it completed half a dozen producing wells on the Joseph Sexton property. Later, in 1959, having drilled another six exploratory wells, Lloyd farmed out 3,000 acres of the property to Standard to continue its development (Kegley 1950a, 1950b, 1950d, 1950f, 1950i, 1950j, 1950l, 1950n, 1951a, 1951d, 1951j, 1951n, 1952c, 1955a, 1955b, 1955d, 1956c, 1957b, 1958d, 1958f, 1959a, 1959b, 1959c).

Lloyd's activity at Oxnard neatly illustrates the role that small firms played in the development of a field whose geophysical characteristics introduced a substantial element of uncertainty into any firm's project planning. Discovered in 1936, majors all but ignored the field, enabling small firms to play key roles in its development. In February 1951 drilling there resumed after a long hiatus. Smaller operators, such as Exeter, Jack Herley, Oceanic, and George Thomas, carried out early tests. At the same time, majors and larger independents scoured about for leases. Lloyd proved equal to the task of acquiring leases in competition with majors, joining Tidewater, Standard, and Shell in securing most of them (Kegley 1952c).

By mid-1952, early success by small firms established the field's potential as a substantial producer, thus attracting more firms to the Oxnard plain. In July, Standard commenced a long

drilling campaign that established it as the leader in the field. Yet entrepreneurs such as Andrew Lucas, a substantial Oxnard landowner and lease holder, and Long Beach proprietor Max Pray drilled important exploratory wells (Kegley 1952a, 1955c, 1957d, 1957e, 1958a, 1958b, 1958g). Moreover, several small firms established production in the field, including Herley, Thomas, and Chase Production Company. For its part, in drilling nineteen wells, Lloyd was second only to Standard in terms of developing the field, which by 1956 was one of the most active in the state, and, as of 1959, was the Ventura group's fourth largest (Smith 1956a; State of California Division of Oil and Gas 1960).

As Kegley (1954b) saw it, 1954 was expected to be "Ventura county's big year in oil." Activity was far-reaching. Increasing production spurred leasing and exploratory drilling wherever operators predicted the next great find to occur. The number of prospect wells drilled rose to fifty-five. As the Ventura group set its all-time record for production, the number of operators jumped to nearly 160. Production had reached a plateau, however, and, after 1958, fell rapidly until the late 1960s. There was a marked decline in wells drilled in county in 1958—a trend that continued until 1964. The number of prospect wells drilled in the county reached a postwar low in 1962 (see figure 6). Upstream activity onshore shifted away from exploration to the development and operation of existing properties.

For the time being, operators sustained the high level of upstream activity. Shell's May 1955 discovery of the Saticoy field set off aggressive drilling campaigns on the part of Shell and Humble. The December 1955 discovery of the so-called Bridge pool in South Mountain field by Union and Texaco made it the group's most active field for 1956. The discovery set off "an epidemic of drilling" that ensured that southern Ventura county would continue to be the scene of California's "big drilling campaign" for the next eighteen months. It involved a number of majors and large independents drilling in and around Saticoy, Fillmore, and Santa Paula. Operators of all sizes continued to make minor field discoveries, extensions of known pools, and new pool discoveries in several fields. The county development picture in 1957 remained strongly positive, with majors pursuing aggressive drilling campaigns in half a dozen Ventura fields. High expectations attracted substantial amounts of capital from major operators. At the same time, the number of small operators in the area remained high, owing to the ability of these firms to acquire leases for exploratory work and the number of small firms that continued to operate producing properties (Kegley 1956b, 1956d, 1956e, 1956f, 1956g, 1956h, 1956j, 1957a, 1957b, 1957c; State of California Division of Oil and Gas 1956: 81–87; State of California Division of Oil and Gas 1957: 87–91; State of California Division of Oil and Gas 1958: 93–97).

The discovery of oil in the Cuyama valley of Santa Barbara and San Luis Obispo counties, the other area of markedly increased upstream activity during the late 1940s and early 1950s, also showed how an increase in potential returns attracted venture capital to an area of exploration under conditions of high risk and low barriers to entry. Cuyama valley discoveries brought more than one hundred companies to the area in search of oil. They often shared the risks of drilling through the investment vehicles of dry-hole money, bottom-hole money, joint ventures, and farmouts (the contribution of lease acreage in exchange for the drilling of a well). The prospect of finding significant reserves sustained feverish levels of exploration.

As this activity waned, wildcatters disappeared and the number of operators declined to a level that could be sustained by known reserves. The decline in oil prospects hit smaller operators hardest in terms of the industry structure, as the remaining operators at this time were most often majors or "first generation" large independents.

As noted, Richfield's leasing program enabled it to dominate production at both Russell Ranch and Cuyama South, the two giant fields in the group. As of October 1949, there were 145 producing wells in the valley. Richfield operated 123 of them. Of the 30,000 barrels of crude oil flowing from the two fields, Richfield produced 24,000. At the same time, a number of other Los Angles-based firms, including large independents and small operators, operated production in the valley (Jones 1962: 239–250; State of California Division of Oil and Gas 1950: 54–57; *Ventura County Star-Free Press* 1949c).

Cuyama South proved to be a much larger field than Russell Ranch. To exploit it, operators, led by Richfield, engaged in an extensive drilling campaign throughout 1950 that involved the drilling of 111 wells. Daily output from both fields boosted daily Cuyama valley production to 43,700 barrels. Although the drilling pace slackened in Cuyama South field in 1951, production soared to its peak of 14 million barrels as the daily output of the field's 200 producing wells reached nearly 40,000 barrels. Indeed, Cuyama valley development made Richfield one of the strongest majors on the West coast. Its 1951 crude oil reserves were up 243 percent over 1948. Revenues were up 211 percent over 1947, net income had increased 261 percent over the same period. By 1953 Richfield was Santa Barbara county's leading employer and taxpayer (Jones, 1972: 265–266, 345–350; Kegley 1950m, 1953a; State of California Division of Oil and Gas 1951: 57–61; State of California Division of Oil and Gas 1952: 42–46).

Even as Richfield dominated actual field production in Cuyama valley, the prospects for further finds attracted ventures of all types and sizes to an area stretching across all three counties, from the Carrizo plain in San Luis Obispo county to the Sespe area of Ventura county (see map 1). Operators spent $240,000 or more on prospect wells in the north Cuyama valley (Kegley 1951c). Owing to the highly speculative nature of drilling in the area, they commonly drilled in combinations of up to six firms in order to spread risk. Operators also drilled on farmouts from major leaseholders (cf. Kegley 1951l, 1954c, 1954d). For all their efforts, only two minor field discoveries were registered, both in 1950. Yet these discoveries were sufficient to attract numerous operators to the area, many of whom had been active in the Cuyama valley since 1948 (Kegley 1950c, 1950e, 1950g, 1950h, 1950l, 1950o, 1950r, 1950s, 1950u).

With crude oil prices not keeping pace with costs from the mid-1950s, however, the industry began to lose its incentive to replace the reserves they depleted. One estimate put the average U.S. cost of replacing a barrel of crude oil in 1956 at $3.16 at a time when the average price was only $2.78. Most production, of course, cost operators less than $2.78 per barrel, but the future trend was clear. To make a profit, they strove for efficiency in the field, and utilized reservoir engineers to maximize production from pools. Workovers of declining wells

increased. It also became more attractive for operators to produce the oil others found. This was an option that small independents increasingly pursued (Olien and Olien 1984: 96–99).

Adamson and Bergstrom (1998) identified some seventy small entrepreneurs who were especially prominent among tri-county independents in the period from 1950–95. Many of them indeed specialized in operating producing properties. Kenneth Hunter of Fillmore, and later, Montecito, is a case in point. Beginning in 1946, his San Marino Oil Company, a partnership with Charles Fetterman, acquired a portfolio of producing wells in the Bardsdale field of Ventura county. As of December 1950, they operated seventeen producing wells and produced 117,802 barrels of crude oil for the year (Conservation Committee of California Oil Producers 1951: 59). In 1957 Hunter joined up with fellow entrepreneurs William Thornbury, whose Thornbury Drilling Company had extended the limits of Guadalupe field into San Luis Obispo county during 1951–52 before selling out to Union, and W. H. Geis to acquire another producing property in the Bardsdale field. Hunter also promoted a series of deals on his own account from 1943–60. In so doing, Hunter established a thriving family business, the value of which his son greatly enhanced from 1960–80 (Adamson and Bergstrom 1998: 62, 98, 128).

By 1958 the period of postwar prosperity was ending, for small- and medium-sized independents especially. Rising costs and slack prices sapped profit possibilities. From 1959–72 drilling expenses rose by two-thirds, according to one industry survey. This was not too far out of line with increases in the consumer price index, yet the global abundance of crude oil suppressed revenues. The economic problems of the period prompted a substantial increase in property sales. Between 1955 and 1965 there were nearly 700 mergers and major property acquisitions in the U.S. oil industry. Fifteen of the thirty-one large independents that were listed on the New York Stock Exchange in 1952 sold out or went out of business by 1962. During 1961 alone there were a dozen big deals, many of which involved companies with operations in the tri-county region. The pace of mergers and acquisitions hit another high in 1965, and slackened only in 1966, when higher interest rates and taxes associated with the Great Society and the Vietnam War diminished the capital available for such transactions. Nationally the effect on independents was significant. By 1969 the number of independents was down to 10,000, from more than 42,000 in 1955 (Olien and Olien 1984: 113–116; *Oil and Gas Journal* 1966d).

In California and the tri-county region, this merger movement eliminated the generation of large independents that was established during the Los Angeles oil boom of the 1920s. Some of these firms, such as Oceanic and Bankline, faced poor oil-finding prospects, high costs, or suffered from other business ills. Others had reached the point where management and shareholders wished to realize the capital gain on the sale of their assets, merge with an integrated firm, or simply move on to other interests (Kinney 1962; *Oil and Gas Journal* 1956). The acquisition of producing properties could also be part of a program by a strong independent, such as Signal and Continental, to establish itself as a viable, integrated competitor to the major operators (*Oil and Gas Journal* 1961a; *Santa Barbara News-Press* 1958f; Tompkins 1964: 218–231). Large, successful independents, such as Honolulu and Monterey, became the target of integrated firms seeking to build up crude oil reserves in order

to feed downstream operations (*Oil and Gas Journal* 1961b; *Oil and Gas Journal*. 1963; *Santa Barbara News-Press* 1961).

Mergers involving majors, which typified the merger movement of the 1980s, were less common during the 1950s and 1960s. Those that did occur, however, represented a substantial shake up of producing properties in California and the tri-county area. They included Atlantic Refining Company's buyout of Richfield, yielding Los Angeles-based ARCO, and Getty's purchase of Tidewater. The latter transformed Getty into California's third largest producer in 1970 and, with the transfer of Tidewater's Ventura Avenue assets, a leading tri-county operators as well.[38]

The 1950s was an attractive time for small operators to sell out to majors that were seeking additional reserves. In 1951, for instance, F. E. Fairfield sold his producing properties at South Mountain to Shell for $6.25 million. Thereafter he remained active in the county as his own proprietor and as a principal for Fairfield-Volunteer Petroleum Company, a Fillmore partnership that he created in September 1950. After discovering an important pool in Shiells Canyon field in August 1952, Harry C. Long of Los Angeles drilled eight developmental wells before selling his lease to Texaco in April 1954 (Kegley 1951h; Kegley 1951k; State of California Division of Oil and Gas 1953: 62; *Ventura County Star-Free Press* 1950a).

Small operators also chose to invest in non-oil ventures. Lloyd Corporation, for instance, increasingly emphasized its commercial real estate business after Ralph Lloyd died in 1953. Richard von Hagen, who succeeded Lloyd at the head of the firm, continued to reinvest its earnings in oil for the balance of the 1950s (Kegley 1953d, 1953f, 1959c; Richardson 1998). By 1960, Lloyd's ongoing investment in the Ventura basin was evidenced by the 100 wells that it operated, 86 of which still produced oil. Yet, the maturity of the basin was evident in the fact that the firm's average overall production was down to 4,170 b/d (Conservation Committee of California Oil Producers 1961). Though this represented a substantial amount for a small independent, Lloyd Corporation began to divert its oil-generated capital other developments. It began construction on the Lloyd Center, a Portland, Oregon shopping mall, in the late 1950s. From 1957, the firm retained a Lloyd Center office to operate and promote the facility.

At the end of the exuberant era, prior to any letting of federal OCS leases, oil industry activity and output had declined from its mid-1950s peak levels, both at the state and local levels. As table 9 shows, the upstream segment of the state industry was rather more concentrated in the

[38] Getty made his fortune, worth some $3 billion in 1957, through exploration and production. He envisioned building an integrated oil company that could compete with the likes of Jersey Standard (Exxon), Mobil, and Shell. However, the Eisenhower administration's "voluntary" oil import quota program of 1957—made permanent in 1959—foiled Getty's plans to refine and market nationally the crude oil from his leases in the so-called Neutral Zone in the Middle East. With the merger of Getty and Tidewater, Getty refocused on upstream operations (Lenzer [1985); Miller [1985]). On the Getty-Tidewater deal, which involved the sale of Tidewater's western refining, marketing, and distribution assets to Phillips to satisfy U.S. Justice Department antitrust concerns, see Lenzer (1985: 143–148); *Oil and Gas Journal* (1966b); *Oil and Gas Journal* (1966c); *Oil and Gas Journal* (1966e); *Oil and Gas Journal* (1966g); *Oil and Gas Journal* (1967a); and *Oil and Gas Journal* (1967b). On the Atlantic Refining-Richfield deal, see Jones (1972), and *Oil and Gas Journal* (1966a).

hands of the seven majors in 1965 than it was in 1950, at similar levels of output. Large independents maintained their share of output, the merger movement that was reducing their ranks notwithstanding. The increase in market share by the majors was acquired at the expense of small independents, whose share of state output fell to 7.1 percent, even as they operated 20.5 percent of the producing wells, down by one-third from 1950.

Table 9. California Crude Oil Production, 1965

	Producing Wells, December 1965	Average Production (b/d)	Percentage of State Total
1. Standard Oil Company of California	7,932	163,399	19.7
2. Union Oil Company	2,101	82,809	10.0
3. Tidewater Oil Company	3,670	72,964	8.8
4. Shell Oil Company	4,073	62,657	7.5
5. City of Long Beach	386	54,549	6.6
6. Richfield Oil Corporation	1,042	53,401	6.4
7. Texaco	1,494	49,589	6.0
8. Socony Mobil Oil Company	2,173	47,117	5.7
9. Signal Oil and Gas Company	1,086	45,198	5.4
10. Union Pacific Railroad Company	130	24,172	2.9
11. Humble Oil and Refining Company	895	20,647	2.5
12. Gulf Oil Corporation	758	16,773	2.0
13. Chanslor Western Oil & Development	1,221	15,529	1.9
14. Belridge Oil Company	1,925	14,484	1.7
15. Superior Oil Company	192	12,160	1.5
16. Sunray DX Oil Company	446	11,192	1.3
17. U.S. Navy	217	9,721	1.2
18. Continental Oil Company	303	8,668	1.0
19. Phillips Petroleum Company	19	4,854	0.6
20. Getty Oil Company	354	4,752	0.6
Total Seven Major Companies (Socony Mobil, Richfield, Shell, Standard, Texaco, Tidewater, Union)	19,034	512,795	61.7
Larger Independent Companies	9,362	259,042	31.2
All Other Companies	7,313	58,899	7.1
Total California	35,709	830,736	100.0

Note: Production includes unit interest; number of wells includes only company-operated wells and joint operations.
Source: Conservation Committee of California Oil Producers 1966

At the tri-county level, as shown in table 10, the upstream segment of the industry more concentrated than that for the state as a whole, continuing a trend that prevailed for much of the twentieth century. Further, with almost 80 percent of production in the hands of majors, it was far more concentrated than it than it had been in 1950. This outcome reflected the investments that majors made in onshore field development during the 1950s, the merger movement that removed many "first generation" independents, and the onset of the offshore

era, which was dominated by majors to a greater extent than onshore activity. Among major operators, note the performances of Standard and Humble, which had little production in 1950, but with vast resources were able to compete successfully against the established majors of the interwar period. Production from state tidelands leases contributed a significant share of both firms' output. Phillips stands out among tri-county operators in producing all of its production from state offshore leases. Note also the relative performance of Shell, whose development of the Ventura field during the 1950s was far more intensive and successful than that of Tidewater. Owing to the relatively rapid declines in output in the Cuyama valley, Richfield relinquished the top spot among tri-county operators to Union, which invested heavily in the primary and secondary development of established field in the Santa Maria and Ventura districts.

Table 10. Tri-County Crude Oil Production, 1965

	Producing Wells December 1965	Production (Mbbls)	Percentage of Tri-county, Total
1. Union Oil Company	1,001 $	9,677	18.0
2. Richfield Oil Corporation	442 #	8,312	15.5
3. Shell Oil Company	993	7,008	13.0
4. Standard Oil Company of California	311	6,834	12.7
5. Tidewater Oil Company	416	4,835	9.0
6. Texaco	324 *	3,444	6.4
7. Continental Oil Company	175	2,094	3.9
8. Phillips Petroleum Company	19	1,772	3.3
9. Socony Mobil Oil Company	202	1,676	3.9
10. Chanslor-Western Oil Development	173	1,461	3.1
11. Humble Oil and Refining Company	77	1,320	2.5
12. Getty Oil Company	121	703	1.3
13. Lloyd Corporation	82	643	1.2
14. Signal Oil and Gas Company	62	443	0.8
15. Sunray DX Oil Company	31	264	0.5
16. Superior Oil Company	25	190	0.3
17. British-American Producing Company	22	185	0.3
18. Imperial Oil and Gas	10	171	0.3
19. Anza Pacific Corporation	16	140	0.3
20. Eastern Interior Oil Company	8	121	0.2
21. Chase Production Company	9	72	0.1
22. Central Lease	8	72	0.1
23. U.S. Natural Gas Corporation	13	63	0.1
24. Jack Herley Operations	4	62	0.1
25. Exeter Oil Company	6	58	0.1
Total Seven Majors (Socony Mobil, Richfield, Shell, Standard, Texaco, Tidewater, Union)		41,786	77.8
Total Tri-County Region		53,735	

Notes: # – Includes all wells in Russell Ranch and Cuyama South units.
$ – Includes all wells in Santa Maria Valley unit.
* – Includes all wells in Shiells Canyon Intermediate Zone unit.

Source: Conservation Committee of California Oil Producers 1966

Despite the more than 20 percent fall in tri-county production from 1950, there were 118 operators with production from almost 50 percent more wells. Whereas 42 operators had at least 50,000 barrels of production in 1950, only 26 firms had at least that much output in 1965. The drop in exploration-oriented ventures accounts for the decline in the number of operators. As can be seen in figure 8, the large turnover among large independents notwithstanding, this decline had its greatest impact on the small ventures that drilled prospect wells.

Service and Supply Firms

Supporting upstream oil activity were service and supply firms that were concentrated in Ventura and Santa Maria. Such firms engaged in a number of tasks, including drilling, seismography, torsion balancing, well maintenance, field service, and transportation. As indicated, we do not have a complete profile of the firms that operated in the tri-county region. Indeed, only for the Ventura Avenue district was research performed that detailed the service and support industry at the level done for the operators, and this was done for a single point in time (1956). Using the Ventura city directory, researchers found that eighty-three oil service and supply firms lined Ventura Avenue. As was the case with operators who organized as partnerships, proprietorships, and small corporations, many of those engaged in this sector of the industry did so as self-employed contractors or small business concerns.

Until the 1920s majors generally remained vertically integrated with respect to service and supply tasks. Thus the latest technology, techniques, and scientific data often remained proprietary. This changed during the depression, when majors began to contract out drilling and service technology (though as we have seen, Associated engaged a contractor to drill its Ventura Avenue wells in the mid-1920s). Service firms and drilling contractors made their innovations available to all. By the 1960s, independents could purchase services from Schlumberger and Halliburton that were as up-to-date as anything that Shell or Union could obtain. This applied to information services as well: independent service firms supplied geological and geophysical data on potentially producing areas. Any operator could hire geological and engineering consultants, many of which were former employees of majors or large independents, to interpret their geological data. (These consultants also have little visibility in prior research on the tri-county oil industry.) Many of these professionals became independent operators themselves—a trend that is especially relevant to the post–1985 era of decline in the tri-county region. With the cost of finding new oil soaring from the late 1950s, technical expertise became essential to maximizing recovery from existing production, or extending the life of existing fields. Hence efficient operation came to the fore, while geological speculation receded. During the 1960s, managing field operations in an area familiar to the petroleum engineer-turned-independent became a business strategy of many small operators. With low capital requirements and overheads, they could profit where majors would take a loss (Olien and Olien 1984: 119–124).

Ventura service and supply firms were often profiled in "Oil Progress Week," a supplement that appeared annually in the *Ventura Star-Free Press* during the early post–World War II period. To a greater extent than was the case with operators, the service industry was locally

based and comprised of smaller firms. Still, many firms were or became national in scope, including Schlumberger, which established a Ventura Avenue office in 1938 (*Ventura Star-Free Press* 1949e), National Supply Company, which was the world's largest manufacturer and distributor of oilfield equipment and supplies as of 1949, and Houston Oil Field Materials. National Supply Company was founded in 1941 in Ventura. By 1953 the firm employed thirty people in the production of power lines, drilling rig wiring, and industrial motors (VC II: 3.1.4). Ventura Tool Company was founded in 1930 by Fritz Huntsinger, Sr., who began his career at the Lane Tool Company machine shop in Ventura. With expertise gained in the armaments industry, Huntsinger began producing a tool for use in inspecting the bores of oilfield tubes. Ventura Tool was a firm that addressed that problem of controlling wellbore pressure during the drilling and production process, with the aim of preventing "gushers" that wasted oil and polluted property. With the onset of the offshore era, Ventura Tool expanded the scope of its operations. This was facilitated by the creation in 1963 of a special team, under the direction of Fritz Hintsinger, Jr. and Carl Huntsinger, to develop new products for the offshore oil industry (ABB Vetco Gray 2001; *Ventura Star-Free Press* 1949f; *Ventura Star-Free Press* 1953g).

At the top of the oil service hierarchy were drilling contractors, whose fortunes waxed and waned with the level of upstream activity. By 1959 only three majors—Shell, Standard, and Richfield—maintained company crews. Yet even these firms engaged drilling contractors. Shell, for instance, contracted out much of its intensive Ventura field development program of the early 1950s. Richfield employed eighteen drilling contractors, in addition to its own crews, in the development of the Russell Ranch and Cuyama South fields (*Petroleum World* 1950). As R. B. Dugger, the company's division manager of personnel and industrial relations, observed: "Since oil drilling equipment is very expensive, every company is reluctant to tie up too much money in equipment purchases and we prefer to contract much of the drilling out, especially since equipment becomes obsolete rapidly" (Quoted in *Santa Barbara News-Press* 1950b). Independents such as Lloyd Corporation also contracted out their drilling efforts (*Ventura County Star-Free Press* 1949g).

The leading drilling contractors of the early postwar period included Los Angeles-based companies that operated in the tri-county region: Bell and Burden, Pike, Rocky Mountain, and A. D. Rushing (*Ventura County Star-Free Press* 1950b; *Ventura County Star-Free Press* 1953a; *Ventura County Star-Free Press* 1959). A survey of Howard Kegley's "Oil Field News" for 1950 showed that tri-county activity supported at least eight contracting firms in the field at any given time. The decline in drilling activity in the early 1960s hit these firms hard, prompting some of them to shut down local offices or cease operations (*Ventura County Star-Free Press* 1964).

Many more firms were prominent in the Ventura district during the early postwar period. Lane-Wells offered gun-perforating, electrical logging, gamma ray logging, and through-tubing perforating (*Ventura County Star-Free Press* 1953e). Baker Tool, Gilbertson Tool Works, McCullough Tool, Union Tool, and Wilson Tool maintained, repaired, and manufactured customized oilfield equipment (*Ventura County Star-Free Press* 1949b; *Ventura County Star-Free Press* 1949d; *Ventura County Star-Free Press* 1949h; *Ventura*

County Star-Free Press 1953f). BJ Service, a subsidiary of Byron Jackson, specialized in cementing and related services (*Ventura County Star-Free Press* 1953b). Ken Corporation of Long Beach and Oil Base of Compton provided special muds for the drilling process (*Ventura County Star-Free Press* 1953c; *Ventura County Star-Free Press* 1953d). As this list might suggest, service and supply firms were crucial to the development of tri-county oil fields, an important source of technical expertise, and an important creator of local jobs (*Ventura County Star-Free Press* 1953h; *Ventura County Star-Free Press* 1957b; *Ventura County Star-Free Press* 1959).

Industrial Activity: Storage, Transportation, and Refining

In contrast to the segment comprising the suppliers of crude oil, the segment of the oil industry that accounted for the purchase and processing of crude oil was dominated by majors from 1895–1940, and was almost exclusively in majors' hands thereafter, as the small refiner all but disappeared. Though firms constructed numerous oil and gas processing facilities in the tri-county area from 1865–1965, the major refining centers (and consumers of petroleum products) were the San Francisco bay area and the Los Angeles basin. In the nineteenth and twentieth centuries, tri-county operators constructed infrastructure to store and transport crude or refined oil to these markets by tanker, rail, pipeline, and truck. The location of storage, transport, and processing facilities that accompanied the development of all major areas of production within the tri-county area (and some areas outside the region) had path dependent impacts on land use and the character of urban development. During the offshore era, the location of onshore processing facilities became a political issue, since local government and citizens' groups used the siting of such facilities as a means of opposing or mitigating the development of offshore leases.

Shipping crude oil produced along the coast by sea historically enjoyed as much as a threefold cost advantage over railroad tanker cars. Early pipelines were designed to deliver crude oil to terminal points along the coast, such as Ventura, Gaviota, and Port Harford (Avila). During the early twentieth century, the construction of major pipeline systems enabled an increasing amount of crude oil to be delivered to refineries in San Francisco and Los Angeles through this means. Well into the twentieth century, however, much of the tri-county area's oil continued to be delivered to refineries by sea. Moreover, local facilities continued to process oil for various purposes, including the production of asphalt for road construction—a market that supported many small refiners.

From the earliest efforts to find oil in north Los Angeles and Ventura counties, the city of Ventura became a primary shipping point for local producers. During the 1870s, 1880s, and 1890s, a number of short pipelines connected producers to tidewater at Ventura. In the late 1860s, Ventura set out to develop its own port, and in 1872 it completed construction of a wharf (Reith 1963: 102–104). With water the only economical means of transporting oil at the time, Star Oil Works, later part of CSOW, constructed a refinery near the Ventura wharf in 1876. The *Ventura Free Press* called for a pipeline from Pico Canyon, where commercial quantities of oil were being found, to assure the refinery of all the crude oil it needed to make

the town California's major oil center. Star Oil Works also had a refinery at Lyons Station, near modern-day Newhall, and constructed a ten-mile, two-inch pipeline to link it to the producing wells in Pico Canyon. With the 1876 completion of the SP line between San Francisco and Los Angeles, Star Oil Works began delivering kerosene to San Francisco, a task facilitated by Isaac Blake's design of a tank car to ship product by bulk (Hutchinson 1965a: 271–274; White 1962: 38–52).

For a number of reasons, including product quality and external market conditions, local production and distribution of kerosene failed to become an established business. Several developments further reduced the incentive to refine locally the crude oil found in north Los Angeles and Ventura counties. In 1878 Standard of Ohio opened a San Francisco sale office, and in 1879 PCO was formed. Both firms focused on refining and distribution. By 1880 PCO had constructed a 500-barrel refinery at Alameda and had enlisted CO&T to handle its distribution (Hutchinson 1965a: 326–328; White 1962: 59–84). The trend was clear. The tri-county region increasingly focused on the upstream segment of the industry. Infrastructure was constructed to deliver crude oil to San Francisco and Los Angeles refineries.

Because of the cost advantage of shipping crude oil by sea, however, operators still had an incentive to deliver their production to Ventura. During the 1880s, the city acquired additional oil infrastructure. Blake's Mission Transfer Company planned to ship crude oil from a Rancho Ex-Mission San Buenaventura lease by sea, and embarked on a building program that included storage tanks and a pumping station on the Ex-Mission lease, and 30,000-barrel receiving tanks, both at the Ventura wharf and Santa Paula. County supervisors permitted the company to lay a pipeline from Santa Paula to Ventura. This was completed in 1884. Hardison and Stewart ran a feeder line from their Ojai wells to the pipeline (Hutchinson 1965a: 328–331).[39]

When CO&T and Standard of Ohio formed Standard of Iowa in July 1885 to assume the marketing operations of both firms on the west coast, PCO was deprived the use of Blake's tank cars for the transport of crude oil from Newhall to its Alameda refinery. Faced with the prospect of using SP's boiler-type cars at a higher rate, MTC constructed a thirty-mile, two-inch line pipeline from Santa Paula to Newhall to give PCO access to tidewater at Ventura and a shipping rate of 46¢ per barrel to Alameda (rather than the 65¢ per barrel rate that SP charged from Newhall) (Hutchinson 1965a: 339).

The use of the city of Ventura as a key oil shipping point was reinforced in the late 1880s when Hardison and Stewart avoided the high cost of transporting fuel oil from their refinery at

[39] The construction of pipelines for the transport of oil soon followed the advent of exploration and production in eastern Pennsylvania in 1859. Early "gathering pipelines" of the 1860s, typically two inches in diameter and made of lap-welded wrought iron pipes, connected producing regions and railroad depots, displacing the barrel-carrying wagons that predominated during the early days of the oil industry. Workers laid sections of pipe on the ground, screwed the ends together, applied welds, and sometimes buried the line in the ground. The development of "trunk" lines followed, replacing railroads as the primary means of transporting crude oil over long distances. Typically five to six inches in diameter by the end of the nineteenth century, workers buried them at few feet in ditches dug by work crews with little mechanical assistance (Johnson 1956; Williamson and Daum 1959: 395–462).

Santa Paula to San Francisco by rail by using the steam-powered *W. L. Hardison*, which they launched in 1889 and equipped with oil burners (Pederson 1990: 12; Welty and Taylor 1958: 43–47).

During the 1890s, Hardison and Stewart, as Union Oil, took additional steps that configured Ventura county as a region specializing in production and established Ventura as a town whose economy depended on oil activity. Union's growth rendered the Santa Paula refinery inadequate, and in 1896 the firm completed construction of larger refinery at Oleum, in the San Francisco bay area. Stewart wanted the refinery to be located near a major market, and had turned to the bay area after Los Angeles city leaders, citing the fire hazard of a refinery and storage tanks, rejected Union's proposal. The concerns of Los Angeles were not unwarranted. In June 1896 fire destroyed Union's Santa Paula refinery. With the completion of the Oleum refinery, Union constructed a second pipeline from Pico Canyon to Ventura and a four-inch pipeline from the Whittier and Fullerton fields to tidewater at San Pedro harbor (Welty and Taylor 1958: 71–74, 90; Williamson *et al.* 1963: 67).

With the development of the giant fields of the San Joaquin valley at the turn of the twentieth century, Associated, Standard (including PCO and Standard of Iowa, its predecessors), and Union constructed large trunk lines to connect the fields to their refineries.[40] In 1904 Associated acquired a 106-mile, six-inch pipeline that connected Coalinga field to tidewater at Monterey bay. After forming the Associated Pipe Line Company with the SP in 1907, Associated constructed two eight-inch lines from Kern River field and Bakersfield, respectively, to the San Francisco bay area, and, eventually, to its Avon refinery (Associated Oil Company 1922b). After Standard of Iowa acquired PCO at the end of 1900, the latter embarked on new investments in storage, transportation, and refining to link new fields with refineries at Richmond, completed in 1902, and El Segundo, completed in 1911. At a cost of $3 million, PCO built a major eight-inch pipeline that linked the Coalinga, Kern River, Midway-Sunset fields to the Richmond refinery, enabling Standard to break into the west coast fuel oil trade. It also built shorter trunk lines to connect the Santa Maria, Pico Canyon, and Los Angeles producing districts to tidewater port facilities, including Port San Luis and Ventura, for shipment by tank steamer to Richmond (prior to the construction of the El Segundo facility) (Andreano 1970: 185–187; White 1962: 249–280). In 1910 the Producers Transportation Company, a joint venture of Union Oil and the IOPA, completed construction of a $4.5 million, 240-mile, eight-inch pipeline that connected Belridge, Coalinga, and Lost Hills fields in the San Joaquin valley to Port Harford (later Avila) where Union erected a tank farm and a wharf. Together with a tank farm that it located in the city of San Luis Obispo, Union could store an additional 27 million barrels of crude oil. Fifteen pumping stations enabled the pipeline to transport 30,000 barrels of oil daily. Union, which gradually acquired

[40] Trunk lines constructed after 1905 were typically eight inches in diameter. By 1941 ten and twelve inches trunk lines, introduced before World War I in California by Standard of California, were increasingly common. Corresponding gathering lines were often four or six inches in diameter. Yet in 1936 two- and three-inch lines comprised about half of the gathering lines in operation. During the mid-1910s, diesel-driven displacement pumps began to replace steam-driven pump stations, though their introduction in California was delayed until the mid-1920s, owing to the low gravity of the crude oil, which had to be heated so that it could flow through pipes with the least amount of friction. Operators typically used the exhaust steam from non-condensing steam engines to heat the oil before shipping it through the pipeline (Williamson *et al.* 1963: 69–72).

the IOPA's interest in the pipeline, shipped the oil by tanker to its Oleum refinery, which it expanded in 1908 (Andreano 1970: 188–191; Welty and Taylor 1958: 104–108). With the pipeline, San Luis Obispo county acquired substantial industrial infrastructure, even though it produced no oil itself.

The opening of the Santa Maria district motivated all three majors to build pipelines to terminal points at Gaviota and Port Harford. The infrastructure erected to support oil activity established both locations as oil shipment centers throughout the twentieth century. Gaviota remains an important processing location for offshore production, and remains one of two sites in Santa Barbara county where oil firms may engage in additional oil and gas activity without submitting the proposed action to the voters for approval.

Gaviota served as a terminal and shipping point for Associated's 41.5 mile, eight-inch pipeline, which linked Casmalia and Santa Maria fields to a refinery that was in use until 1920. In 1896 the Alcatraz Asphaltum Company constructed a facility for the making of asphalt on the site, where it processed product mined at Sisquoc Ranch, about thirty-five miles to the north. Alcatraz mixed the output from Sisquoc Ranch with distillate, and shipped it through a four-inch pipeline to the refinery, where the distillate was driven off during the manufacturing process, condensed, and pumped back to Sisquoc Ranch through a three-inch line. The final product was shipped by rail or by sea. In 1904 the National Oil and Transportation Company took over the plant, converting it into an oil refinery. The pipelines were relaid to connect the facility with a new pump station on the Careaga lease, on which the Santa Maria field had been discovered. The lines had a 5,000 b/d capacity. Associated acquired the property in 1905, and built the eight-inch pipeline in 1908 (and extended it to Cat Canyon field). With the 1913 completion of Associated's 30,000-barrel capacity refinery at Avon, near San Francisco, the Gaviota plant was used only to dehydrate crude oil, load ships and rail cars, and distribute fuel oil and gasoline. To facilitate the unloading of gasoline and loading of crude oil from the pipeline, Associated rebuilt the wharf in 1924, extending it 360 feet (Thorpe 1925).

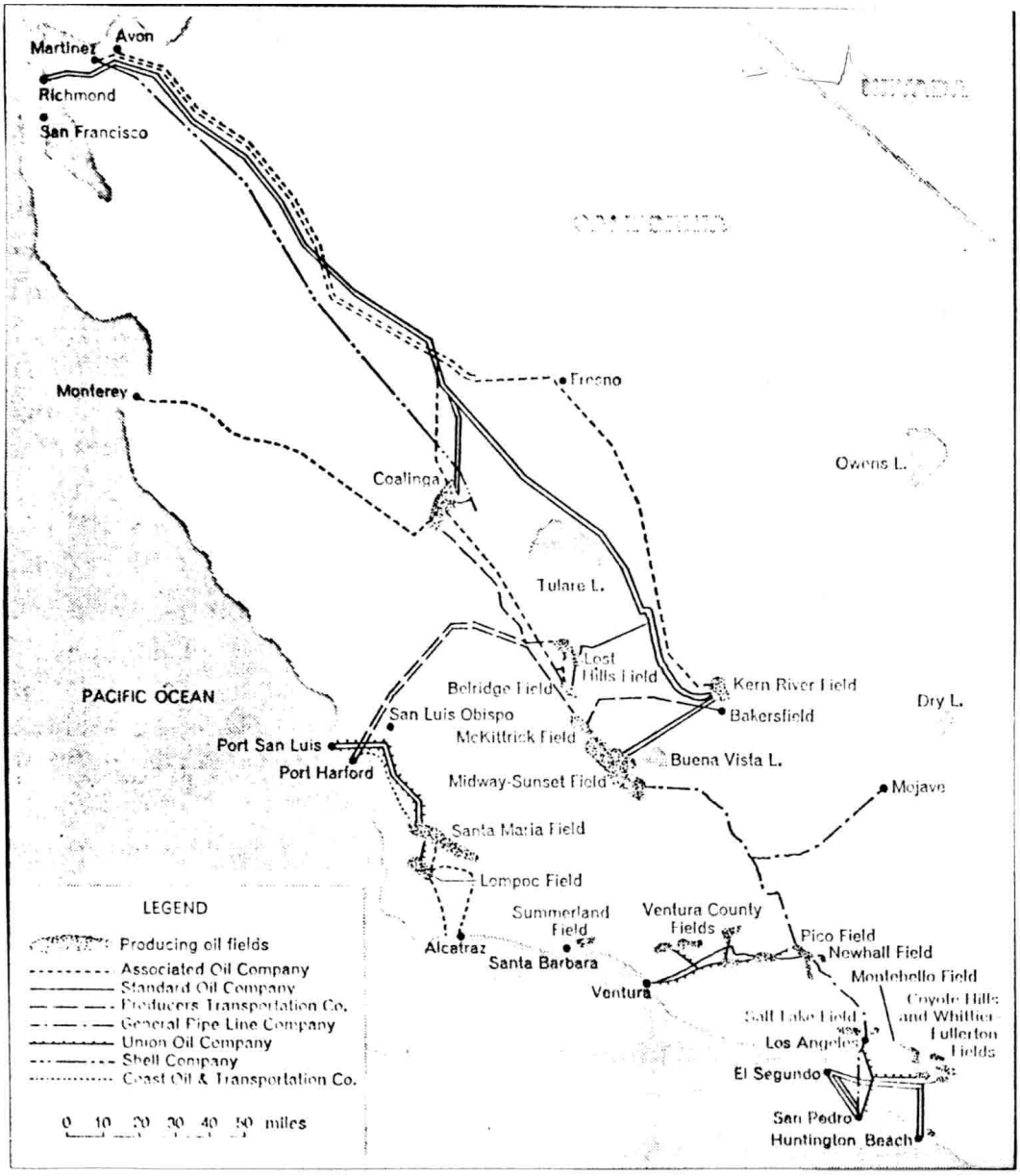
The development of the Santa Maria district prompted Union and PCO (Standard) to build eight-inch pipelines from the oil fields to Port Harford. In November 1903 Iowa Standard signed a three-year contract with Pinal Oil for 120,000 barrels of crude oil, with Pinal bearing the cost of shipping the product by tank car to Port Harford, where PCO set up a tank farm. The Richmond refinery was initially interested in Santa Maria's fairly light (20˚ to 26˚ API gravity) crude oil for engine distillate or gasoline. By 1905, when PCO signed large contracts for the district's output, Standard's interest had shifted to kerosene, owing to advances in refinery technology. In early 1905, it built an eight-inch pipeline from Orcutt to Port Harford. To deliver crude oil to Richmond, PCO expanded its tanker fleet to four with the purchase of the *Atlas* and *Barge 93* from the Standard Oil trust, tripling the fleet's capacity to 74,000 barrels. Over the next five years, the PCO (Standard) fleet added four more barges, a stern wheel steamer for river traffic, and two launches. In 1910, Standard shipped 3.8 million barrels of Santa Maria district oil from Port Harford, up from three million barrels in 1908 (White 1962: 266–273, 327).

For its part, Union built a four-inch pipeline from the Santa Maria and Lompoc fields to Port Harford. In 1906 it replaced that line with a six-inch pipeline, and built tanks at Avila with a storage capacity of 250,000 barrels. Together with its facilities at San Pedro harbor, Union prepared to ship much of its crude oil to overseas markets. In 1910, however, Union constructed an 8,000-barrel refinery at Avila to process some of the crude oil into fuel oil or road oil for domestic use (*Petroleum World* 1940: 54–55, 58; Welty and Taylor 1958: 99–100).

By 1911, Associated, Standard, and Union accounted for 90 percent or more of California's refining capacity, excluding asphalt production. Standard alone accounted for 57 percent of the total. The three firms accounted for a similar percentage of fuel oil sales. The production of asphalt was less concentrated. At the same time, Union had about 40 percent of the latter market (Andreano 1970: 191).

Though the 1910s constituted a period of slower growth in terms of building infrastructure, majors continued to build storage, transportation, and refining capacity. Standard extended its San Joaquin valley network, using twelve-inch pipe. In 1917 Union built a 70,000-barrel capacity refinery in Los Angeles, its largest of the pre–World War II period (*Petroleum World* 1940: 58). GP and Shell, the two new majors in the California market, built their own pipelines and refineries. In 1913 GP completed a 213-mile line from Maricopa, in the Midway-Sunset field, to its refinery at Vernon. Two years later, Shell finished construction on a 170-mile, eight- and ten-inch pipeline from Coalinga to its refinery at Martinez, which came on line in 1916 with a daily capacity of 13,000 barrels (Beaton 1957: 80–97; Williamson *et al.* 1963: 67–69). By 1920 California had some 2,200 hundred miles of pipeline (see map 10).

Map 10. Oil Pipelines of California, 1921
Source: Williamson, Andreano, Daum, and Klose (1963: 68). Copyright © 1963 by the Northwestern University Press. Reprinted by permission.



During the interwar period, Ventura, Gaviota, and Avila continued to be used as oil shipment points. Additional infrastructure in the form of storage tanks, gathering lines, drilling piers, and natural gas plants accommodated new production at Ventura Avenue, Elwood, Rincon, and the Santa Maria area. Avila gained an additional six-pipeline in 1930, when Union built one for the purposes of transporting natural gas conserved from the wellhead—a new idea during the 1920s—in the Kettleman Hills field of the San Joaquin valley (*Petroleum World*

1940: 55).[41] Companies built infrastructure at the other locations to accommodate increases in field production. At Elwood, for instance, pipelines initially connected onshore wells to a special loading platform, where oil was shipped the Los Angeles refineries of Barnsdall and Rio Grande until production levels justified the construction of a flexible, floating pipeline to load ships at sea (*Santa Barbara Morning Press* 30 July 1928b). With one exception—a proposal to build a pipeline on the city of Santa Barbara's beaches for the transport of oil from the Mesa field, discussed below—none of these projects was opposed by local communities.

At Ventura, Associated laid the first underwater pipeline on the west coast—a ten-inch line that extended 2,850 feet from shore (Hertel 1924). Shell and Associated initially shipped Ventura Avenue production by rail car. In 1922 both companies then laid pipelines to the wharf, which had been rebuilt in 1917 (after being destroyed during the winter of 1913–14) with a view to using it as an oil shipping point (Reith 1963: 124–126). From the wharf, small tankers were loaded. With production increasing, Associated experimented with running an eight-inch hose from the end of the wharf to the tankers. It built the underwater line after rejecting as cost prohibitive a proposal to extend the wharf 800 feet to accommodate large tankers (Hertel 1924).

Operators at Ventura also built pipelines to transport the natural gas from both the wellhead and local facilities. In 1925 the Southern Counties Gas Company began work on a twelve and one-half inch line to transport gas to Los Angeles under contract with Associated (*Petroleum World* 1925d). In 1926 Shell built a natural gas plant at Ventura with a daily capacity of 150,000 gallons—at the time the largest in the country. To ship the output of twenty rail cars per day on an economical basis—railroad rates were expensive, and suffered evaporation rates of up to 20 percent—Shell built a 100-mile, four- and six-inch pipeline to Wilmington, where the natural gas was "stabilized" and later used for blending with finished gasoline (Beaton 1957: 338–339).

In 1940 midstream and downstream operations were dominated by major operators, both statewide and at the tri-county level. The seven majors that dominated the upstream segment also controlled refining, transportation, and distribution—but even more so. They controlled the trunk lines and tankers used to transport crude oil from the tri-county region to refineries elsewhere. Statewide they controlled 81 percent of the operating daily refining capacity of 954,260 barrels of crude oil. Standard led all firms with a daily capacity of 225,000 barrels. Union (96,500 barrels), GP (72,000 barrels), Shell (71,100 barrels), Richfield (60,000 barrels), Tide Water Associated (57,600 barrels), and Texas (41,000 barrels) followed.

Another forty-three independents operated refineries, ten of which had daily operating refining capacity of more than 5,000 barrels, and fifteen of which had cracking capacity. Of the

[41] During the 1920s and 1930s, technological advances and market imperatives spurred oil companies to introduce pipelines for natural gas and refined products such as gasoline. These pipelines demanded higher quality pipes and joints than the pipelines that historically transported crude oil. Improved seamless and welded pipe and electric welding of pipe joints enabled the safe transport of natural gas and refined products. At the same time, electrically driven centrifugal pumps replaced diesel-driven displacement pumps on these lines (Johnson 1967: 254–263; Williamson *et al.* 1963: 585–589).

147,910 barrels of daily capacity accounted for by independents, slightly more than three-fourths was located in the Los Angeles basin, where operators had access to crude oil from adjacent fields. A little more than 10 percent was situated in the tri-county region (Bain 1944: 50–55). Seaside Oil had a 5,000-barrel capacity refinery. In addition, several Los Angeles-based independent refiners had tri-county production during the interwar period, including Capitol Crude Oil, Century Oil, O. C. Field Gasoline, Five C Refining, Gilmore Oil, Golden Bear Oil, Los Nietos, and the Petrol Corporation (Bain 1944: 106–107 [table 6]). O.C. Field operated the Casmite Company at Casmalia, where it produced road oils and asphalt in a 3,000 ton daily capacity plant from crude oil obtained from Associated leases (*Petroleum World* 1931c). New Santa Maria Refining and Rice Ranch Oil, which sold its Rancho and Hi White brands in the Santa Maria area, were two of the twenty-four independents that had idle capacity as of January 1941 (Bain 1944: 108–109 [table 6]). Finally, seventeen companies had facilities that processed only natural gas. Many of these were large independents with tri-county operations, including Bankline, Barnsdall, Honolulu, Pacific Western, Signal, Superior, and Universal Consolidated (Bain 1944: 108–109 [table 6]).

With respect to transportation, shipping by sea still enjoyed significant cost advantage that induced coastal producers to use this means to deliver crude oil to refineries. At $3.50 per mile, pipeline transportation was two and one-half times as expensive. Rail tank cars, which were more than six and one-half times as expensive as tanker ships, were used mostly for refined products. Thus tri-county producers typically delivered crude oil from the field by pipeline to tidewater locations, from where they shipped it to Los Angeles or San Francisco (Bain 1944: 75–77). Avila, Gaviota, and Ventura maintained their value as ports, and producing oil as close to the ocean as possible remained particularly attractive.

In 1940 three-fourths of California crude oil (in term of refinery receipts) was shipped by pipeline. The seven majors controlled all but two of the state's trunk lines. Tide Water operated 841 miles of trunk line, followed by Union (637 miles), GP (632 miles), Shell (609 miles), Standard (574 miles), Richfield (258 miles), and Texas (237 miles). All of these firms had tens of millions of barrels of storage capacity associated with these networks. Tanker ships accounted for another 23 percent of crude oil deliveries to refineries. The seven majors operated 90 percent of this fleet, which numbered between sixty and eighty vessels with an average deadweight capacity of 10,000 tons (Bain 1944: 77–79).

Some of the capacity held by Richfield and Texas had been the property of Doheny's companies, including the Ventura Refining Company facility at Fillmore (which Texaco upgraded during the 1930s, and then shut down in 1950), a 4,500 barrel per day cracking plant at Casmalia, operated by Pan-American Petroleum, a Los Angeles refinery, and more than a dozen natural gas absorption plants, which were located mostly in the Los Angeles basin. In addition, California Petroleum had controlled 105 miles of pipeline, excluding gathering lines. Pan American operated a 310-mile pipeline system, counting both trunk and gathering lines, and it included a 140-mile line from the Elk Hills Naval Reserve to its Los Angeles refinery (Ansell 1998: 213–221; Moody's Investor Service 1929: 1657–1658, 2532–2533; Scott 1984).

The post–World War II expansion of exploration and production across the region generated the need for additional storage, transportation, and processing infrastructure. Richfield's facilities that accompanied its development of the Cuyama valley demonstrated how substantial the industrial imprint of upstream oil activity could be. From the discovery of the Russell Ranch field in January 1948 to March 1950, Richfield spent $9.6 million on two natural gas absorption and injection plants (for the purpose of maintaining field pressure, and thus production levels) and $3 million on two pipelines: an eight-inch line from the Cuyama valley to Maricopa (for the delivery of oil under contract to Shell and Tide Water Associated), and a ten-inch line from Cuyama South field to the Wheeler Ridge field in Kern county, where it was linked to a new 14-inch line to Richfield's Watson refinery in the Los Angeles basin. Four pump stations—two in the Cuyama valley, one at Maricopa, and one at Wheeler Ridge—supported the transportation of crude oil by pipeline. In 1958, with valley production in decline, Richfield constructed a 59-mile natural gas pipeline to Southern California Edison's Mandalay generating plant at Oxnard (Jones 1972: 256–263; Stockman 1950).[42]

By March 1950 Richfield also had constructed more than thirty tank farms, fifty-five miles of roads, three water wells, twenty-three miles of water lines, two airstrips, and field offices to support its development efforts (Jones 1972: 258–259 [map]; *Petroleum World* 1950). Further, it embarked on the construction of a new town, New Cuyama, and plotted sites for 600 homes, a school, and a business district (Stockman 1950).

The building of this infrastructure demonstrates the San Joaquin valley, rather than coastal, orientation of the Cuyama fields. In contrast to many tri-county fields, Cuyama production was shipped exclusively by inland pipeline to its refining destination. Taft and Maricopa were the nearest towns; it is likely that Richfield and other operators used service and supply firms located there, or in Bakersfield, rather than firms located in Ventura or Santa Maria.

Operators also built infrastructure to support onshore development in the coastal districts. As in the pre-1945 period, projects were generally sited on land that had previously supported oil and gas activity, or in areas that had the support of local communities.

Majors added to the networks of gathering and trunk pipelines that crossed the region. In 1950, for instance, Tide Water Associated built a dual-purpose, submerged pipeline from its marine loading station at Gaviota. With the line in place, the company transported distillate that was delivered by sea to its Zaca field in Santa Barbara county, where field workers

[42] Technological advances promoted a boom in large-diameter (twenty to twenty-six inches in diameter) crude oil pipeline construction in the early post–World War II period. During World War II, they had enabled the construction of the government planned and funded Big Inch and Little Big Inch pipelines to transport crude oil from production and refining centers in Texas and Louisiana to the east coast for shipment to Europe. At twenty-four and twenty inches in diameter, they were the largest diameter oil pipelines constructed to date. Pipe manufacturers developed a new cold-bending machine for use on the "Inch Lines" and introduced a number of innovations soon thereafter, including internal lineup clamps in 1945, X-ray inspection of welds in 1946, and hydraulic bending machines for thin-wall pipe in 1948. Improvements in pumping, such as the use of six-stage centrifugal pumps to provide steady pressure and safety devices, and the introduction of microwave communications systems, automatic pumping stations, and remote-reading gauges complemented developments in pipeline construction (Johnson 1967: 351–354, 378–380; Pratt and Castaneda 1999: 95–123, 137–142).

injected it into wells to thin the heavy crude oil. The pipeline then transported the oil to Gaviota. Prior to the installation of the pipeline, the firm delivered distillate by truck from Ventura (Kegley 1950t). Richfield constructed a six-inch pipeline that allowed the company to reopen several Ojai wells with potential production of 1,500 b/d. The line also enabled Texaco to receive Continental's San Miguelito field production on a contract basis for shipment by tanker ship to Los Angeles harbor (Kegley 1951u). Union constructed a submerged tanker-loading terminal offshore from Hueneme, a two-inch feeder line from Saticoy to the facility, and a six-inch line to Santa Paula. The new infrastructure linked Union's gathering lines from several fields in Ventura and north Los Angeles counties. During 1954–55, Union built a $4 million, 65-mile trunk line from Torrey Canyon to its tank farms at Torrance, in the Los Angeles basin, enabling its production from deep zones at Torrey Canyon, Oakridge, and Tapo Canyon to be delivered to San Pedro harbor (Welty and Taylor 1958: 214–215).

Majors also constructed a number of midstream processing facilities, often for the purpose of conserving natural gas produced at the wellhead. Operators either injected the gas into reservoirs as part of secondary recovery projects or delivered it to utilities such as Southern California Gas, Southern Counties Gas, and Southern California Edison. For instance, in 1946 Shell constructed a small, automated gas processing plant at Santa Maria (Beaton 1957: 646–647), and, three years later, a gas absorption plant at Ventura (*Ventura County Star-Free Press* 1949a). Associated also operated a Ventura gas processing facility, which produced butane and propane, in addition to natural gas (VC II: 3.1.5). Union built a gas compressor plant and a gas separation facility to process gas produced at the wellhead in the Santa Paula and Santa Maria Valley fields, respectively (VC II: 3.1.6). Operators of state tidelands leases constructed a number of gas separation facilities, including Texaco, at Gaviota, Richfield, at Rincon, and Standard, at West Montalvo (VC II: 3.1.12–3.1.13 [table 3.1.1]). The construction of these facilities took place without significant local opposition.

Proposals by Humble and Standard for the siting of an onshore processing facility to support production from platforms Hazel and Hilda in Summerland offshore field, however, generated concern among local citizens, foreshadowing the opposition to the industrialization of the coast that shaped offshore development during the environmental era. Neither Summerland and Carpinteria wanted to become (or return to being) "oil towns." The Santa Barbara Planning Commission initially approved a site between the two towns, but Standard determined that the site would be inadequate for the storage and marine terminal facility that it desired. Standard found an alternative site east of Carpinteria, then an unincorporated community. The Planning Commission also approved this site. At the request of the county board of supervisors, however, the county's Department of Public Works examined alternatives to a new tank farm at either location. When Standard adhered to its preference for the Carpinteria site, citizens registered their opposition to a tank farm at either site before the board of supervisors. The board, however, approved the Carpinteria site. In the waning years of the age of exuberance, opposition was directed at the specific sites proposed for onshore facilities rather to offshore development in general, but the trend toward opposition to the building of industrial infrastructure along the coast, especially in populated area, was gaining momentum (Lima 1994: 239–254).

An exception to plants built for the purpose of conserving natural gas for secondary recovery purposes or delivery to natural gas utilities was the $3.5 million anhydrous ammonia plant that Shell Chemical Corporation completed in Ventura. Using natural gas from the Ventura field, the facility produced ammonia fertilizers that Shell sold to markets in the Pacific Northwest (Beaton 1957: 679; *Ventura County Star-Free Press* 1954).

In keeping with the upstream orientation of tri-county oil and gas activity, coastal operators continued to ship much of the area's crude oil in bulk to refining operations in the Los Angeles and San Francisco areas. However, a minor share of crude oil continued to be refined in the tri-county area. U nion operated three refineries in the Santa Maria area during the 1950s. It bought Sunray's refinery, located southwest of Santa Maria, which produced asphalt and fuel oil.[43] Union also constructed a $12 million, 20,000-barrel daily capacity facility at Santa Maria for the purpose of producing gasoline feedstocks, as part of a program to upgrade its manufacturing facilities to support the production of high-value gasolines (Pederson 1990: 109; *Santa Barbara News-Press* 1953a). Union built a third refinery at Nipomo, in San Luis Obispo county, which produced coke and asphalt (*Santa Barbara News-Press* 1953b; SB I: 41–42).

"Boom" Towns and Related Urban Developments

The boom-bust model of extractive region development, and the connotations ascribed to it by popular and scholarly writers, does not apply to the tri-county area's experience with oil development. As applied to towns of the nineteenth-century American West, booms were associated with rapid population increases spurred by mineral discovery and extraction in remote regions. Busts were associated with the rapid economic and demographic decline that followed from depletion or a fall in price in the commodity on which the boom town wholly depended. In this context, journalists, popular writers, filmmakers, and promoters alike described boom towns in terms of social chaos, lawlessness, and economic exploitation.

Until recently, few scholars paid serious attention to the social realities of urban development associated with oil and mineral extraction. Those who have now done so have found that social and economic life in boom towns generally had little in common with the stereotypes conveyed in, for instance, the works of newspaper columnist Boyce House and the film *Boom Town*, a 1940 production starring Clark Gable, and accepted uncritically in scholarly works such as Carl Coke Rister's *Oil! Titan of the Southwest* (1949) (Olien and Olien 1982: 1–18, 209–212). Indeed, in describing the business, economic, and social histories of nineteenth-century extractive centers and settlements, Smith (1967, 1977, 1980, 1984, 1987, 1997) and Spence (1958, 1970, 1989, 1999) have shown that conventional wisdom regarding the boom towns of this period is misplaced. The towns of the Mountain West that Smith and Spence studied were populated by average people who recognized the temporary nature of mineral

[43] A small independent, Oxnard Oil and Refining Company, also produced asphalt during this period.

extraction, and were willing to move on, once bust conditions set in. Though many speculators and promoters flocked to boom towns, many people arrived in search of employment. On the whole, they tried, to the extent possible under difficult conditions, to replicate social and cultural life of the places from where they came. Despite the economic instability associated with these isolated towns, Smith and Spence also found that they contributed significantly to the development of the West.

Much the same can be said for the oil boom towns of the twentieth century. Indeed, the stereotypes hold to a much lesser extent, if at all, for technological improvements have made resource depletion a gradual process, and improved transportation and communications networks and reinvestment of oil-generated revenues made economic diversification possible, ensuring that business activity persisted in even the most isolated centers. As Olien and Olien (1982) have shown in their study of five towns in the Permian basin of west Texas, booms were periods of rapid urban expansion that created short-term problems in terms of public health and order, housing, education, and government. Yet the booms also offered economic opportunities that more than compensated for these problems. Jobs, both permanent and transitory, attracted workers, promoters, and entrepreneurs to the oil fields. The economic development spurred by oil activity was lasting, and therefore those who benefited from it appreciated the wealth-creating activities of oil companies and entrepreneurs. The booms were associated with the periods of high exploration activity. Business activity was sustained by long periods of established production. Decline, when it came, was gradual.

The "boom" town model of development, as applied to mineral extraction in frontier areas, does not fit the characteristics of the tri-county area, where oil development was sustained, or "phased."[44] Substantial firms developed the region's far less remote oil districts as long-term investments. Advances in science and technology extended the lifecycle of the extractive region. Oil was found in areas that sustained, and sustain, a robust agricultural sector. Economic growth and diversification occurred in conjunction with oil activity. By all accounts, oil—where it was found in substantial commercial quantities—promoted economic growth and employment on an industrial, rather than extractive, model. As was the case in the Permian basin, decline was gradual. Indeed, economic adaptation and diversification in the tri-county area's boom towns occurred long before the abandonment or severe curtailment of oil field operations.

Substantial economic growth and diversification also took place independently of the oil industry. Given its location on the Pacific Ocean and its climate, the area has historically attracted tourists and retirees, and, more recently, high-technology industries. A more or less permanent military and defense presence was established during World War II. The area also hosts significant institutions of higher learning. The seemingly inexorable expansion of Los Angeles linked much of Ventura county to its metropolitan area in the post–World War II era at the same time that production from tri-county oil fields subsided. Owing to economic

[44] As Cluck and Luton (2002) have argued, the "boom-bust" model also does not apply to the socioeconomic effects of offshore oil and gas activity in the Gulf of Mexico region. As Freudenburg and Gramling (1993: 358-360; 1994b: 128-130) have noted, however, areas of Texas and Louisiana that "overadapted" their economies to energy extraction were poorly positioned to weather the collapse of oil prices in the 1980s.

diversification and the gradual decline of oil production, the tri-county area has never suffered the busts associated with regions that were far more dependent on oil and gas extraction. As this section discusses, the tri-county booms of the exuberant era were manageable, and produced positive economic benefits in the major oil districts. As a result, towns and cities that owed much of their growth to oil activity, such as Fillmore, Orcutt, Santa Paula, and Ventura, perceived the industry in a positive light throughout the twentieth century.

As *Santa Barbara News-Press* publisher Storke saw it, Union's development of the Santa Maria and Lompoc fields brought prosperity to the Santa Maria area (Storke 1958: 208–210). Union established the company town of Orcutt, complete with a private water and sewer system: It soon became the leading commercial center in the Santa Maria district. For a time, Standard also housed its workers there. In the period before World War I, hundreds of workers came from the east to work the district's fields (Nelson 1987: 17). Some workers and their families lived in tents or shacks on leases outside of town: evidence of the short-term housing shortages that oil booms may create. Indeed, lease communities persisted well after the initial exploration and development phase. Some unspecified percentage of these workers moved on to other oil producing districts, since the greatest period of oil field employment occurs during the initial period of development and building of support infrastructure. As Olien and Olien (1982: 22–23) observed, this was a matter of lifestyle: so-called "boomers," comprised of speculators, promoters, and camp followers, and the more conventional oil-field workers, who often traveled with their families, preferred oil-field employment to other work and were willing to relocate to find it. (The research under review in this study developed no precise data, but the anecdotal evidence presented in SB I, drawn from local histories and newspaper accounts, suggests that the findings of Olien and Olien apply to the development of the Santa Maria district in the early twentieth century.) A significant number of workers also came from local ranches and farms, especially during the initial boom, when seasonal or temporary work was needed (Nelson 1987: 30, 55–56). As Olien and Olien (1982: 23) observe, ranch and farm hands could apply their skills to oil-field work, and they would have been familiar with the long hours and hard work of the roustabout, teamster, or tool dresser.

Though we need more detail on the social, demographic, and economic impacts of the coming of the oil industry to the Santa Maria district, the impact of the early twentieth century boom on north Santa Barbara economy was positive in the long term. Certainly, there may have been growing pains. The authors of SB I concluded that growth at Orcutt, for instance, occurred "in fits and starts" (15), owing to cutbacks by Union and the abandonment of plans by Graciosa Oil to build a pipeline to Pismo Beach. Yet there is no evidence that the experience of Orcutt was atypical for an oil boom town. Abrupt growth was inevitable, as production ramped up in the district from nothing in 1901 to 3.4 million barrels in 1905, and then to 8.3 million barrels in 1907. For the next decade, production fluctuated, but within a range of 4.4 million to 7.6 million barrels annually. After the initial burst of exploration and development, the demand for workers would have declined, but the district's production was sustained at a relatively high level of production for the next two decades. It may have been true, as SB I notes, that Union shut-in a number of wells as soon as they were completed. Yet such action did not impede the overall expansion of the district. As discussed, oil production was sustained, or increased, throughout the balance of the exuberant period. In conjunction

with a vibrant agricultural sector, centered on the city of Santa Maria (Carlson 1959: 235–239), and the establishment of Vandenberg air force base in 1956, oil activity helped to ensure that the towns of Orcutt, Santa Maria, Lompoc, and Casmalia thrived, despite periodic economic downturns. During the interwar period, the Santa Barbara newspapers, Reginald G. Fernald's *Morning-Press* and Storke's *Daily News*, regularly boosted the Santa Maria and Lompoc valleys. As the *Daily-News* (1930g) observed, for instance, in an editorial backing water projects for farmers, "the splendid economic structure of the north [county] is built on a solid foundation" was expected to "further progress along the same lines" in the future. Unsurprisingly, the beneficiaries of the marginal economic gains provided by oil activity supported the industry throughout the exuberant period.

In the Ventura district, oil drove urban growth and shaped the character of the city of Ventura and the small towns of the Santa Clara valley. Santa Paula was one of the towns whose urban history was shaped by the oil industry. As reported in one of the earliest histories of the Union Oil Company (*Petroleum World* 1940: 45), Santa Paula in the 1880s was "a typical frontier town" (rather than "a typical oil boom town," as reported in VC I: 15), with "28 houses, three saloons and 200 residents, but very few women, and several bad men who had no compunction about running off settlers' horses and cattle." With the coming of the oil industry, in the persons of Hardison and Stewart, "the town began to change," as the oilmen "brought much needed business and enterprise." As the company's history put it: "It wasn't long before Santa Paula lost its frontier atmosphere, and blossomed into a thriving, hustling center of commerce." In addition to establishing their oil company there, Hardison and Stewart started the Santa Paula Hardware Company, which grew into the Union Tool Company, a national leader in the oil service sector. In 1891, to leverage the Santa Clara valley's advantage as a citrus growing region, Hardison teamed up with Nathan Blanchard to form the Limoneira Company, which grew into a giant marketer of growers' products. The same year, the pair organized the Santa Paula Water Works.

The Union Oil Company history, produced in conjunction with the firm's fiftieth anniversary, meant to showcase the reform efforts of Hardison and Stewart, both of whom were religious men, and demonstrate how they helped to convert the town "into a peaceful, civilized, and thoroughly desirable community." Discounting the company boosterism motivating the discussion of Santa Paula, the source is valuable in that it suggests how positive community attitudes toward the oil industry may have developed. As detailed in VC I, throughout the twentieth century, local residents sustained the view that oil activity was good for the Ventura county communities that were located in the proximity of the fields.

Spurred by oil and agriculture, and the arrival of the SP rail line in 1887, Santa Paula's population tripled during the 1880s (Triem 1985: 109). By 1890, Santa Paula had a national bank, a newspaper, and a high school, and Union Oil already employed 100 people. A distinctive central business district of Victorian homes and businesses was being erected. Though both Union Oil and Union Tool had relocated to Los Angeles by 1901 (Welty and Taylor 1958: 89), oil and agriculture sustained the town throughout much of the twentieth century. As we have seen, a number of small independents kept their offices in town, and a succession of field discoveries, from South Mountain in 1916, to Saticoy and Fillmore in the

1950s, ensured that the contribution of the oil industry to local economic development was sustained throughout the exuberant era. As a result, the town grew steadily in size, from 1,324 people in 1900, to 7,452 in 1930. There is no evidence presented in VC I that Santa Paula suffered even the short-term problems that may be associated with oil booms.

In similar fashion, oil shaped the urban history of the nearby town of Fillmore. As noted, Montebello Oil's development of the Shiells lease spurred a real estate and building boom in the small agricultural town. About 100 people lived on the lease itself, which included a grocery store and a school (Scott 1984). Fillmore landowners responded to the demand for housing from oil workers by subdividing several orchards. Shop owners replaced their wooden storefronts with distinctive sandstone and brick buildings, and the central business district supported a number of hotels and banks, and an opera house. A special section in a September 1911 edition of the *Fillmore Herald* boosted the town's location "in the center of the Ventura County oil industry" (Quoted in VC I: 17). In 1916, the Ventura Refining Company opened its facility, which employed 150 people. Like Santa Paula, Fillmore enjoyed economic benefits from the sustained presence of the oil industry that more than compensated for any short-term dislocations that may have been precipitated by the 1911, and subsequent, booms.

With the declines in oil production, the residents of the towns in the Santa Clara valley relied more and more on agriculture for their livelihoods. As a result, their economic fortunes waned relative to cities such as Thousand Oaks and Simi Valley, which became integrated into the Los Angeles metropolitan area after World War II, and attracted high-technology and professional workers and firms.

The city of Ventura experienced a number of oil booms, which cumulatively shaped its urban history on an industrial model that local residents viewed positively. It experienced a number of booms during the late nineteenth century, which established important land use precedents for the city's urban development during the twentieth century. Two booms, during the 1920s and 1950s, however, established the dominant role of oil in the city's economy and society. Ventura residents, like those in many of Los Angeles's suburbs described by Viehe (1981), embraced an industrial ideal based on disciplined work in oil and gas extraction. Though contemporary observers recognized the short-term problems that accompanied the booms, they valued the economic and urban growth that the booms produced, and compared Ventura's experiences with oil booms favorably to those of Los Angeles's suburbs.

As indicated, from the end of the Civil War, oil shaped the character of the town, which was the center of a "truly isolated land in a veritable California backwater" (Hutchinson 1965a: 93). The first oil boom in California, in the mid-1860s, largely accounted for the population increase in Santa Barbara county (which included Ventura) from 3,543 people in 1860 to 7,784 in 1870, and first established Ventura as a commercial center (101–102). Even though local oil activity during the nineteenth century was historically significant, it was not particularly intensive. Thus, as of 1885, Ventura's population remained low (it had 1,370 people as of the 1880 census), and its economy relied heavily on extensive agriculture (Reith 1963: 107–109).

The coming of the SP rail line in the late 1880s, linking Ventura and the Santa Clara valley to the trunk line at Newhall, made possible a period of slow, but steady, economic and urban growth through World War I. The railroad's coming sparked a building boom in what is now the downtown area. Ventura's population increased to 2,320 people in 1890. Yet the SP did not connect Ventura with San Francisco at this time and, as described above with respect to oil shipments, San Francisco was its biggest market. (However, as we have seen, as far as oil was concerned, an SP line would not have diverted shipments to the rails.) Thus Ventura oriented its commercial market, based largely on a growing citrus industry, to Los Angeles, and in 1904 a coastal rail linked Ventura to Los Angeles. When the SP finally linked Ventura to San Francisco, it had little impact on the city's economy or growth. Because its civic and business leaders did not encourage its growth as an agricultural processing center—a function that nearby Oxnard was happy to take on—Ventura's growth remained slow. The 1920 census listed the city's population at 4,156 people. That is, it was hardly bigger than Santa Paula (Reith 1963: 110–120).

Ventura, however, became a veritable oil boom town with Associated's deep-drilling success in the Avenue field in 1925. As *Petroleum World* reporter Douglas G. McPhee (1925) put it, Associated's solution of the field's geological challenges "rejuvenate[d] a pioneer oil district." Aware of the connotation of the term "boom town," McPhee described Ventura as a "booming town" with scant evidence "of the forced, impermanent, uncivilized growth that was apparent in Santa Fe Springs. . . It is not the unhealthy growth of a forced hot-house plant, but rather the starling upspring of a well-tended plant which has found a new source of strength in a potent fertilizer." Or, as the F. W. Hertel (1924: 12), Associated's resident geologist in Ventura, asserted: "The growth of the city of Ventura has been greatly augmented by oil field operations, and, unlike some of the southern [California] cities, the work has gone along slowly but steadily and under conditions which have given a substantial foundation for the city's growth."

As McPhee (1925) reported, Ventura experienced short-term pressures on housing and other infrastructure. Real estate prices increased rapidly, the volume of mail swamped the post office, the demand for electrical hook-ups on the part of Southern California Edison doubled, and many newcomers could not find adequate housing. According to one resident, many workers were living in Ojai, Oxnard, or Santa Paula—a long commute at the time. A furniture dealer told McPhee (1925: 96) that he had "sent down a bed to a rooming house … where there [were] twenty-eight oil men living in a seven-room residence."

Nevertheless, most of the Ventura residents whom McPhee interviewed were pleased with the growth that the boom was spurring. Merchants and other business leaders believed that the business expansion produced by Ventura oil field developments would constitute, as Amos Lovvorn, a department store manager put it, "the very best kind" kind of growth—"conservative … and probably permanent in its value," rather than the "sky-rocket growth that will lead to a slump after a brief period of artificial inflation" (Quoted in McPhee 1925: 96). Moreover, as Ventura county district attorney Ed Henderson observed: "The oil developments [had] come at a very opportune time for the city," as they compensated for the local slump in agriculture (Quoted in McPhee 1925: 96).

The oil boom transformed Ventura into an industrial city—something that was a source of great pride for local residents. As Reith (1963: 127, 137–141) observed, oil activity spurred the creation of new industries, fueled urban growth and improvements in transportation, and resulted in an expansion of the city's boundaries. Ventura's population increased to 11,603 in 1930. Oil activity attracted newcomers from southern California and elsewhere, sustaining high demand for housing, oil services, and commercial goods and services until the depression. Affordable housing along Ventura Avenue replaced the packing houses and farms that previously occupied the land, and west Ventura became a working-class neighborhood. Houses for oil field workers were also constructed below the downtown area. Ventura Avenue became an industrial district, with numerous service and supply companies, restaurants, taverns, and card rooms.

Unlike Montebello, Placentia, Signal Hill, and Whittier and other communities of the Los Angeles basin (Viehe 1981: 11–13), Ventura was unable to incorporate its major oil field into its city limits. Though more research needs to be done on the politics involved, according to Reith (1963: 139–140), the field's landowners (presumably the Hartmans, Sextons, Taylors, and so on) successfully opposed the extension of the city's boundary to include either the newly settled areas along Ventura Avenue or the oil field itself. Hence, Ventura could not tax the unincorporated area to pay for the public services it provided to it. Nevertheless, oil created the wealth and purchasing power that fueled the city's growth.

With the depression, the pace of growth slowed, affording Ventura the opportunity to digest the changes brought on by the boom. Given the adjustments that occurred within a very short period of time, it seems rather unfair for Reith (1963: 140) to characterize the Ventura Avenue area as "blighted" and to lament that it was inhabited by "the lowest income groups" who "tended to congregate [there] because it was cheap": a view accepted uncritically in VC I (27). Reith's analysis was that of the urban renewal enthusiast of the 1950s and 1960s, who viewed "unplanned growth" in negative terms, and thus she dismisses the economic opportunity that the development of the Ventura Avenue field presented for the many workers who flocked to Ventura in search of employment and the chance to get ahead.[45]

With the boom of the 1950s, oil was the leading industry in Ventura and the largest factor shaping its urban development. Residents saw oil companies as key contributors to the city's economic growth and cultural advancement. Oil workers recognized that the durability of the Ventura district's fields, the Ventura field in particular, provided stable employment and a settled community (again suggesting the appropriateness of using an industrial, rather than extractive, model to characterize Ventura's urban development). As General Petroleum

[45] Reith (1963: 184–186) applauded the construction of U.S. 101 freeway through the city because it reduced residential congestion and improved access to other cities in the area. "By providing the rapid transportation essential to a rapidly growing hinterland dependent on the automobile, it will offer one of the basic necessities for residential and urban development." The route selected after many hearings "disturbed the city as little as possible," though it separated the central business district from the beach—and thus diminished the city as a tourist destination. More importantly: "For the first time [when completed] Ventura will be linked to a flexible mass transportation system covering all of Southern California."

superintendent Alex McLean noted, production in Ventura field, assured by the size of the field and technological advances that enabled its recovery, prompted three-fourths of GP employees to buy homes locally and to become active in one or more community groups (VC I: 38). Oil sector employment was sufficient to make the industry a pervasive social and economic influence.[46] If a person did not work for an oil or oil service firm, he or she likely operated or worked in a business that depended oil activity. Taxes supported schools—the assessed value of all Ventura county oil properties increased from $23.5 million in 1941 to $164.5 million in 1953, 55 percent of the assessed valuation (VC I: 36). The majors paid higher-than-average wages. Shell and other firms sponsored numerous cultural and educational activities (VC I: 38–41).

A survey of 200 Ventura residents taken at the height of the postwar oil boom, in 1954, cited in Reith (1963: 187–188, 196–197), found no evidence suggesting that the city was experiencing any of the problems commonly associated with oil booms. More than half of the people surveyed had come to Ventura since 1936: more for business than any other reason. More than half of those surveyed indicated that they preferred Ventura to any other place, and fully 92 percent of the respondents intended to stay. The study concluded that the "average" Ventura resident was hard-working, earned a relatively high income, was secure economically and content emotionally, placed a high value on the lack of class distinctions among the city's residents, and possessed outstanding community spirit. He or she also cited good schools and numerous parks and opportunities for recreation—all supported by oil money—as key amenities of city life.

The laments of Reith and, increasingly during the 1960s, local government officials, regarding the lack of planning aside, there is no evidence that the oil boom of the 1950s was viewed by Ventura residents in any terms other than positive ones. Of course, with the decline in exploration of the late 1950s, oil sector employment declined to a level that was appropriate to ongoing production. Yet the city of Ventura, whose 1960 population topped 29,000, continued to grow, if more slowly relative to communities that were less dependent on oil. With regional economic diversification and the building of freeways, other sectors contributed to employment and population growth during the 1950s and 1960s.

Economic Diversification

During and after World War II, military, defense, and high-technology spending diversified the non-agricultural economies of the Santa Maria and Ventura districts, and helped to mitigate the effects of the end of the postwar oil boom in these areas. The isolated and sparsely populated Cuyama valley remained dependent on oil and ranching. The non-industrial coastal areas, including San Luis Obispo and Santa Barbara, continued to cultivate tourism, retirement-oriented services, and recreation while preserving their built and natural environments. In the postwar period both cities also developed post-secondary educational institutions. This section focuses on the Santa Maria and Ventura districts, deferring discussion of San Luis Obispo and Santa Barbara to the following section.

[46] According to the California Statistical Abstract, 2,800 people were employed in Ventura county in oil, gas and mineral extraction. However, the figure does not include self-employed entrepreneurs.

The affects of the defense build-up associated with World War II differed quantitatively and qualitatively in the tri-county area relative to the Los Angeles, San Diego, and San Francisco metropolises. As Lotchin (1992) has argued, city builders and boosters of the latter cities spent much of the twentieth century using military resources to help them construct the urban empires they envisioned. From 1919–41 they competed to establish manufacturing bases that would provide stability, prosperity, diversification, and independence. Boosters lobbied hard for both bases and manufacturing plants. Thus, the relationship between urban growth and the U.S. armed forces in these cities was well established before World War II. The research under review in this study presented no evidence of similar efforts on the part of tri-county boosters to attract either bases or manufacturing facilities on a similar systematic and deliberate basis prior to World War II. Indeed, Santa Barbara failed to prevent the Lockheed brothers and Jack Northrop, the eponymous founders of leading aerospace firms, from relocating to Los Angeles after they spent several years in town during and immediately after World War I (Storke 1958: 228–234). Moreover, the tri-county area's wartime experience was far less hectic than elsewhere in the state. The area hosted several bases, but no large manufacturing facilities, and endured the demographic and social strains that afflicted numerous California cities at a much lower level of intensity.

For the U.S. West as a whole, the war triggered a surge of extraordinary urban growth. The federal government invested $4.3 billion in military base expansion and another $4.1 billion in military production facilities, transforming small towns into booming cities, putting stress on infrastructure, and producing social tensions. Western cities emerged on the cutting edge of growth industries nationally and internationally. The region grew in economic and cultural independence and political weight (Abbott 1989).

California alone received 10 percent of the Washington's defense spending during the war—about $35 billion—which constituted fully 45 percent of the state's personal income for 1941–45. In 1930, at the beginning of the depression, federal spending in California totaled $190 million; in 1945 it equaled $8.5 billion (Nash 1977: 197–198; White 1991: 496–502).

California also led the nation in population growth, increasing by one million people, or 15 percent, from 1941–45. The portion of the state that lies south of the Tehachapi mountains was affected most. For instance, San Diego's population went from 60,000 people to more than 250,000. Moreover, 90 percent of the newcomers located in towns and cities (Nash 1977: 192–195). With wartime contracts for aircraft and shipbuilding driving a much broader industrial expansion statewide, Boeing, Douglas, Lockheed, Kaiser, and other firms employed thousands of workers who were previously employed in agricultural or extractive industries. These wartime efforts spurred huge demographic changes, drawing in laborers from the West and the South (Schwantes 1994). Indeed, cities such as Los Angeles, Oakland, Richmond, San Francisco, and Vallejo faced many of the short-term problems commonly associated with oil boom towns.

The war brought both economic opportunity and immense pressures on local communities. Wartime population growth on the Pacific coast, driven by large numbers of disadvantaged groups and ethnic or racial minorities, complicated the urban problems of many California

cities. Many wartime boom towns lacked resources to build housing and infrastructure and offer public services. Local leaders often lacked political will to act quickly, even as their cities groaned under the crush of newcomers. Haphazard location of defense plants and emergency housing exacerbated the ability of local government to mitigate myriad problems (Abbott 1987: 101–113; White 1991: 503–510).

The tri-county experience was much more benign. For instance, during the war more than 5,000 people were employed in civilian and military defense positions in the Oxnard-Camarillo-Hueneme area of Ventura county. The interwar development of a deep water port at Hueneme attracted the U.S. Navy, which established a base in 1942. During the war, the port became the nation's busiest facility. Many families chose Ventura as a place to live, owing to housing shortages on, or in the immediate vicinity of, the naval base, and many stayed on after the war. Housing was built in eastern Ventura to accommodate the increase, and additional housing was built for the purpose of attracting even more people. With business in Ventura's central business district confined by geography and residential areas, business owners established a second commercial area east of downtown (Reith 1963: 145–151).

In the San Luis Obispo and Santa Maria areas, the pattern of permanent demographic change spurred by the establishment of military bases was replicated. Soldiers trained at camps Roberts, Cook (later Vandenberg air force base), and San Luis Obispo. The navy also operated a station at Morro Bay and the army air corps had a field at Paso Robles. Many of the 75,000 individuals who were stationed along the central coast were attracted by its natural and social amenities, and settled in the area at war's end. The bases at which they were located fueled increases in demand for local goods and services, boosting prices and wages. The direct impact of defense spending on south Santa Barbara county in terms of installations was comparatively small, though a U.S. Marines base was located in Goleta (SLO I: 29–30; SB I 29–30, 42–43).

In the postwar period, the California economy boomed, after a short transition period. Wartime production was converted to satisfy civilian demand. The construction and consumer industries benefited handsomely from federal loans. More than $1.6 billion was invested in industrial expansion, and Los Angeles emerged as the nation's third leading industrial center. Low cost fuel and power were key factors driving the boom (Cleland 1959: 415–419). With the Cold War, federal defense dollars continued to flow to the Pacific coast, with Los Angeles attracting a disproportionate share (Lotchin 1922: 153–172). By 1959 the state was winning 24 percent of the aerospace contracts. By 1962 California was securing 46 percent of the research and development contracts let by the Defense Department. The large civil engineering firms, such as San Francisco-based Bechtel, also benefited greatly from the global postwar presence of America, building overseas military bases and other infrastructure (White 1991: 513–518).

From 1945–64, the state gained 10 million people, for a total of 19 million. The surge in employment accounted for much of this growth. In 1940 there were 2.53 million people employed in California. In 1950 the figure was 3.9 million. By 1954 manufacturing

employment in California was 44 percent above its 1939 level. Aircraft, food production, metal fabrication, apparel, printing and publishing, and petroleum production and refining constituting the state's leading industries (Cleland 1959: 415–419).

The postwar establishment of military installations at Point Mugu (1946), Oxnard (1952), and north Santa Barbara county (Vandenberg, 1956), and the continuing operation of bases established during the war, contributed to local growth and the economic diversity of the tri-county area's leading oil districts even as the petroleum industry enjoyed its greatest boom period. At the end of the exuberant era, Ventura, Camarillo, and Oxnard were becoming bedroom communities for firms established on the fringes of the Los Angeles metropolitan area, and residential areas for those employed in local military installations. (At the same time, the greatest growth in Ventura county during the 1950s and 1960s occurred in eastern Ventura county, which was located outside the core Ventura oil district. Freeways enabled people in Thousand Oaks, Newberry Park, and Simi Valley to commute to Los Angeles defense and aerospace companies) (VC I: 45–50). The Santa Maria area was initially affected by the postwar closure of Camp Cooke. With the outbreak of the Korean war, however, the facility reopened, and in 1956 the Defense Department converted it into Vandenberg air force base, a national missile center. By 1962 the base employed 21,000 people. Since about two-thirds of those stationed at Vandenberg lived off the base, housing construction was a vibrant sector in the area during the late 1950s and 1960s. Accordingly, the population of cities such as Lompoc, Orcutt, and Santa Maria increased by one-third or more (SB II: 41).

The Santa Barbara Exception

During the exuberant era, numerous California cities, large and small, pursued quantitative growth on an industrial model. In contrast Santa Barbara sought to grow qualitatively, with an economic base supported by tourism, recreation, resort and leisure services, and craft-based small businesses. Its well-heeled residents thus sought throughout the twentieth century to conserve the natural environment that initially attracted them to this "Newport of the West." Local civic and business leaders supported them, recognizing that the economic activities that they promoted depended on Santa Barbara's beaches, mountains, and climate. Santa Barbara was one of the few cities in America that wholeheartedly embraced the City Beautiful movement. Elsewhere, as in Los Angeles and San Diego, the movement was overwhelmed by quantitative growth in practice, or defeated politically by growth-oriented city councils. After an earthquake in 1925, prominent citizens realized their goal of creating the built environment in a Spanish colonial-revival style that conformed to the Andalusian ideal that they imagined.

Unlike Orcutt, Santa Maria, or Ventura, Santa Barbara's urban history owed little to oil activity, the discovery of a minor oil field on the beach at Summerland in the late nineteenth century notwithstanding. By the time that commercial quantities of oil were being discovered on the Mesa and at nearby Goleta, Santa Barbara's character as a resort and tourist town was firmly in place. Unlike Seal Beach and Huntington Beach to the south—cities whose residents held similar attitudes with respect to oil activity—Santa Barbara was never overwhelmed by a gigantic oil field. Had the Mesa field proved to be as big a field as

Wilmington, Long Beach, or Huntington Beach, Santa Barbara's urban history may have been much different, since there was little that the city could do during the interwar period to prevent the development of a large field. As it turned out, perhaps Santa Barbara got lucky in this regard: the Mesa field was a minor and short-lived one. Nonetheless, Santa Barbara's attitude toward oil activity was decidedly of the "not-in-my-backward" variety. Local leaders and residents, many of whom were conservationist in outlook, objected to it for aesthetic and socioeconomic reasons. Though oil activity may have been inappropriate for Santa Barbara, many local leaders viewed oil activity elsewhere in positive terms, as their reactions to the discovery and development of nearby Elwood field suggest.

As early as the 1880s, Santa Barbara residents were already choosing resort and charm over the bustle of a business city. The arrival of the SP line in 1887 failed to nudge residents in the direction of quantitative growth. Indeed, with the linking of Santa Barbara by rail with both San Francisco and Los Angeles in 1901, Santa Barbara became the "Newport of the West," replete with fabulous hotels and resorts, and places of winter residence and retirement for the wealthy capitalists of the Gilded Age, including the Armours, Cuhahys, Peabidys, and Swifts, and yeast-king Max Fleischmann: extraordinarily wealthy people who constructed Montecito along Mediterranean revival lines and made substantial contributions to the area's civic institutions and public infrastructure. A wealthy elite controlled Santa Barbara and made it into a distinctive city. This elite defined a Santa Barbara heritage, finding a useable past in an upper class, aristocratic Hispanic metaphor. During the 1910s and 1920s, they set out to preserve this past that they constructed. This effort entailed shaping the built environment, preserving the Spanish mission, holding fiesta days, and many other activities (Starr 1990: 248–262).

In 1909 the Santa Barbara Civic League retained planner Charles Mumford Robinson to create a master plan. Robinson recommended that the city develop the Spanish mission and De la Guerra Plaza as central urban symbols. Roads, architecture, landscaping, and public spaces would integrate the city and distinguish it from interior California cities. His report was accepted by the mayor and city council and filed and forgotten, except by the local elite. Robinson's argument that Santa Barbara should use its Hispanic past as a controlling metaphor and avoid industrial development resonated with the elite's emerging point of view. During the next fifteen years, those who adhered to Robinson's perspective won control of municipal government. They began to remake Santa Barbara as Robinson's plan suggested. Santa Barbara had opportunities to diversify beyond the service, hotel, and agricultural sectors that kept it a small town with a tourist economy. They included film, aviation, and the U.S. Navy. Yet Santa Barbara remained too small (Starr 1990: 263–278). By the 1920s, the fledgling aircraft designers and filmmakers had relocated to Los Angeles, and the U.S. Navy had selected San Diego, whose boosters, as Lotchin (1992: 26–28, 38–41) notes, aggressively lobbied U.S. military and political leaders.

These developments enabled Santa Barbara's elite to realize the City Beautiful ideal in architecture, gardens, and landscaping, while business and newspapers touted the town's attractiveness as a tourist destination. Real estate development of the Riviera and Hope Ranch proceeded under the auspices of Harold Chase, W. W. Caitlin, and others. The Community

Arts Association, which captured the municipal government, brought Santa Barbara under the political control of affluent preservationists for two decades. Most prominent in the association were Pearl Chase and Irene and Bernhard Hoffmann. From 1922 they embarked on a project of city beautification and improvement. At the urging of its Plans and Planting Committee, the city established a City Planning Commission in 1923, the same year that the Plans and Planting Committee launched its Small Homes Program, with Pearl Chase in the chair. The planning commission wrote and promoted a building zone ordinance, which the city council adopted in May 1924. A year later, on the eve of the devastating earthquake, the Plans and Planting Committee pushed through a comprehensive building code. After the earthquake, Santa Barbara was rebuilt from architectural plans that promoted a Spanish colonial revival style. In 1926, a Better Homes in America jury judged Santa Barbara the most beautiful residential environment in the nation (Starr 1990: 278–288).

At the same time, wealthy residents conserved Santa Barbara's waterfront and contributed heavily to local charities, hospitals, and churches. Through gifts and other actions, they succeeded in removing industrial facilities from beachfront areas. Fleischmann contributed $630,000 toward the cost of constructing a breakwater (to enable him to dock his yacht). Residents approved a $200,000 bond issue to assist him. They also voted another $1.4 million in bonds to renovate the beachfront boulevard. In 1924 a number of wealthy citizens acquired a block of beachfront property, in order to keep it undeveloped until a series of bonds, issued from 1925–31, enabled the city to purchase it intact and convert it into a public park (SB I: 19–21; Molotch *et al.* 2000: 804). The *Santa Barbara Daily News* (1930f) got it right when it opined: "The charm of Santa Barbara is no indefinite thing. It has ever been a potent force, growing upon one. It is as tangible an asset as any we may enumerate in giving a reason for the faith that makes certain of Santa Barbara's future."

Whereas Ventura, Santa Maria, Orcutt and other tri-county towns owed the development of their urban environments to wealth generated locally by oil and agricultural activity, Santa Barbara benefited by attracting citizens with immense financial assets that were created elsewhere. Indeed, Santa Barbara attracted oil wealth as well, as members of the Mosher (Signal), Keck (Superior), and other oil families owned residences in the city or nearby Montecito.

During the 1910s and 1920s, then, Santa Barbara self-consciously charted a development path that was different from the Los Angeles model embraced by much of California. With the petroleum, manufacturing, and film industries driving its urban expansion, Los Angeles embodied growth, industry, and urbanism. For many residents and civic leaders, Santa Barbara represented refinement, self-imposed limits, and a lifestyle that embodied both agricultural and resort elements (Starr 1990: 231). Santa Barbarans agreed with Charles Fletecher Lummis, local historian and author, who wrote in 1933 that "the worst curse that could befall Santa Barbara would be the craze of GET BIG! Why big? Run down to Los Angeles for a few days—see that madhouse! You'd hate to live there!" (Quoted in Storke 1958: 286). Santa Barbara was also selective and politically cohesive (Starr 1990: 231). Indeed, a distinct class-structure distinguished Santa Barbara demographically from Ventura

and the suburbs of Los Angeles whose development depended on oil and/or manufacturing activity.

At the same time, leading citizens such as *Morning Press* publisher Fernald and *Daily News* and *News-Press* publisher and editor Storke, wanted the city to grow and develop in a progressive, non-industrial manner that was compatible with its natural setting. As a 1929 *Morning Press* editorial made clear, many of the city's political and business leaders promoted the type of planned, qualitative growth that allowed for the development of the waterfront, parks, and a bird sanctuary, the construction of miles of paved streets, the extension of the water system, and large-scale home development. As an advertisement, which appeared in the *Daily News* on March 15, 1930, proclaimed, boosters and business owners alike sought "a bigger and better Santa Barbara" in keeping with the city's climate, scenic beauty, and other attractions.

For his part, Storke energetically promoted Santa Barbara as a place congenial to "smokeless," small-scale, and decentralized manufacturing, scientific laboratories, craft-oriented enterprise, and college and university life. Such an economy would also support a broad expansion of the middle-class. Santa Barbara would grow qualitatively, yet "free of unwise crowding and smog and the other unpleasant by-products of growth and wealth that are not well planned to harmonize with nature's plans and offerings" (Storke 1958: 255–258, 269–270). Storke used his newspaper to promote the growth of Santa Barbara along these lines.

In the New Deal, Storke saw the means to produce local economic growth through programs that were essentially extensions of the patronage state. An active member of the Democratic Party since 1912, Storke used his connections within the Roosevelt administration to secure some $22 million dollars in public works projects for Santa Barbara, including the county courthouse, the post office, a federal building, an amphitheater, a breakwater, a water-softening and filtration plant, a reservoir at El Cielito, and a sewer system, and the restoration of the mission, the replacement of Stearns wharf, and reconstruction of Sheffield reservoir (Starr 1990: 288–296; Storke 1958: 346–347, 356–364, 401–409).

During the 1940s, Storke and his newspaper campaigned relentlessly for the Cachuma project, in order to provide a long-term solution to the city's water needs. Without the project, approved in 1949, Storke believed that Santa Barbara's continued growth and development would be impossible. As Storke (1967) told Arizona senator Carl Hayden, a crucial supporter of the project, because Cachuma was constructed, ten thousand new homes and the University of California campus in Goleta could be built. As the *Santa Barbara News-Press* (1949) proclaimed after Santa Barbara county voters approved the Cachuma project: "We are on our way again to a finer as well as a bigger Santa Barbara … We have what we need for the kind of growth we want—beautiful homes, a beautiful land to live in, life worth living." As the newspaper's perspective suggests, during the exuberant era, Santa Barbara was not the no-growth-oriented city that it became during the environmental era.

After World War II, Santa Barbara continued to develop in a manner in keeping with Storke's vision. Construction of the University of California campus began in 1955. There followed

funds and institutions devoted to high-technology and defense research. UCSB was one of four charter sites of the Defense Department DARPA network, a precursor to today's "information superhighway." General Electric, Raytheon, and other electronics, computer, and defense firms set up shop in either Santa Barbara or Goleta (SB I: 35–36, 39, 44). In addition, Santa Barbara continued to distinguish itself as a premier tourist and resort location.

Santa Barbara's exuberant-era responses to local oil activity are best understood in the context of a qualitative growth, rather than modern ecological, perspective. Oil activity was potentially detrimental to Santa Barbara's social, economic, and cultural environment. Santa Barbarans objected to it on these grounds. Though they had to tolerate drilling under the contemporary regulatory regime, they sought to limit its extent. Their actions ultimately had little impact on actual onshore oil production in the area during the exuberant era. At the same time, Santa Barbarans prevented their city from becoming an oil shipment point, and took steps to limit offshore activity along the urban coastline. If oil exploration and production occurred in rural Santa Barbara county, however, it was applauded for the taxes and jobs that it generated. The city's conservationist newspapers were quick to register concern about the physical and economic waste of oil, no matter where it occurred (cf. *Santa Barbara Daily News* 1930e).

Property owners in Santa Barbara, Summerland, and Montecito, like residents of many coastal California cities, have a long history of protesting oil activity on urban beaches and tidelands. (At the same time, it should be recalled, property owners on the Santa Barbara Mesa were keen to lease their lots to oil companies during the 1920s and 1930s.) In the late nineteenth century, local residents objected to unsightly derricks on the beach at Summerland and strongly resisted beach area production. The Santa Barbara Chamber of Commerce also opposed beachfront drilling. As early as August 1899 the *Santa Barbara Morning Press* went on record opposing the turning of Santa Barbara into a commercial or industrial city, and predicted that oil development would drive down property values and prompt citizens to leave the area (Lima 1994: 143–149). Explaining that "[i]t would be an unfortunate disaster if the beach near Santa Barbara's waterfront should be disfigured with the ugly derricks of oil wells," the newspaper urged people to resist any attempt to erect drilling rigs beyond Summerland (Quoted in Sollen 1998: 11). With no legal means of preventing entrepreneurs from drilling for oil on Summerland's beaches, property owners heeded the call to resistance, demolishing a derrick and part of a wharf at Miramar, on the Montecito coast (SB I: 10–11).

During the interwar period, property owners continued to seek ways of limiting oil activity in the vicinity of their community. The Montecito Community Association passed a zoning regulation that banned the erection of rigs or other apparatus that might be used to drill or explore for oil. Three years later residents sought an injunction in court to prevent the installation of an oil derrick that would disturb the community, depress property values, and violate zoning regulations (SB I: 26; *Santa Barbara Morning Press* 1930).

However, the regulatory regime generally supported onshore oil development. For instance, the Santa Barbara county board of supervisors amended the Montecito Community Association's zoning ordinance by selectively opening sections of the district to oil drillers

(*Santa Barbara Daily News* 1929a). Moreover, the Montecito property owners lost their plea for an injunction. The Lincoln Drilling Company successfully argued that it was drilling on sparsely populated county land. However, the trend was clear. Where oil activity encroached on land whose use was socially incompatible with industrial activity, it would be resisted. In the tri-county area during the exuberant era, such resistance was confined to the city of Santa Barbara and its adjacent communities.

Santa Barbara also resisted the building of infrastructure that would have enabled its wharf to be used as a shipping point for oil. In 1908, for instance, the Chamber of Commerce went on record in opposition to the building of a pipeline to the wharf, as part of a broad-based movement that foreshadowed later stands against the building of onshore facilities for the processing of offshore production. Santa Barbara's wharf thus never served the same purpose as did Ventura's, and Santa Barbara did not serve as a transshipment point for an oil hinterland.

The city also resisted the building of a pipeline from the burgeoning Mesa field to the sea. Though the city council was split on the merits of the proposal, prominent city leaders and editors railed against the request by the Irvine Oil Company to secure a permit from the city proposal for the project (*Santa Barbara Morning Press* 1931b). E. W. Alexander, chairman of the board of harbor commissioners, argued that oil companies could not ensure the safety of the city's beaches. In noting that tourism was Santa Barbara's principal source of revenue, Alexander warned that the city council could "not afford to menace … the municipal beach with an oil pipeline" (Quoted in *Santa Barbara Daily News* (1931b). The *Morning Press* (1931a) declared: "It would be an absolute disregard for the interests of the community and the rights of the people to permit an oil company to lay a pipe line into the ocean that might damage our beaches irreparably." The newspaper did not question either the right of property owners to lease their property to oil interests or the right of companies to drill for oil. Indeed, it noted that if the field produced commercial quantities of oil, companies would find a way to transport it. Yet it argued along progressive lines, stating after the city council voted down the pipeline proposal: "That which benefits the greatest number must prevail" (*Santa Barbara Morning Press* 1931c). "Santa Barbara can never become a manufacturing or industrial city … its success or failure [lies] in attracting tourists, visitors and those with money seeking a pleasant place in which to live … we cannot destroy or even endanger the things that are most valuable to us in attracting this 'trade.'"

At the same time that they moved to restrict oil activity within their urban limits, Santa Barbara's leaders were enthusiastic about developments at Elwood, Goleta, and elsewhere along the rural south Santa Barbara coast. The city's two newspapers followed oil activity in these areas with great interest. Many stories received coverage on page one above the fold. The *Santa Barbara Morning Press* (1928a) stated that the promising Goleta oil field would be "a wonderful asset to Santa Barbara" if its output and duration met initial expectations. If the field proved to be "a good one," there would be "much additional prosperity in store" for Santa Barbara. Moreover, the field had the advantage of not being "close to residential property or to a section of the seashore that is much used at present by the public." The field did not live up to expectations, however, and was soon abandoned. Hugh Martin, a member

of the Santa Barbara Lions Club, expressed the sentiments of many Santa Barbarans when he also explained the discovery of the gigantic Elwood field in terms of giving the city the best of both worlds. It was "far enough away to avoid damaging our esthetic [*sic*] values," yet it was "close enough to give this city full benefit of the large sums to be spent in [its] development. Every merchant and property owner of the city will benefit" (Quoted in *Santa Barbara Morning Press* 1928c).

In the early postwar era, Santa Barbara moved to ban oil activity within its limits. In 1947, however, voters soundly defeated a measure to amend the city's charter to do so. Again, in 1951, voters approved a measure that allowed firms to drill for oil on the airport land that the city owned, which lay about twelve miles from the central business district. In 1953, however, the city council enacted a ban on drilling in the city. By this time, the Mesa field was producing a paltry seven thousand barrels of oil annually. In 1965 Santa Barbara voters easily passed a measure that amended the city's charter to include the ban (SB I: 46).

During the post–World War II period, Santa Barbara leaders and citizens consistently opposed offshore oil leasing and development. Local government action during the late 1940s failed to assert zoning authority over the state's tideland areas. However, Santa Barbara protests helped to convince the SLC to halt temporarily seismic testing—which at the time involved measuring the sound wave patterns generated from dynamite explosions in the channel, which caused property damage, killed fish, and created other nuisances. Local opponents surmised correctly that the time to head off development was before oil firms had invested in the exploration process and estimated the amount of oil and gas that could be recovered. In this instance, seismic technology expanded the area of possible offshore activity. The matter came to a head in 1953, with Humble's application for a seismic testing permit. Citing Huntington Beach, Seal Beach, and Long Beach as examples of what would happen if offshore exploration took place, Santa Barbara officials lobbied Sacramento to make the channel an "oil-free" sanctuary. The state government supported Humble's petition, but its officials recognized that such testing was a precursor to development that was incompatible with Santa Barbara citizens' view of their city as an urban "sanctuary," as Mayor Norris Montgomery put it. Ultimately a compromise was reached. Seismic testing was banned in areas where it was incompatible with local values—at the time, this included only Santa Barbara (Lima 1994: 202–217).

City leaders and citizens mobilized to secure a sanctuary in the Shell-Cunningham Act (cf. Storke 1958: 294–295). Stretching from Summerland to the site of the University of California campus in Goleta, the sanctuary banned leasing and oil exploration activity in state waters. Local leaders exerted direct and indirect influence throughout the process. The act was seen as a compromise. However, Santa Barbara opposition was based not just on aesthetics, but also on concern for the social environment (Lima 1994: 218–239).

In the exuberant era, Santa Barbara was unique among tri-county communities in moving to restrict the development of oil that lay beneath it. It established a model that other coastal cities emulated. One such town was San Luis Obispo. Though its residents did not oppose oil development during the exuberant era, the lack of oil in the area permitted the town to develop

in a manner that valued controlled, qualitative, non-industrial growth. In any case, San Luis Obispo residents did not have to make choices regarding oil that confronted Santa Barbarans. However, like Santa Barbara, the town's character was influenced by an institution of higher education, tourism, and recreation.

Unlike Santa Barbara, San Luis Obispo did not construct a historical past. Rather, during the interwar period its leaders moved to preserve its small-town and rural character. Quality of life became an important issue under Mayor Louis Sinheimer, who insisted that all expansion be accounted for fiscally as a way of adopting a planned, slow-growth approach. The so-called Monday Club harnessed similar sentiments (but wielded less direct political influence) than Santa Barbara's Plans and Planting Committee, stressing the town's natural beauty and marketing it as a tourist destination. Other citizens worked on behalf of nature preserves and other projects that preserved the small-scale agricultural base of the town's hinterland (SLO I: 26–30).

After World War II, with the expansion of the state university (Cal Poly) campus and tourist-related trade, there were significant increases in sales, professional, technical, managerial, and non-farm laborer jobs. An increase in the importance of public employment to local economic growth went along with an increase in the importance of natural amenities and tourism. Cal Poly emerged as a dominant institution in San Luis Obispo's cultural, intellectual, social, and economic development. Students and faculty supported local, independent, proprietary businesses, and pushed the city to adopt planned growth and devote attention to quality of life issues. Like UCSB, Cal Poly offered stable employment to its employees. With the building of Mission Plaza in the 1960s, San Luis Obispo opted for historic preservation and cultivation of small-town, scenic quality of life. Cal Poly demonstrated its local influence, as faculty and students lobbied for the project and contributed ideas and effort to its realization (SLO I: 31–45). San Luis Obispo did not so much as "switch" from oil as develop in a qualitative manner in its absence.

Conservation, Pollution, and Public Policy

During the exuberant era, a majority of people placed an economic value on oil activity that generally compensated for the external costs of such activity, including industrial accidents, pollution, and the like. This is not to say that there was no concern for these externalities. Particularly along public beaches, as we have seen in the cases of Montecito, Santa Barbara, and Summerland, people protested oil activity. And in 1910 residents were already complaining of oil on the shores of Pismo and Avila beaches, and found that employees of Union and the Port of San Luis were dumping tar, garbage, and residual products of asphalt and bitumen production into the bay (SLO I: 13). As Sollen observes (1998: 13–14, 18–20), in the absence of regulations to compel them to act otherwise, oil operators have historically

left industrial waste, leaking wells, and other debris on public leases that they abandoned for taxpayers to clean up.[47] This was certainly the case at Summerland and Elwood fields.

As Elkind (2000: 123–124) notes, though oil was and remains a messy business, the containment of spills and blowouts has been more challenging historically in tidelands and offshore areas than on onshore leases, even as technological advances improved the efficiency and safety of oil activity. Thus public opposition was often present with respect to the former areas, and it mounted during the 1920s, after the 1921 state's Submerged Land Leasing Act failed to address conflicts between industrial and recreational uses of beachfront property. However, the trend that Pratt (1978) observed in the case of the Gulf region prevailed in California during the exuberant era: regulatory efforts that were perceived by the public as a threat to sustained economic growth confronted insurmountable difficulties.

Nonetheless, the major public policy concern of the first half of the twentieth century was not pollution, but waste. Public officials, scientific and technical experts, and oil industry executives all weighed in on the conservation issue. In California, however, spirited debate did not yield much in the way of public policy, even though many experts, industry executives, and public leaders agreed on the need to conserve natural resources and exploit oil reserves in the most efficient manner. But it gave rise to new techniques in field operations, including the conservation of natural gas at the wellhead. Moreover, concern about blowouts provided business opportunities for service firms such as the Ventura Tool Company to provide technology to control the drilling process (ABB Vetco Gray 2001). In the early post–World War II period, conservation in terms of limiting production largely disappeared from discussions regarding energy policy.

The blowout of Union's well Lakeview No. 1 in March 1910 in the San Joaquin valley, which ran uncontrolled for eighteen months, sparked worries among conservationists about the nation's oil supply and motivated oil companies and oil service firms to develop technology to prevent blowouts from recurring in the future.[48] For the next decade, the debate was engaged at the rhetorical level by progressives such as U.S. Forest Service head Gifford Pinchot and any number of experts from the U.S. Geological Service and the U.S Bureau of Mines. Confronted by conservationists, oil industry leaders became reconciled to participating in the debate during the 1920s. *American Petroleum Supply and Demand*, a report issued by the American Petroleum Institute (API) in 1925, addressed questions about the extent of reserves and defended industry practices to date. Yet it was either ignored or weakly received among conservation-mind experts and officials, and therefore did not change the terms of the debate, which remained highly critical of the oil industry's "wasteful" practices, in both the economic and physical depletion sense of the word (Olien and Olien 2000: 119–166).

[47] Operators demonstrated at least some concern for the beaches on which they drilled. At Elwood, for instance, concrete aprons were installed under the derrick floors as part of a system to capture any oil that was spilled during well completion (Gilbert and Siemon 1933).

[48] Blowout prevention equipment, however, only became practical with the introduction of rotary drilling rigs. Such devices were not adaptable to cable tool methods. Because rotary rigs allowed for the drilling of deeper wells into higher-pressure zones, blowout prevention became a safety issue as well as an economic one.

During the next five years, industry leaders adjusted their position, so that by the end of the 1920s, both majors and independents were ready to support industry-wide efforts to curtail production. Yet there was little agreement among operators regarding how to proceed. The rule of capture encouraged maximum production. Defining how to limit it was fraught with the perils of unintended consequences. Allocating production according to production potential, for instance, encouraged operators to drill more wells. Allocating production by leased acreage put operators with large production from a small area at a disadvantage. In any case, such cooperation opened participants to charges of collusion under U.S. antitrust law. Though majors and independents did not divide neatly into identifiable groups on the idea, majors tended to be more enthusiastic for proration—the restriction of production among operators in a field by a regulatory body—which raised suspicions in the minds of public officials and private observers. The discovery of the enormous East Texas oil field in late 1930, however, demolished the idea that the industry could regulate production itself. Now, in states such as Texas and Oklahoma, independents went along with the majors that had been calling for such regulation (Olien and Olien 1984: 41–45; Olien and Olien 2000: 167–183).

Yet California did not create a regulatory counterpart to the Texas Railroad Commission or the Oklahoma Corporation Commission. In July 1929 Sacramento lawmakers passed a conservation law that encouraged voluntary agreements to restrict production, but small firms in Long Beach, Santa Fe Springs and other fields where town-lot drilling was the norm ignored it. In February 1930 conservationists tried to cut state production to less than 600,000 b/d, and had the support of major operators such as Richfield and trade publications such as *Petroleum World* (1930). Again, however, small producers resisted, and nobody could force them to comply with the curtailment schedule that an industry committee worked out (Olien and Olien 1984: 52–53). In the wake of the East Texas discovery, Sacramento passed well-spacing and hazard prevention laws that aimed largely to reduce fires and pollution rather than control production (Bradley 1996: 138–142). Thus California opted out of what Erich Zimmerman has called "one of the most remarkable systems of economic control ever attempted in this country [state oil regulation]" (Quoted in Bradley 1996: 134). On a field-by-field basis, where a few cooperative operators controlled production, as at Ventura, or where one firm was dominant, as in the Cuyama valley, conservation or unitization schemes might be implemented (cf. Matier 1927; Swigart 1928). But overall, market conditions and technical operations of individual producers largely dictated the level of onshore production during the depression. In the tri-county area, as discussed, operators shut-in a substantial part of their production even as they continued to drill new wells.

World War II quashed the intellectual and institutional basis for postwar conservation. During the Truman administration, in the context of the Cold War, federal natural resource development policy dropped the New Deal's emphasis on redistribution and conservation in favor of material abundance and development (Koppes 1983). In the early postwar period, California's natural resources policy likewise privileged the use of resources for economic growth and national defense. Majors in California used the war environment to beat back federal efforts to establish ownership of offshore oil and silenced public criticism of beachfront drilling. They lobbied, sponsored studies, and participated in government agencies. Further, the war reinforced public preferences for limited interference with private

enterprise. Thus, for instance, the postwar resolution of the state-federal jurisdictional debate on authority over offshore lands took place in the context of national security and production concerns. During the war, in the context of gasoline rationing and supply bottlenecks, prewar restrictions on resource exploitation, such as those that the State Lands Act put on California beachfronts, came under fire from business interests (Elkind 2000: 120–122).

The postwar state-federal debate regarding jurisdiction over offshore leasing thus raged between proponents of planning (who opposed monopolistic capitalists) and defenders of free enterprise (who were often red baiters). A debate on the merits of tidelands drilling was absent, swamped by the Cold War drive for maximum production. Major oil firms benefited from the wartime experience of rationing, which the public did not enjoy, and improved their standing by assuring the public and the military that, if they were unfettered by regulation, they could supply the nation's energy needs. Industry leaders used the new demands for energy to free themselves from wartime-like controls. Oil executives in wartime agencies helped frame oil conservation policy to benefit larger producers, and the public, impatient to return to the civilian economy, accepted their arguments. Until the 1969 Santa Barbara channel spill propelled the environmental movement, dissent from the growth and security paradigm was difficult to sustain in conservation matters (Elkind 2000: 131–137).

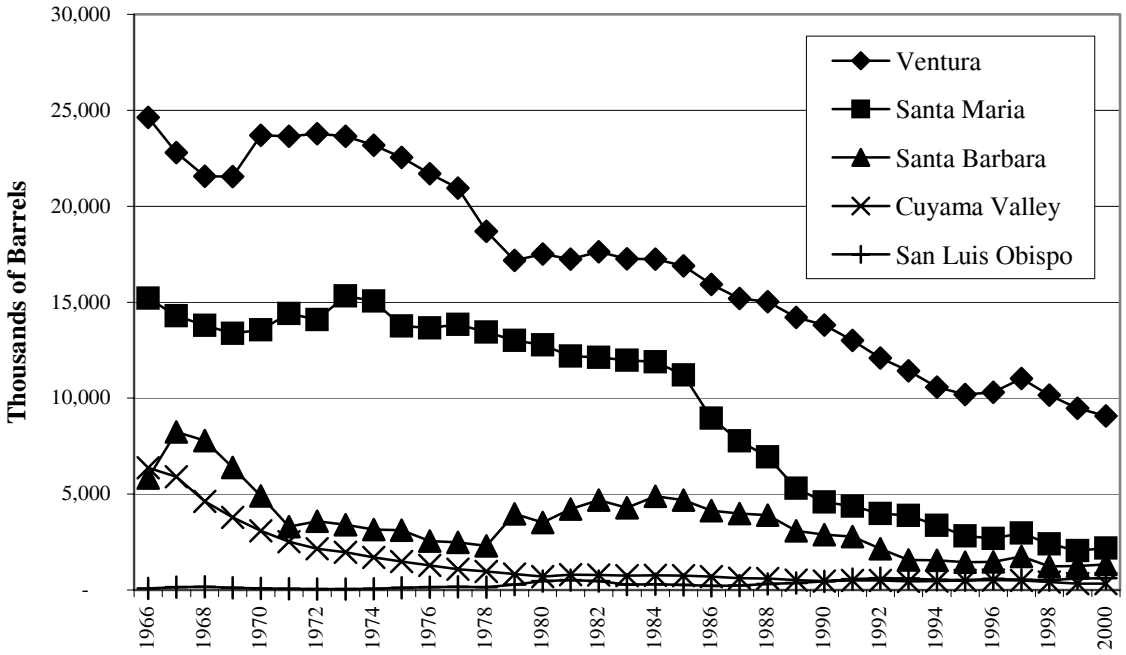
Part II. The Environmental Era, 1966–1985

Tri-county oil activity from 1966–85 took place during a time when a countercultural movement prevailed, casting doubt on the perceived positive impacts of technological invention and improvement. Distrust of technology, and the institutions that deployed it, replaced the enthusiasm that prevailed for much of the previous century. Indeed, the countercultural critique questioned the values of the technological society and scrutinized its effects on the natural environment (Hughes 1989: 443–446). The movement gained crucial political and social momentum, as far as it concerned local offshore oil development, after the 1969 Santa Barbara oil spill suggested to many people that ocean, marine, and urban environments were vulnerable to oil development along the California coast. The spill had implications at the national, state, and local levels. The anti-oil backlash at the tri-county level was immediate and sustained, as civic, non-oil-related business, and citizens' organizations called for new restrictions on offshore oil activity, or its termination. New regulations and moratoria on offshore activity raised costs, delayed development projects that were in process or in the proposal stage, and restricted available locations for new leasing. As a result, the level of offshore oil development in the Santa Barbara channel was much lower than oil industry executives and federal government officials predicted it would be during the 1960s (Gramling 1996; Lima 1994). Onshore activity was increasingly regulated as well. However, the impact on actual production during this period was probably slight, since most development occurred on producing properties that were exempt from many regulations.

The 1969 Santa Barbara channel spill thus helped to create the context for subsequent tri-county activity, both onshore and offshore. Economic diversification and urbanization in the region reinforced declining trends, in terms of both the contribution of the oil sector to economic development and its influence on social and cultural life. Moreover, perceptions of the local impacts of the oil industry turned increasingly negative, even as significant differences separated public opinion in the Santa Maria and Ventura oil-producing districts, on one hand, and the San Luis Obispo and Santa Barbara districts, on the other.

Rapid and significant increases in the real price of crude oil and pro-development energy policy at the federal level that followed in the wake of the 1973 embargo on shipments of crude oil to the United States by the members of the Organization of Petroleum Exporting Countries (OPEC) spurred a final boom period of onshore activity and enabled a substantial amount of development of OCS leases to occur. Unlike the booms of the 1920s and 1950s, the period from 1973–85 did not yield onshore discoveries of gigantic fields or large increases in production of the tri-county region's producing districts. Yet production numbers alone are deceiving. Substantial investment in developmental drilling and secondary recovery projects stalled, and sometimes reversed, declines in production from increasingly mature fields, and sustained the industry in terms of both operators and service firms (see figure 11). At the same time, a number of gigantic fields were developed in federal OCS areas, fueling the growth of a service sector dedicated to supporting offshore activity.

Figure 11. Coastal California Crude Oil Production By Group, 1966-2000



Source: California Division of Oil and Gas (various years); California Division of Oil, Gas, and Geothermal Resources (various years)

In terms of production alone, offshore development more than compensated for the lower output of the major onshore and state offshore fields. By the mid-1980s, however, local and state opposition successfully stalled the federal OCS leasing program in the Santa Barbara channel. Moreover, the real price of crude oil had stopped rising, as demand for petroleum products slackened relative to supply, owing to greater efficiencies on the part of users in the United States, Europe, and Japan. Coupled with increased taxation and regulation, the drop in prices diminished the incentive to produce oil, either offshore or onshore. Few predicted, however, the precipitous collapse in oil prices during 1986 that ushered in the era of decline that is the subject of Part III.

Leasing and Developing Federal OCS Lands

Not for lack of trying, the federal government failed to replicate the success of its OCS Gulf region program in California. As Freudenburg and Gramling (1994b: 21–22) note, in theory, the federal OCS leasing and development program is national in scope. Yet from 1954–69, all but four of twenty-one federal lease sales took place in the Gulf of Mexico. Further, from 1959–91 (except for 1961, 1963, and 1965) Gulf region lease sales occurred annually—often there were two or three per year. Elsewhere, levels of opposition were much higher even though the level of leasing activity was much lower. The first Pacific OCS lease sale occurred

in May 1963, and pertained to forty-one tracts in the La Honda, Santa Maria, and Salinas basins of central and northern California (Gramling 1996: 88–90; Richardson 1972: 4).[49] After the U.S. Supreme Court defined state and federal boundaries in the Santa Barbara channel in 1965, the way was cleared for federal OCS leasing to occur, and the Interior Department auctioned tracts in the Santa Barbara channel in 1966 and 1968. In the wake of the 1969 spill, however, lease sales outside the Gulf were postponed for six years. In 1984 the Minerals Management Service held the last lease sale in the Santa Barbara channel to date, for a total of five from 1966–84 (Galloway n.d.). Gulf lease sales, by contrast, continued unabated. From 1969–91, for instance, there were at least two lease sales annually, with the exception of 1971 and 1977, when there was one sale (Freudenburg and Gramling (1994b: 21–22).

The disparity in leasing volume translated into large differences in developmental activity among regions. For instance, Gramling (1996: 108 [table 5.3]) surveyed the number of fixed platforms under construction in selected months in the Gulf and Pacific regions (January 1975, March 1978, and March 1981). The Pacific region had one, zero, and two platforms under construction, respectively. In contrast, the number of platforms being erected off the Louisiana and Texas coasts was sixty-one, fifty-five, and ninety-four, respectively. Further, from 1953–89, firms erected 4,404 platforms in the Gulf and 23 platforms off the coast of California, 19 of which lay in the Santa Barbara channel (68 [table 3.1]).

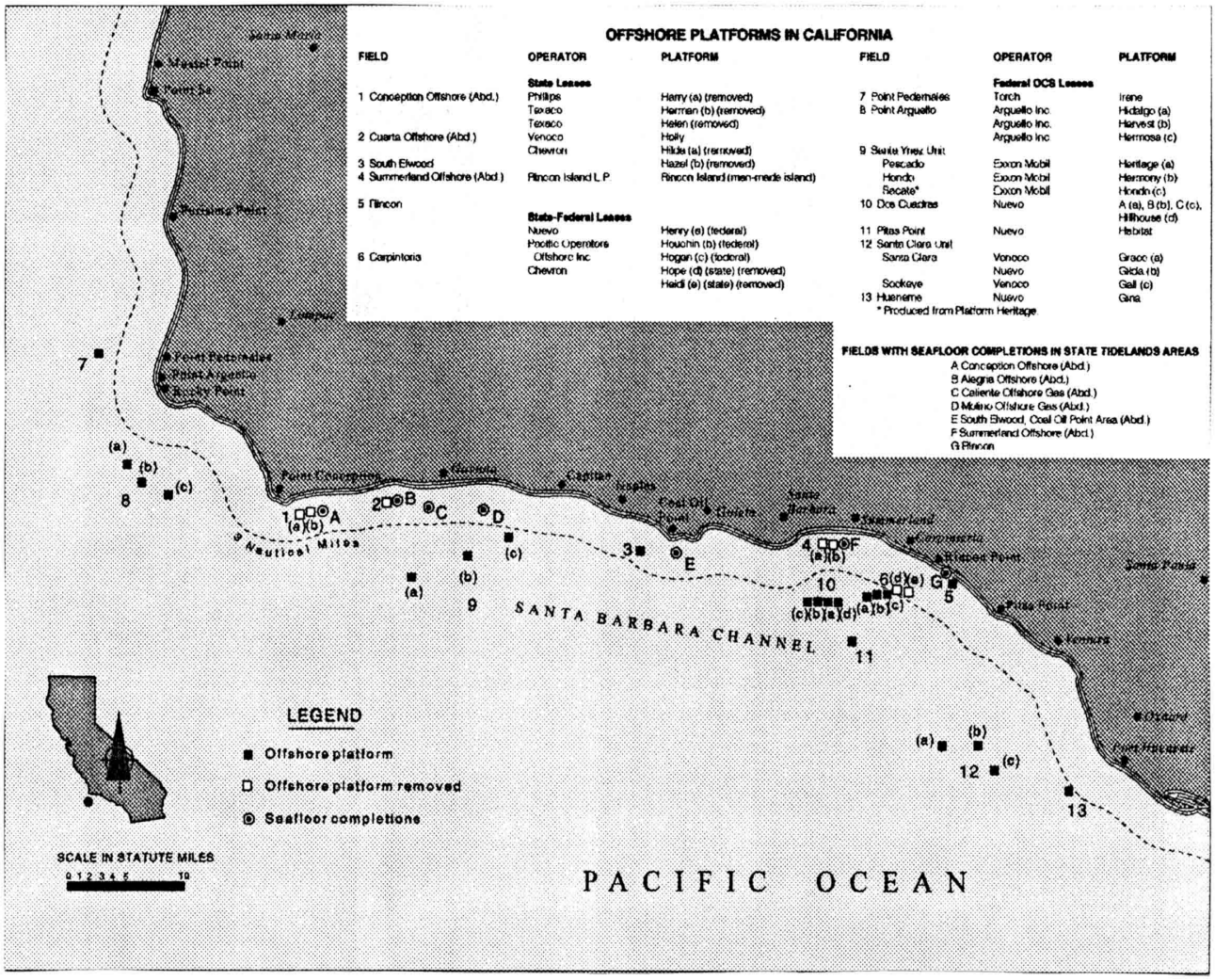
The first federal leasing in the Santa Barbara channel took place in December 1966. For $21.2 million, a three-firm consortium, comprised of Phillips, Continental, and Cities Service, acquired a 1,995-acre tract that adjoined state parcel 21 (Oil and Gas Journal 1966h). During 1967 the group constructed Platform Hogan to develop the lease. Phillips, the operator, discovered and developed the gigantic Carpinteria OCS field—the state's 48th largest overall—which offset the Carpinteria field in state waters (see map 11). It was the first gigantic field discovered in the tri-county area since Cuyama South. Production from the field commenced in 1968, the year in which the group installed Platform Houchin to further develop the field (California Division of Oil and Gas 1967: 88; Richardson 1972: 4).

There followed the record P-4 sale of February 1968, which yielded the discovery of the gigantic Dos Cuadras OCS field, to date the 24th largest overall in California (see map 11). The Department of the Interior opened bids on 75 tracts (it offered 110), comprising 363,181 acres of offshore lands in the Santa Barbara channel. It accepted bids on seventy-one tracts, totaling $602.7 million, including a record cash bonus of $61 million, which Union paid for tract 402. Other successful bidders included consortiums headed by Gulf, Humble, Mobil, Standard, and Texaco. Late in 1968 Union installed platforms A and B, and the discovery well of the Dos Cuadras field was completed in November. On January 28, 1969, however, the fifth well that Union was drilling from Platform A blew out, causing the spill that constituted a pivotal event in the history of offshore oil development in California. Though regulators allowed Platform Hillhouse to be installed on tract 401 in Dos Cuadras field in November (in order to accelerate the reduction of pressure in the reservoir), it would be

[49] Operators drilled and abandoned single wells, before quitclaiming the La Honda and Santa Maria leases. Development of the Salinas basin tracts did not proceed beyond seismic exploration.

another seven years before the next platform was installed in the Santa Barbara channel. Nevertheless, operators in Carpinteria and Dos Cuadras fields realized substantial returns on their investment, as crude oil production from these federal OCS fields soared to some 31 million barrels in 1971 (California Division of Oil and Gas 1967: 16–17; Richardson 1972: 4-5; Sollen 1998: 239 [Appendix A]).

Map 11. Santa Barbara Channel Offshore Platforms in State and Federal Waters, 2000
Source: California Division of Oil, Gas and Geothermal Resources (2001: 14)



As discussed in the next section, offshore oil development during the post–spill era was contentious and controversial, resulting in long delays in the development of tracts leased from the P-4 sale. During 1969 and 1970, tests confirmed the existence of several offshore fields, including Hueneme, Hondo, Pescado, Pitas Point, Sacate, Sockeye, and Santa Clara (see map 11). Hondo and Pescado were gigantic fields, the 25th and 50th largest in the state to date. Both were included in the Santa Ynez Unit, which Exxon operated. From 1976–81, after a protracted approval process, operators installed platforms and onshore processing facilities to develop some of these fields. In 1980 Standard began production in the Santa

Clara field from Platform Grace, the same year that Union installed Platform Gilda in the same field. The next year Exxon began production from Platform Hondo. In 1982 Texaco began producing natural gas from Platform Habitat and Union began producing crude oil in Hueneme field from Platform Gina. During the same period, Union installed Platform C in Dos Cuadras field and Sun erected Platform Henry in Carpinteria field. Thus, as of 1984, half a dozen firms, including Chevron, Exxon, Phillips, Sun, Texaco, and Union, operated twelve platforms in six federal offshore fields in the Santa Barbara channel (Galloway n.d.; Sollen 1998: 250–253 [Appendix E]).

Operators constructed onshore processing facilities to support offshore development. Phillips and Union constructed an oil and gas processing facilities on the northern Ventura county coast, at La Conchita and Rincon, respectively, to support production from platforms Hogan, Houchin, A, B, C, Henry, and Hillhouse. Exxon constructed a gas processing facility at Las Flores Canyon in Santa Barbara county to handle natural gas from Platform Hondo. Until the late-1980s construction of an oil and gas processing facility at the same site, however, Exxon stored the oil produced from Platform Hondo in its Offshore Storage and Treatment vessel until it was shipped to port. This owed to a protracted permitting process for the onshore facility (Galloway n.d.; VC II: 3.1.13–3.1.14 [table 3.1.1]).

The installation of these platforms and their support infrastructure made possible the reversal in a decade-long decline in federal OCS production from the Santa Barbara channel. Led by output from Exxon's Platform Hondo, production revived from 10.1 million barrels in 1980 to 26.6 million barrels in 1983.

Four sales, held from 1979–84, constituted the last leasing of offshore California OCS lands in the twentieth century. In June 1979 the federal government conducted lease sale 48, the first one to involve tracts in the Santa Barbara channel since 1968. (Lease sale 35, held in December 1975, excluded the Santa Barbara channel.) Operators bid on 55 of 148 tracts offered, and the government netted $527.8 million in cash bonuses. Chevron's 1981 discovery of the gigantic Point Arguello field—to date the 37th largest in the state—on lease P-0316 from this sale created great expectations on the part of oil companies for the Santa Maria basin tracts offered in lease sale 53, which took place in May 1981. Consortia of oil companies bid on 81 of 111 tracts offered by the Department of the Interior. Successful bidders paid $2.1 billion in cash bonuses for these leases, including Union's payment of $121.7 million for five leases that contained the Point Pedernales field, from which production began in 1986. In October 1984 MMS reaped only $62.1 million from lease sale 80. Oil companies bid on only 25 of 657 tracts offered (Galloway n.d.; Sollen 1998: 239 [Appendix A]).

To produce oil from the Point Arguello OCS field, Chevron installed platforms Harvest, Hermosa, and Hidalgo during 1985 and 1986. To support production from these platforms, Chevron constructed an oil and gas processing facility at Gaviota—a site long used for such purposes. Owing to a number of delays in the permitting process, however, production did not commence until 1991. To develop its Point Pedernales field, Union installed Platform Irene in 1985 and constructed a heating, separation, and pumping facility at Lompoc. From

there, crude oil was piped to the company's marine terminal at Avila or to its Santa Maria refinery (Chevron 1983a; Chevron 1983b; Chevron 1984; Galloway n.d.; Sollen 1998: 250–253 [Appendix E]; VC II: 3.1.13–3.1.14 [table 3.1.1]).

At 23.2 million barrels, production from federal OCS leases in 1985 was significant, though it had tapered off from 1983. More importantly, for all involved, the federal OCS program as far as offshore California was concerned had stalled, owing to sustained opposition at the local level, which received crucial support from both the government in Sacramento and California representatives in Washington.

Technological Advances, Offshore California

Offshore California's physical environment, which includes earthquakes, and, relative to conditions in the Gulf of Mexico, extreme wind and wave action, greater water depths, fewer adequate harbors, fewer onshore support facilities, and stricter environmental practices, created engineering challenges for the oil and oil service firms that built offshore infrastructure. The continental shelf in the Santa Barbara channel sloped steeply. Deep water depths of 660 feet (200 meters) or more were reached only two-to-fifteen miles from land, unlike the gradually sloping Gulf floors, where the 200-meter level extended one hundred miles or more from land. For the development of OCS leases, engineers had to design a drilling platform that did not have to rest on the seafloor. Unlike the often-inaccessible coastline found along Louisiana, the tri-county coastline was becoming increasingly populated, and long-time residents and newcomers alike opposed its industrialization, including the construction of onshore processing facilities and the deployment of rigs on piers, in the manner used by operators at Elwood and Rincon. In both state and federal waters, huge platforms would be clearly visible from the coast, which raised aesthetic issues that operators and regulators mitigated with various beautification and concealment measures. (This also applied to additional onshore infrastructure.) It also meant that there would be fewer, larger platforms, each capable of drilling dozens of wells. The proximity of platforms and onshore processing facilities to expanding population centers also meant that pollution was an issue that offshore operators and regulators had to address (Freudenburg and Gramling 1993; Freudenburg and Gramling 1994b: 75–95; LeBlanc 1997a; Pratt, Priest, and Casteneda 1997: 158–163).

Offshore technology, which emerged and evolved in the Gulf region, had to adapt to this new environment. The problem of water depth in the Santa Barbara channel was first addressed in the mid-1950s with the development of the drillship. Four companies—Continental, Union, Shell, and Superior—formed a consortium, named CUSS, for the purpose of developing a motion-restricted, unballasted vessel. In 1953 the group converted a 300-ton U.S. Navy patrol boat, installing a coring and drilling mast on one side. In 1956 the group converted and deployed a large U.S. Navy barge into a drilling unit, known as CUSS I, which proved able to operate in depths of up to 350 feet in rough weather. With some adjustments, including the removal of a mooring system and a riser, CUSS I was able to drill a test well in 11,700 feet of water off the coast of San Diego in 1961 (LeBlanc 1997b: 98).

In the late 1950s and early 1960s, operators installed submersible rigs in state waters. Based on the concept of gravity structure design, installation entailed floating a platform jacket on empty caissons to its destination. Operators then flooded the caissons and guided them to the seafloor, where they anchored them with cement or sand on the shale formation underneath the sandy loam. This was the approach taken in 1958 by Standard and Humble with platform Hazel, whose jacket was built at a San Diego shipyard and towed to Summerland (Standard Oil Company of California 1959). It was repeated with platforms Hilda, Helen, Harry, Herman, Hope, and Heidi. The water depths of these platforms ranged from 85 feet to 140 feet (Sollen 1998: 254–256 [Appendix F]).

These platforms were larger than those typically installed in the Gulf. Texaco's Platform Helen, for instance, installed in 1960 by Brown and Root, a Houston-based civil engineering firm, was the largest offshore platform in the world at the time. With a lower deck that measured 124 square feet and an upper deck that measured 130 by 138 feet and sat 55 feet above mean water level, Helen had a capacity for forty wells. Its size prompted Brown and Root to build only the decks at its main fabricating yard at Greens Bayou, Louisiana. The jackets were subcontracted to a Long Beach yard. Indeed, Brown and Root used this approach in fabricating many of the jackets and most of the decks installed in California waters during the 1960s (Pratt *et al.* 1997: 158–163).

With the development of federal OCS leases in the Santa Barbara channel, semisubmersible rigs replaced the submersible variety. The concept involved the deployment of a partially ballasted hull that removed most of the motion that floating vessels experienced while they floating at the surface. It was first realized in the Gulf of Mexico in 1962 with the launch of the *Bluewater No 1*. Shell and Bluewater Drilling Company, the operators, developed "a braced assembly of large floodable columns that could be ballasted down far enough to escape pitching and rolling motions." Two years later Shell and Bluewater launched the second generation *Bluewater No. 2*. In between these events, Ocean Drilling and Exploration Company built the *Ocean Driller*, which could be converted to a submersible rig—a dual-purpose design that was significant at the time. Subsequent generations of semisubmersible rigs proved capable of withstanding all weather condition, and became the design of choice in the North Sea and other offshore locations (LeBlanc 1997b: 98).

From 1966–71, the Santa Barbara channel was the focus of attention of the offshore oil industry. Semisubmersible rigs drilled test wells, many of them for Humble/Exxon, reaching a record depth of 1,497 feet in 1970 (Simmons 1976). Engineers used advances in computer-aided design (CAD) and lessons learned from installing platforms in the Santa Barbara channel to improve their knowledge of the loads that these structures would have to endure in the Pacific ocean. An earthquake in the Santa Barbara channel in August 1978, measuring up to 5.7 on the Richter scale, seemed to validate the design and construction of the platforms in place (Pratt *et al.* 1997: 158–163).

Following the 1969 oil spill, the focus of deepwater activity shifted to the Gulf—where investment in offshore activity topped $16 billion in 1973 (Le Blanc 1997a)—and elsewhere.

For the most part, the Santa Barbara channel lost its position as the "cutting edge" testing area for offshore technology.

The geographical path of technological innovation can be seen in the achievements of the Ventura Tool Company, which became Vetco Offshore Industries in 1970 (shortened to Vetco in 1976). As noted in Part I, the firm capitalized on the coming of the offshore era to California by forming a special team to develop new products for the offshore market. The team developed a number of "firsts," including a system for subsea drilling and completions, for which it received its first order in 1964. In 1969 the firm installed the first subsea and completion system off the California coast (ABB Vetco Gray 2001). By 1978 there were 140 subsea completions worldwide (Le Blanc 1997a).

The company continued its record of innovation during the 1970s and 1980s, with the development of the industry's first motion compensator system for offshore drilling vessels in 1971, the introduction of a valves and control system in 1976, and the development of increasingly advanced completion systems during the 1980s. Reflecting the shift in attention away from California following the 1969 spill, all of these technologies were implemented in the Gulf of Mexico or elsewhere. Indeed, Vetco was no longer locally owned as of 1977, when Combustion Engineering acquired it (ABB Vetco Gray 2001). Nevertheless, Vetco continued to be a significant local employer, with 1,300 employees in 1982, the year in which it built a new Ventura Avenue facility (VC II: 3.1.8).[50]

As Molotch, Woolley, and Jori (1998) note in some detail, other tri-county based service and supply firms developed commercial innovations and services as by-products of their support of oil development in the Santa Barbara Channel. Diving Systems International, for instance, developed the first commercially successful fiberglass diving mask. California Divers developed a rotary full cleaning device and a closed-circuit television system for the maintenance and repair of offshore platforms and vessels. Oceaneering International used remotely operated vehicles to perform inspections of offshore installations. Port Hueneme Marine Supply Company distinguished itself as a supplier of vessels used in emergency situations, such as oil spills. Santa Barbara-based HEMEC Communications used its experience in servicing marine electronics devices from 1964–79 to develop satellite communications systems during the 1980s and 1990s.

Exxon's 1976 installation of Platform Hondo in 850 feet of water was a significant event for the offshore industry, and a significant leap for the Santa Barbara channel, since the last platforms to be installed before then—A, B, and Hillhouse in Dos Cuadras field—sat in only 190 feet of water (Sollen 1998: 250–253 [Appendix E]). The controlling design criteria were seismic rather than wave-loading. Instead of a heavy, self-floating jacket, Exxon constructed a massive, pipe-supported jacket that Kaiser Shipbuilding sectionalized at its yard in Oakland.

[50] Combustion Engineering also purchased the Gray Tool Company. In 1985, Combustion Engineering merged the two firms, forming CE Vetco Gray. In 1987, Combustion Engineering and Hughes Tool Company combined the two companies with Hughes Offshore to form Vetco Gray Hughes. After Baker Oil Tools acquired Hughes, Vetco Gray was divested. ABB, a wholly owned joint venture of Asea and Brown Boveri, Swedish and Swiss civil engineering firms, respectively, acquired Vetco Gray in 1991 (ABB Vetco Gray 2001).

At the offshore site, the two pieces were launched and mated horizontally in protected water with welded connections from inside the legs. This approach addressed the limitations on fabricating and installing larger structures posed by existing equipment and yard capacity (Pratt *et al.* 1997: 77–81).

Regulations required operators to address environmental impacts of offshore activity by devising pollution abatement systems for the fourteen platforms installed in the Santa Barbara channel between 1976 and 1989. To meet standards on air and water discharges from platform and onshore facilities, for instance, oil and oil service companies developed advanced effluent recovery units to assure low levels of emissions. Other innovations included electric-powered platforms and pipelines that could accommodate multiple effluents in a single system (SB II: 7.7–7.8).

Responding to Federal OCS Oil Development

During the environmental era, county-level political boundaries mattered with respect to the siting of onshore processing facilities that supported offshore oil activity. Since county and state governments had no jurisdiction over the leasing of federal OCS lands, local opposition to the industrialization of the coast, expressed in county-level regulations and referendums, provided a means of restricting or stopping offshore development, while citizens' groups and other organizations used a variety of tactics to stall the federal government's OCS program in California. Opposition to oil development in federal waters preceded the 1969 Santa Barbara channel oil spill. In its wake, however, opposition was organized, sustained, and effective. By 1985 it was evident that the federal government would be unable to replicate its extensive and intensive Gulf OCS region program in California. Indeed, there has not been a federal lease sale pertaining to the Santa Barbara channel since 1984. Under an executive order issued by President Bush in 1990, which President Clinton extended, a moratorium on new leasing off the coast of California remains in effect until 2012.

The January 1969 oil spill from Union's Platform A in the Santa Barbara channel was partially credited with the January 1970 passage of the National Environmental Policy Act (NEPA), which required that study of the environmental impacts of platform installations and other major projects occur before federal permits could be issued, the success of the first Earth Day in April 1970, the 1972 passage of the Coastal Zone Management Act (CZMA), which granted states limited authority over federal OCS leasing, the eventual passage of the 1978 amendments to the Outer Continental Shelf Lands Act, and the emergence of widespread, sustained, organized resistance to the federal offshore oil program in most coastal states. At the state level, it spurred passage by referendum (Proposition 20) of the 1972 California Coastal Act, which established the California Coastal Commission. Indeed, with the spill, Sacramento changed its pro-development stance, joining tri-county governments and interest groups in opposing federal offshore policy (Freudenburg and Gramling 1994b: 21–22; Kaplan 1982).

As Lima (1994) shows, however, opposition to the federal offshore program in south Santa Barbara county predated the spill. By 1965, the year that the U.S. Supreme Court cleared the way for federal OCS leasing to commence, oil development was abutting urban areas. Since the passage of the Shell-Cunningham Act, the Santa Barbara county government had moved aggressively, but reactively, against threats to the sanctuary set up under the act and whenever oil development threatened beaches, recreation, or tourism. Otherwise, it had adopted a pro-development position, motivated in part by the increase in the county tax base and the revenues for school districts that offshore oil development produced. The state returned one percent of the royalties to the county as well. With the success of the Carpinteria and Elwood tracts that the state leased in 1964 and 1965, however, county officials recognized the need for comprehensive planning, and acted to protect the sanctuary and to manage the construction of onshore facilities in urban areas (280–293).

The installation of platforms Hope, Heidi, and Holly in the two fields, and the construction of an oil pier at Carpinteria, raised awareness among local residents and officials in south Santa Barbara county regarding the potential impact of extensive offshore development. (Ironically, during this period, little development of federal leases occurred in the area where it had the greatest support, that is, in Ventura county.) Both the Santa Barbara county planning commission and residents opposed the construction of onshore facilities at Elwood. Though the area was zoned for both oil and residential purposes, it was now suburban, and local interests viewed oil was viewed incompatible with residential use. Concern about the industrialization of the coast motivated county officials to consolidate onshore support facilities. At the same time, delays meant lost revenues for the state treasury, and oil companies wanted to time the building of onshore facilities with their own production schedules, and therefore proved unreceptive to sharing infrastructure. In the Elwood case, county officials moved the site of the onshore facility slightly westward (293–296).

The siting decisions involving federal leases proved more difficult to resolve, given that the Supreme Court decided in its 1965 decision that the Santa Barbara channel was not an inland waterway, and therefore could be leased outside the three mile zone from the coast and a three mile buffer zone around the channel islands. Santa Barbara county officials addressed oil development in federal waters in a number of ways, including making policy regarding onshore facilities, petitioning federal officials to delay leasing to provide more time for assessments of impacts, and moving to protect the sanctuary from encroachment. The county achieved these goals, with the help or acquiescence of non-local officials, but the federal program went ahead on modified terms. Policy on onshore facilities, contained in a planning commission resolution of April 1967, allowed for one more marine terminal, no refining facilities, and discouraged new storage and processing facilities within three miles of an existing facility, encouraging instead consolidation on adjacent lands. Facilities also had to be compatible with the existing and potential recreational, scenic, and residential character of the area. Facilities would become non-conforming at the end of the oil lease term. That is, the permit approval process would be reopened whenever the lease was extended or the facility was used to process crude oil from other sources (296–307).

Local groups and discussion talked of a channel-wide sanctuary and of establishing a moratorium on further development. County officials took up these actions, but U.S. officials in the Interior Department showed little interest in their concerns, though it proposed establishing a two-mile buffer zone between the existing sanctuary and federal leases. The P-4 lease sale went ahead in early 1968 (after a sixty-day delay). With some observers predicting the installation of as many as seventy-five platforms in the Santa Barbara channel, officials and groups at the state and local levels raised concerns about the impact of such development—concerns that increased with the revelation of the location of offshore fields that emerged from this lease sale (Dos Cuadras, Hondo, Pitas Point, and Santa Clara) (see map 11). With the lease sale completed, the county board of supervisors expressed increased concern over matters of aesthetics and pollution, but overall devoted most of its attention to managing development. Citizens' groups, however, mobilized to oppose the level of development that the board was willing to sanction, including a proposal by Humble to build an onshore processing facility in Carpinteria. Citizens responded with a referendum measure that blocked Humble's proposal, prompting the firm to relocate the facility to Ventura county. A few months later, however, Union's spill in the Santa Barbara channel occurred (307–320).

With the spill, the politics of offshore oil along the California coast changed fundamentally, with environmental concerns joining social and economic ones as cause for opposing offshore activity. Policy changed at the national level, and encompassed all natural resources, not just offshore oil. Development itself, rather than its timing and scope, became the primary issue. New agencies at the federal, state, and local levels became involved in policymaking, as did citizens' groups that had been largely ignored. Thus when drilling activity resumed in the Santa Barbara channel in 1975, it did so in a greatly modified political environment. Community opposition coalesced around the spill, which proved that the sanctuary established under Shell-Cunningham was not inviolable (331–336).

Within the tri-county area, responses to the spill, and to offshore development generally, varied by district, depending on previous relationships with the oil industry. In the Santa Maria and Ventura districts, people supported offshore development, and tended to view the spill in technical, rather than systemic or environmental, terms. Along the south Santa Barbara county coast, the response to an event that threatened the character of the community was intense and sustained. In south San Luis Obispo county, residents and leaders also reacted critically. Having developed in a qualitative manner that in many ways emulated the Santa Barbara model, the people of San Luis Obispo perceived only costs and few benefits from oil development off their coast. The Santa Barbara oil spill hammered home the costs of offshore oil activity.

For the city of Santa Barbara, the channel oil spill presented an opportunity for its residents to reassert its character and uniqueness of place. It galvanized local opposition to offshore oil development and prompted the creation of a number of non-governmental organizations, including Get Oil Out! (GOO), that sustained opposition to offshore oil. Future decision making on offshore oil activity thus involved local participation, which produced "new local energies and modes of community organization as citizenry took part in a newly developed public process for judging the value of projects" (SB I: 67). With its wealthy residents, the

University of California campus, arts communities, non-profit organizations, and retirees, the city of Santa Barbara by 1969 was a place that was conducive to such local interest in offshore oil development (SB I: 60–69).

Local opinion was critical of both the Interior Department's and Union's handling of the spill. In the minds of many local observers, government officials and Union's executives minimized the spill's effects by adhering to low estimates of the number of barrels spilled, the number of birds and other wildlife killed, and the damage sustained by sensitive marine environments. Indeed, Union's stance on the spill remained unchanged for two decades. Writing about the spill in Union's one-hundredth anniversary volume, the company's historian wrote that, "by July 4, the holiday crowds found many of the beaches in better condition than they had before the spill," and that, by the end of 1969, "the seepages were minimal, far less than the centuries-old seepages in state-owned waters off Coal Oil Point" (Pederson 1990: 162, 163). Further, she cited Dale Straughan's study for the Allan Hancock Foundation at the University of Southern California, sponsored by the Western Oil and Gas Association, as evidence "that there had been no permanent damage to the environment" (163). As Sollen (1998: 7273) notes, researchers at UCSB and the Woods Hole Oceanographic Institute in Massachusetts criticized the report for having established no baseline against which to make such a conclusion. The technical merits of the claims of U.S. and Union officials notwithstanding, the actions that they took and the statements that they made in the wake of the spill heightened the level of distrust that local officials and residents felt for those responsible for offshore oil development.

At the level of county politics, an understanding emerged that any offshore oil development project would have to pay its own way, contribute to local parks and other amenities, and sustain the environment if it were to receive any consideration for its approval. Ideally Santa Barbara county officials sought to eliminate all offshore development in the channel, rather than just limit it. A 3–2 majority on the board of supervisors was willing to forego the contributions to the general fund from offshore activity in favor of protecting the values of the community, the natural resources of the coastal and marine areas, and economic sectors such as tourism. To eliminate development, the county regulated land use, lobbied state and federal agencies, and raised policy issues to the state and national levels (Lima 1994: 336–344).

In 1972 Santa Barbara voters selected a pro-environmental and pro-no/slow growth city council for the first time, and it has remained so oriented since that time. At the same time, the communities and politicians of the Santa Maria district retained their pro-business and pro-oil-development stance (SB I: 69–73).

SB I (73–78) gathered evidence of Santa Barbara county's anti-offshore oil public sentiment from surveys and votes. Countywide surveys carried out in 1972, 1988, and 1990, for instance, suggest that local concerns about offshore oil development increased over time, with a little more than half of the respondents opposed to further drilling in the Santa Barbara channel. But strong differences of opinion among residents in the northern and southern parts of the county persisted, reflecting the relative historical contribution of oil activity to the

social and economic development of these areas. The north-south county split was also evident in the vote for the California Coastal Zone Conservation Act, which Santa Barbara county approved by a margin of 62 percent to 38 percent.

For San Luis Obispo city and county, the Santa Barbara channel spill was not as important to its development as demographic changes that increased the number of people who wanted to get away from industrialization generally. Having progressed some way toward emulating Santa Barbara's qualitative development model, and having developed an interest in growing their tourism, recreation, and hospitality sectors, however, residents adopted a strong anti-offshore oil development stance. County voters also supported the Coastal Zone Conservation Act by a 62 percent to 38 percent margin. County residents became very concerned with possible federal offshore development, either directly offshore, or in support of development elsewhere (through onshore facilities). They networked, educated one another, and otherwise prepared to defend their way of life.

For the residents of San Luis Obispo county, local perceptions regarding the risks of offshore oil development were shaped by their experience with governmental and corporate institutions over the construction of the Diablo Canyon nuclear power plant (Beamish 2001: 15–16). Opposition to the plant "galvanized a new generation of environmentalists, quality-of life-oriented activists, and like-minded officials, who remain active in SLO [*sic*] government and quite powerful in county politics as well" (SLO I: 66). The controversial project also motivated the *San Luis Obispo Telegram-Tribune*, the largest newspaper in the county, to adopt a stridently pro-environmental and pro-slow-growth editorial stance (67–71). (By contrast, the *Santa Barbara News-Press*, following in the tradition of Tom Storke, generally supported pro-growth business interests that it found to be compatible with the city's and the county's development, even as it opposed offshore oil activity [SB I: 62–66].)

Thus in 1975 San Luis Obispo county leaders and environmental activists persuaded Standard to drop plans to construct a $100 million supertanker port in Estero Bay, and Standard of Ohio (Sohio) to shelve a similar proposal the following year. In the latter case, San Luis Obispo city and county officials, environmental activists, newspaper editors and reporters, and other interested parties followed developments closely, querying state and federal officials and Sohio executives about their plans to build infrastructure in support of transporting the crude oil produced at Prudhoe Bay, Alaska. San Luis Obispo county sites were considered as alternatives to Long Beach, where marginal increases in pollution from the project jeopardized the air quality standards of the Los Angeles basin under the Clean Air Act. Local mobilization on the issue created an organizational model of local response to future proposals to industrialize the coast. In this case, the proposal was a "false alarm," in that Sohio abandoned plans to build a port, owing to both legal obstacles and decreases in the U.S. demand for oil. Yet the local response demonstrated how even the perception of offshore oil-related activity had actual impacts locally. The county's planning department therefore responded to subsequent proposals with reports that developed and defined environmental impacts and listed actions that were needed to mitigate physical, social, and economic impacts (SLO I: 77–81).

In Ventura, the spill was treated more as an unfortunate, technical accident. Whereas Santa Barbara residents tended to think that the spill resulted from federal and corporate insensitivity to local concerns, Ventura officials, media, and residents did not think that it was cause for punitive action against either the oil industry or the federal government. Moreover, local officials made no attempt to increase their regulation of the industry. (Increased regulation of oil operations in Ventura county dates from the 1980s.) Ventura county officials maintained their pro-oil industry stance, and did not join Santa Barbara county officials in calling for a drilling moratorium in the wake of the spill—though Ventura's representative in the U.S. Congress, Charles Teague, Jr., lobbied the Interior Department (unsuccessfully) for a permanent ban. Ventura county voters supported the Coastal Zone Conservation Act by only the slimmest of margins, 50.5 percent to 49.5 percent margin. The city of Ventura was evenly split. Among county towns and cities, only Ojai, Simi Valley, and Thousand Oaks polled a majority in favor of the referendum (VC I: 84–90).

For its part, the State Lands Commission (SLC) suspended drilling and exploration in state leases until 1974–76 for Santa Barbara channel leases—and ordered a review of spill containment and clean-up technology. Though the technology in the area of well control advanced from 1969–76, uncertainty regarding spill containment and cleanup, as well as the safety of offshore operations, remained high. Sacramento also designated non-leased areas as drilling sanctuaries and prohibited the SLC from issuing exploration permits in these areas (to prevent economics from driving politics). A state bill to ban drilling permanently in the Santa Barbara channel, however, failed to pass. Lima (1994: 344–349) attributes the outcome to the revenues that offshore oil activity produced. Overall, the state of California increased regulation, but it did not prohibit existing activity, or activity that was in the pipeline, as it were, from proceeding.

In the context of the oil crisis, the federal government pressed on with offshore oil development, with the expressed aim of achieving energy self-sufficiency. In January 1974 President Richard Nixon announced Project Independence, which, among other things, directed the Interior Secretary to lease ten million acres, or three times the acreage leased to date, beginning in 1975. A staff report prepared by the National Ocean Policy Study for the Senate Commerce Committee objected that the policy was unrealistic on four grounds: (1) estimates by the U.S. Geological Survey of recoverable reserves in federal waters exceeded even industry estimates, (2) the oil industry did not have the capacity to develop tracts as quickly as the administration desired, (3) given the requirement that tracts had to be explored within five years of their sale date, increased offerings would yield fewer revenues per acre, and (4) increased offshore development might seriously disrupt the coastal states. Leasing went ahead anyway under presidents Nixon and Ford. It fell short of its acreage goal, however, as leasing outside the Gulf region met local and state government resistance. Development activity was also much delayed, owing to suits that local and state interests brought under CZMA, NEPA, and other laws. These responses were much different than the experiences of the oil industry and federal regulators in the Gulf region (Freudenburg and Gramling 1994b: 22–24).

As Freudenburg and Gramling (1994b: 24–26) suggest, successive administrations in Washington may have been interested solely in achieving energy independence. Yet, as they also note, the federal leasing program was contributing substantial revenues to the U.S. Treasury—more than $100 billion through 1991, suggesting the possibility that the financial aspects of the program attracted U.S. officials and politicians as well. The opposition registered by local governments, interest groups, and interested publics in coastal areas outside the Gulf convinced Congress to amend the OCS Lands Act in 1978. Members of Congress were concerned that the OCS leasing process was undemocratic and essentially closed to parties other than the Interior Department and the oil industry. Opening the decision-making process under the act (by, for instance, requiring the Interior Secretary to publish five-year leasing schedules and associated environmental impact statements (EISs), and submit them to public comment and scrutiny) was thought to be a way of increasing public confidence in the process. But coastal support was not forthcoming, as Freudenburg and Gramling (1994b: 47–67) show with respect to the response of northern Californians to lease sales 53 and 91.

The stance of the Reagan administration—the approach of Interior Secretary James Watt in particular—added to the local distrust of, and fomented more opposition to, the federal offshore oil program. Watt created the Minerals Management Service as a single supervisory and promotional agency for the OCS program. He also introduced area-wide leasing, which greatly increased the acreage offered in a given lease sale. Average bonuses per acre in lease sales plummeted as a result. By throwing open vast areas to sale, and therefore increasing the number of communities that could be affected by offshore development, area-wide leasing increased opposition to the OCS program, resulting in renewed political pressure at both the state and federal levels. By the 1990s, MMS found itself denied access to many OCS lands by an executive order of President Bush, who extended until 1999 a moratorium on leasing that Congress had been renewing annually since 1982 (Freudenburg and Gramling 1994b: 24–26).

The research team that produced SB I, SLO I, and VC I tested local reaction to federal leasing with a comparative case study of the public responses to the hearings on the draft EISs associated with lease sale 53, involving 243 tracts off the coasts of central and northern California, and lease sale 68, involving 218 tracts off the central and southern California coasts. The former was held in San Luis Obispo in June 1980; the latter in Santa Barbara in July 1981. The team analyzed the content of the draft EISs in terms of the volume of discussion given to different types of issues. Researchers counted each line of text, classifying them by subject matter, in the manner of Freudenburg and Gramling (1994b). Likewise, they determined the content of public response as represented by statements made at the hearings and letters filed. Finally, they analyzed newspaper coverage of the events, and applied the same classification technique to each line of text in the relevant articles. In this way, the team looked at "amplification," or the way in which the content in the EISs was selectively portrayed and reformulated as it moved through successive stages of "public life" (SB I: 78–79).

As in the Louisiana and northern California cases analyzed by Freudenburg and Gramling (1994b), the research team confirmed that whereas the content of draft EISs focused on

quantitative, technical issues, the public expressed concerns regarding qualitative, broader issues. San Luis Obispo residents and interest groups strongly opposed lease sale 53 and criticized the draft EIS. Indeed, ninety-two percent of commentators at the hearing opposed the sale or criticized the draft EIS. By contrast, 51 percent of Santa Barbara commentators opposed lease sale 68, and only 13 percent of the comments received from Ventura residents and organizations opposed lease sale 68. Significant numbers of both San Luis Obispo and Santa Barbara commentators demonstrated distrust of the estimates in the draft EIS of the environmental effects of the lease sale, perceived the leasing process to be undemocratic and inadequate, expressed concern for the economic impacts of subsequent development on the environment, and opposed the sale for its potential effects on the local way of life. Supporters of the lease sale cited national energy policy disproportionately as the reason why offshore projects should be approved. At the same time, opponents scored the government for its lack of a renewables program and better conservation efforts (SB I: 78–89, 125–132; SLO I: 82–85, 114–121).

Ventura county commentators were not well represented at either one of the hearings.[51] The individuals who appeared tended to stress environmental issues as reasons why the lease sale should be supported. The organized presence at these hearings from Ventura county came from oil support firms, professional organizations, and pro-oil economic development groups rather than environmental groups, as was the case with representatives from San Luis Obispo and Santa Barbara counties (VC I: 129–130).

The research team also tracked the coverage given to these hearings by local newspapers. In terms of column inches, both the *Santa Barbara News-Press* and the *Santa Maria Times* devoted fewer column inches to the hearings than the *Five Cities Times-Press-Recorder* and the *San Luis Obispo Telegram-Tribune*, and even the *Ventura Star-Free Press*. The *News-Press* devoted 70 percent of its coverage to opponents, even though 65 percent of speakers at the hearing supported lease sale 68. The *Telegram-Tribune* devoted 88 percent of its coverage to opponents, even though 81 percent of speakers at the hearing supported lease sale 53. The *Star-Free Press* devoted column inches to lease sale 68 hearing in rough approximation to the proportion of supporters and opponents. The *Oxnard Press-Courier*, by contrast, devoted its column inches overwhelmingly to opponents. Overall, the results of the newspaper analysis pointed to the need for federal regulators and the oil industry to address a number of issues, including the legitimacy of the leasing and development process, the public's concern that decision makers remained insensitive to local concerns, and the weakness of appealing to national energy policy to justify local offshore development.

The local response to offshore oil development was also institutional, with implications for onshore oil activity as well. In 1974, for instance, Santa Barbara county created the Office of Environmental Quality. Along with the Environmental Studies Program at UCSB, it served as a source of expertise on the environmental impacts of proposed projects. In 1977 the office was elevated to department status and renamed the Department of Environmental Resources. In 1981 it merged with the Planning Department to become the Department of Resource

[51] For a description of a hearing on a draft EIS that was held in Ventura, see Chevron (1983b). This hearing concerned lease sale 80, which was slated for February 1984, but which was delayed until October.

Management, which became the Department of Planning and Development in 1991. In 1983 Santa Barbara county created an energy division within the Department of Resource Management, with oil development fees financing its operations (SB I: 70–71).

The establishment of these agencies constituted an organizational response to the volume of projects that oil companies were proposing during the 1970s and 1980s. As Lima and Woolley (1991) observed, the desire on the part of the county to consider these projects in detail created an "agenda glut" for the board of supervisors and the planning commission. Thus the budgets and staff at the energy division and other new agencies grew significantly over time.

Between 1975–85, these agencies established a regulatory regime that limited new and expanded onshore industrial plants to six coastal canyons that hosted oil and gas facilities. As Lima (1994: 397–399) observes, county officials acceded to onshore facilities that they could control, rather than have operators use offshore storage and tankering facilities over which they had no control. During this period, seven offshore platforms were constructed under this regime—seven too many, in the minds of many residents and citizens' groups (SB I: 69–75).

No such institutional apparatus was set up in Ventura county (and the Santa Maria district's supervisors opposed the Santa Barbara measures). However, from the late 1970s, Ventura county abandoned so-called blanket permitting of onshore drilling projects in favor of more restrictive measures. In 1976 the county began limiting the duration of conditional use permits for oil well drilling to fifty years—down from perpetuity. As of 1983, all new permits were subjected to a set of specific conditions and general guidelines, regarding such items as the minimization of drilling sites, the concealment of oil rigs and related equipment, and the reduction of noise levels. Existing permits were unaffected. Oil permits were also subject to revocation and modification, based on findings of compliance staff or complaints from citizens. Moreover, under the CZMA, all oil development along the coast was subject to oversight from the California Coastal Commission. The county's Air Pollution Control District also gained jurisdiction over onshore permitting. Though it had no authority over federal OCS development, the APCD also successfully lobbied Union to use electrical, rather than diesel, power on platforms Gina and Gilda, and achieved a lower-emission compromise with Chevron regarding the powering of Platform Gail (VC II: 6.2.2–6.2.4).

During the 1980s, many California coastal communities took measures that restricted the building of onshore oil infrastructure. Indeed, by 1990 twenty-seven polities had done so. In November 1985 the Santa Barbara county board of supervisors sponsored Measure B, which limited new onshore construction to two south-county coastal sites, encouraged pipeline, rather than tanker, transportation, and enhanced air pollution control standards. It passed by an 80 percent to 20 percent margin. At the same time, a more expansive and restrictive Measure A failed by a margin of 62 percent to 38 percent. In the context of a stalled state of California effort to negotiate with the Interior Department and oil industry representatives regarding selected areas that might allow offshore leasing, a Santa Cruz, California citizens' group, Save Our Shores, began organizing other coastal communities to resist oil industrialization. The group drafted six local and six county initiatives for the November

1986 ballot. Nine California coastal communities, including San Luis Obispo, which were keen to avoid the protracted rearguard actions that engaged Santa Barbara county, approved preemptory measures. They included policies that banned onshore infrastructure projects, required a vote for such construction, or delayed construction pending decisions regarding permanent bans (Sollen 1998: 168–171).

In San Luis Obispo county, voters approved Measure A by a 53 percent to 47 percent margin, even though the oil industry outspent supporters of the measure tenfold. The measure was a direct response to the lobbying by Cities Service for onshore processing facilities at Nipomo to support its Platform Julius project. By requiring voter approval for the building of onshore support infrastructure, Measure A employed local authority over land use to thwart such industry and federal government initiatives. In June 1988 San Luis Obispo county voters rejected three initiatives put forward under Measure A by the board of supervisors with respect to processing facilities in support of Platform Julius, now promoted by Shell, effectively killing the project (SLO I: 87–91).

For its part, Santa Barbara adopted an integrated plan in 1987 that permitted the oil industry to construct new onshore facilities in two locations. Eight existing plants were frozen at their originally authorized level of production, thereby locking in a decline in their usefulness to operators. In the early 1990s, the county moved to phase out these plants through re-zoning. Plants could be maintained, but not altered or replaced. In 1996, Santa Barbara county adopted an initiative similar to San Luis Obispo's Measure A. In contrast, neither Ventura county nor any of the communities within it adopted any measures restricting the building of onshore infrastructure in support of offshore development (Sollen 1998: 168–171).

In 1987 the Western Oil and Gas Association sued thirteen polities, including San Luis Obispo city and county, alleging that, in preventing the Interior Department from carrying out federal energy policy, these measures were unconstitutional. In 1988 a U.S. District judge dismissed the petition. In 1991, the U.S. Supreme Court confirmed the decision, giving California cities and counties the authority to restrict the construction of onshore support facilities (SLO I: 89; Sollen 1998: 168–171).

Tri-County Field Development

In terms of output alone, the attractiveness of tri-county area declined relative to other areas of the state during the environmental era. After 1962, when California's output reached a nineteen-year low, state and tri-county production (excluding federal OCS activity) diverged. California production attained record highs in 1968, and again in 1985. Reflecting the maturity of its onshore fields and the flush production of its state offshore fields, local production gradually declined from 1962–85, despite enjoying temporary rebounds in production in selected fields.

State production revived and set a new high in 1968 of 373.2 million barrels. On the strength of deep pool discoveries and steam injection projects in four gigantic fields in Kern county

and the development of offshore fields, state production revived (*Oil and Gas Journal* 1967c; *Oil and Gas Journal* 1967d). Indeed, offshore output was a significant part of the revival, increasing 128 percent from 1958–67, to an average of 177,554 b/d, or 18 percent of the state total. East Wilmington and Huntington Beach fields in the Los Angeles basin were by far the largest producers (Armstrong 1966; *Oil and Gas Journal* 1968; California Division of Oil and Gas 1969). After declining to 306.3 million barrels by 1974, state production responded to the exploration and development work that the price increases associated with the oil crises of 1973 and 1978–79 generated. The expansion of secondary and tertiary recovery projects, particularly steam injection in Kern county's fields, and the development of new fields, enabled California production to hit a record 423.9 million barrels in 1985 (California Division of Oil and Gas 1976: 1–3; California Division of Oil and Gas 1982b: 36; California Division of Oil and Gas 1987: 1–3).

In contrast, tri-county production overall gradually declined from 1962–85 even as operators invested heavily in developmental drilling and secondary recovery projects. However, during the late 1960s and early 1970s operators maintained or increased production in several major fields and dramatically increased production in a number of old ones. After 1974 secondary recovery methods and new drilling activity could not maintain the production in the area's increasingly mature fields. Thus, while California output overall responded positively to the real price increases of the 1970s, tri-county production did not. Operators deployed the latest technologies in an effort to sustain production. Yet even before the price collapse of 1986, the tri-county area was in transition to an extractive region of secondary rank, as operators sought greater returns in more promising areas elsewhere.

The utilization of secondary recovery methods, coupled with more intensive rework, redrilling, and development efforts reversed declines in production in the Santa Maria and Ventura districts, and significantly boosted production in the Arroyo Grande field, the only productive field in the San Luis Obispo district. From the mid-1960s, operators implemented waterflooding projects in several fields. By 1975 operators were employing cyclic steam, steam flooding, and gas stimulation techniques as well. By the early 1970s, secondary recovery accounted for almost one-quarter of the production of the coastal region (Richardson 1972). Operators also reworked and redrilled existing wells in many of the districts' maturing fields. Finally, firms began new developmental drilling programs in selected fields. As a result, the industry stemmed the steady decline in production that began in the mid-1950s.

In the Ventura district, output increased in three of the four years between 1969–72. At 23.8 million barrels in 1972, district production was up ten percent over 1968. Thereafter operator efforts yielded diminishing returns and generally failed to overcome the natural decline of the district's fields. For instance, although production increased in twenty of the district's fields in 1975, only in the San Miguelito field, where Continental engaged in an extensive developmental drilling campaign, was production up significantly. Thus operators made their greatest gains in boosting production before the oil crises of the 1970s spurred real prices in crude oil prices, suggesting that advances in secondary recovery methods was a factor motivating operators. District production overall declined three percent even as state production began a decade-long ascent that peaked in 1985. Even so, the level of oil activity

during the 1970s and early 1980s was significant, and was reflected in the number of oil and oil service firms that continued to operate in the district (California Division of Oil and Gas 1962: 86–87; California Division of Oil and Gas 1967: 83–85; California Division of Oil and Gas 1969: 13–14, 44–46; California Division of Oil and Gas 1970: 13–15, 44–46; California Division of Oil and Gas 1971: 17–19, 46–48; California Division of Oil and Gas 1972: 23–26, 62–64; California Division of Oil and Gas 1973: 29–31, 80–82; California Division of Oil and Gas 1976: 24–26; California Division of Oil and Gas 1985: 14–15).

Field responsiveness to these efforts varied. At Rincon, for instance, operators boosted production from four million barrels in 1961 to 4.66 million barrels by increasing the productivity of individual wells: only 317 wells were producing in 1972, as opposed to 353 wells in 1961. Continental increased production at San Miguelito field from 855 thousand barrels in 1970 to 2.4 million barrels in 1980. Shell and others used a combination of approaches to increase production at Ventura from 8.2 million barrels in 1968 to 11 million barrels in 1974.

Ojai and Sespe, two of the oldest fields of the Ventura "backcountry," recorded the most impressive responses to developmental and secondary recovery work. By 1961, production at each of these fields had fallen below 250,000 barrels annually. The efforts of independents Imperial Oil and Gas (later Argo Petroleum), Central Lease, and Eastern Interior Oil helped to increase production at Sespe from 271,000 barrels in 1964 to just over two million barrels in 1969—making it one of only four fields in the district to top one million barrels for the year (Dosch 1968). Output in the field peaked the next year at 2.6 million barrels. At Ojai, Argo's program increased production to 1.2 million barrels in three years, after output had declined to 141,000 barrels by 1970. Thereafter the firm maintained the field's production, which was still 1.3 million barrels in 1984 (Basenberg 1998). In all, according to well records kept at the California Division of Oil and Gas's district office in Ventura, Argo drilled seventy developmental wells in Ojai field and 133 wells in Sespe field from 1968–86.

Not all fields responded positively to the additional investments of operators. Production at Fillmore, Oxnard, South Mountain, and Saticoy declined significantly during this period. Indeed, Fillmore field was abandoned in 1973. (It was reopened in 1980.) At Oxnard, where production declined 85 percent from 1961–74, to some 375,000 barrels, secondary recovery efforts failed to reverse the decline.

Operators employed similar approaches in the Santa Maria district, with corresponding results. At Cat Canyon field, for instance, a combination of developmental drilling, waterflooding, steamflooding, and steam injection increased production from 3.9 million barrels in 1961 to 7.9 million barrels in 1967. Operators achieved similar results at other fields in the district, including Casmalia, where production tripled from 1961–65; Orcutt, where Union-led efforts increased production from 899 thousand barrels in 1961 to 2.5 million barrels in 1967; and Santa Maria Valley, where a combination of waterflooding and developmental drilling boosted output from 1.3 million barrels in 1968 to 3.6 million barrels in 1974 (California Division of Oil and Gas 1962: 86–87; California Division of Oil and Gas 1966: 95–96, 151–152; California Division of Oil and Gas 1968: 17–18, 48–49; California

Division of Oil and Gas 1969: 15–16, 48–49; California Division of Oil and Gas 1970: 16–17; California Division of Oil and Gas 1972: 27–28, 66–67; California Division of Oil and Gas 1975: 39–40, 85–87).

From 1974–85, however, secondary recovery and developmental drilling efforts were barely sufficient to overcome the natural decline of the district's fields. Except for a slight increase in 1977, production in the Santa Maria district gradually declined, even as California production climbed steadily. Still, production held up better over this period than it did in the Ventura district, and demonstrated the ability of technology and ongoing investment on the part of operators to extend the life of an extractive region.

Exploration played only a minor role in operators' upstream activities. Indeed, onshore prospecting had all but ceased by 1972 (see figure 6). Most operators apparently agreed with the 1961 conjecture of one firm's district superintendent that "the major deposits have been discovered" and that all that remained for operators to do was to produce crude oil from known reserves (Quoted in *Ventura County Star-Free Press* 1961). Exploratory work by independents discovered several minor fields, but they contributed little to the tri-county area's output.

At the same time, several fields discovered in state waters were abandoned after only a few years of production, including Coal Oil Point, Conception, and Cuarta. Of the producing fields developed from 1958–70, only Carpinteria and South Elwood maintained significant levels of production through 1985. Indeed, as noted, tri-county tidelands production had already peaked in 1964, at 8.9 million barrels. By 1984 output from these fields had declined to 4.9 million barrels, well below the 7.7 million barrels produced in 1968, the year before the oil spill. On the strength of South Elwood's output, however, production levels for the Santa Barbara district increased during the early 1980s (see figure 11).

By the early 1980s, the development of federal OCS leases held the only potential growth possibilities for the oil industry. Yet sustained, effective state and local opposition limited the development of many of the tracts let by the Interior Department. Moreover, ongoing offshore production remained locally contentious and highly regulated, imposing costs that only high prices for crude oil could justify.

Industrial Activity

Rising demand for petroleum products and technological advances that sustained production levels in maturing fields produced a correspondingly stable structure of oil well operators from 1966–85 (see figure 7). As figure 8 shows, the number of majors and large independents was slightly lower than the 1945–65 period, as a "second generation" of large independents replaced the "first generation" firms that the 1960s merger movement eliminated. Among large firms, the proportion of companies that maintained their headquarters out of state and in the Los Angeles basin remained high (see figure 9). The number of large firms based locally remained low, and the number of non-Los Angeles-based California firms dwindled

proportionately. Among small independents, the proportion of tri-county based firms increased, as the number of Los Angeles-based firms declined slightly (see figure 10). Among all operators, however, stability in terms of the numbers, types, and locations of the firms that were active in the area was the outstanding feature of the industry structure for this period.

Seven majors continued to dominate tri-county oil activity, especially if federal OCS activity is taken into account. With Getty's acquisition of Tidewater, the number of majors fell by one. However, with the installation of Platform Hondo, Exxon became a leading coastal producer. Further, a "second generation" of large independents joined the remaining "first generation" independents, including Aminoil (formerly Signal), Continental (Conoco), Getty, Occidental, Pyramid, Santa Fe Energy (formerly CCMO), and Superior, to compete with the majors. Founded in the 1960s or 1970s, the "second generation" included Los Angeles-based firms such as McFarland Energy, Argo Petroleum, McCulloch Oil and Gas, and Petrominerals, and out-of-state companies, such as Husky Oil of Denver, Coastal Corporation of Houston, and Home-Stake Oil and Gas of Tulsa. The oil and natural gas subsidiaries of large, diversified conglomerates such as Tenneco, Celanese Corporation, and W.R. Grace also operated in the tri-county area during this period. All of these firms considered the tri-county area's reserves to be economically attractive during a period of rising real prices. At the same time, none of the "second generation" firms displaced any of the majors, either at the state or tri-county levels. Moreover, they also did not achieve the results of the leading "first generation" independents.

As the case of Argo Petroleum suggests, however, low barriers of entry and high demand for petroleum products enabled new entrants to establish themselves as operators in a mature extractive region. Argo began in the early 1960s as Imperial Oil and Gas, a Santa Monica partnership. Headed by Morris Frankel, the firm's business model entailed reviving production in maturing fields. Through Cecil Basenberg, Imperial acquired a lease in the Sespe field from Commander Oil (Basenberg 1998). As noted, the firm's developmental drilling program substantially increased the output of both Ojai and Sespe fields. By December 1970, Imperial's California assets included sixty-four producing wells, thirteen of which were in the Ventura district. Its output averaged 2,244 b/d, making the partnership California's twenty-fifth largest producer (Conservation Committee of California Oil Producers 1971).

In 1971, the partnership amalgamated assets to form Argo Petroleum. As Basenberg, now vice president, put it, "the timing was good" in terms of oil prices for what Argo wanted to do: drill wells in the Sespe and Ojai fields. To design and execute these projects, the firm created a department of some thirty geologists and engineers, which Basenberg headed. In all, Argo employed about 120 people during the 1970s (Basenberg 1998). As table 11 shows, by December 1980 Argo was California's twenty-sixth largest producer. Among tri-county producers, Argo ranked fourteenth (see table 12).

In both absolute and relative terms, large independents overall did well at the state and local levels between 1965–80, increasing their share of California's producing wells and output of crude oil to 51.6 percent and 57.3 percent, respectively, up from 26.2 percent and 31.2 percent

in 1965 (see tables 11 and 12). Of course, Getty's purchase of Tidewater was a significant factor in this increase. At the same time, the share of the state's producing wells and production operated by the major firms declined to 40.3 percent and 40 percent, respectively, down from 53.3 percent and 61.7 percent in 1965 (see table 11). At the tri-county level, majors retained less than half of the production, down from slightly more than three-fourths in 1965 (see table 12). The years 1965 and 1980, however, do not adequately reflect the effect of federal OCS activity on the tri-county structure of industry. The former year misses the period of expansion in federal OCS production from 1968–71, and the 1980 marked the beginning of a second expansionary period. Hence tables 11 and 12 miss the effect of OCS activity, which favored well-capitalized majors.

Table 11. Leading California Crude Oil Producers, 1980

	Average Producing Wells	Percentage Production (b/d)	of State Total
1. U.S. Navy	1,112	128,241	13.2
2. Chevron Corporation	6,625	127,942	13.1
3. Getty Oil Company	5,637	114,383	11.7
4. Shell Oil Company	3,646	84,153	8.6
5. City of Long Beach	774	71,505	7.3
6. Kernridge Oil Company	3,053	49,083	5.0
7. Mobil Oil Corporation	2,268	43,304	4.4
8. Texaco	1,144	43,224	4.4
9. Union Oil Company	1,861	42,240	4.3
10. Santa Fe Energy Company	2,264	28,035	2.9
11. Atlantic-Richfield Oil Company	958	25,814	2.6
12. Aminoil	424	24,726	2.5
13. Sun Exploration & Production Company	546	20,344	2.1
14. Tenneco Oil Company	753	20,086	2.1
15. Gulf Oil Company	1,192	14,081	1.4
16. Champlin Petroleum Company	105	13,026	1.3
17. Exxon Corporation	299	12,941	1.3
18. Conoco	374	12,866	1.3
19. Superior Oil Company	125	5,945	0.6
20. Occidental Petroleum Corporation	179	5,846	0.6
21. Berry Companies	745	4,934	0.5
22. Phillips Petroleum Company	49	4,714	0.5
23. Petro-Lewis Corporation	519	4,322	0.4
24. Husky Oil Company	72	2,975	0.3
25. Grace Petroleum Corporation	358	2,746	0.3
26. Argo Petroleum Corporation	135	2,719	0.3
Total Seven Major Companies (Atlantic Richfield, Chevron, Exxon, Mobil, Shell, Texaco, Union)	16,801	389,618	40.0
Larger Independent Companies	21,484	557,735	57.3
All Other Companies	3,399	26,658	2.7
Total California	41,684	974,011	100.0

Note: Production includes unit interests and federal OCS operations. Number of wells includes only company-operated wells and joint operations.

Source: Conservation Committee of California Oil Producers 1981

Table 12. Leading Tri-County Oil Producers, 1980

	Producing Wells	Production (Mbbls)	Percentage of Tri-County Total
1. Union Oil Company++	966	6,648	14.7
2. Getty Oil Company	295	5,835	12.9
3. Shell Oil Company	459	4,971	11.0
4. Conoco	323	4,107	9.1
5. Mobil Oil Corporation	120	3,069	6.8
6. ARCO Oil and Gas Company#	424	2,681	5.9
7. Texaco**	305	2,679	5.9
8. Chevron USA	225	2,208	4.9
9. Phillips Petroleum Corporation	49	1,722	3.8
10. Gulf Oil Exploration & Production Company	54	1,577	3.5
11. Santa Fe Energy Company	393	1,472	3.3
12. Sun Exploration & Production Company	58	1,408	3.1
13. Husky Oil Company	72	1,089	2.4
14. Argo Petroleum Corporation	124	960	2.1
15. Superior Oil Company	33	813	1.8
16. Grace Petroleum Corporation	164	723	1.6
17. Marathon Oil Company	12	586	1.3
18. Hunnicutt and Camp Drilling Company	16	307	0.7
19. Aminoil USA	20	275	0.6
20. Exxon Company USA##	34	196	0.4
21. Lloyd Corporation	10	176	0.4
22. Gato Corporation	22	130	0.3
23. Cabot Corporation	20	96	0.2
24. Chase Production Company	13	76	0.2
25. McFarland Energy	27	46	0.1
Total Seven Major Companies (ARCO, Chevron, Exxon, Mobil, Shell, Texaco, Union)		22,452	49.8
Total Tri-County Region		45,097	

Notes: Federal OCS production included. Production totals apportion unit interests; producing wells pertain to operated wells only.
For unit operations in which for operated unit, net wells calculated to equal to 80 percent of gross wells in the unit; otherwise, unit operations not factored into producing well total.
++ : Well total includes 15 wells operated as unit operator in South Mountain field and 76 wells operated as unit operator in Santa Maria Valley and Orcutt fields.
# : Well total includes 202 wells operated as unit operator in Cuyama South and Russell Ranch fields.
** : Well total includes 32 wells operated as unit operator in Shiells Canyon field.
: Well total includes 11 wells operated as unit operator in South Mountain field.

Source: Conservation Committee of California Oil Producers 1981

Small independents fared the worst from 1965–80, accounting for only 8.1 percent of the producing wells and 2.7 percent of output statewide in 1980. Fewer than seventy small independents had production in 1980, and only eight had production of 25,000 barrels or more (Conservation Committee of California Oil Producers 1981). Facing a diminished number of opportunities, most small firms choose to develop or maintain existing producing properties. Many operators sold their assets to other small operators who were better positioned to invest in developmental programs, creating opportunities for the latter to accumulate a portfolio of

properties. Through lease acquisition and developmental drilling that tapped underexploited reserves in known areas, the most aggressive small entrepreneurs aimed to build firms whose output typically ranged between 100 b/d and 1,000 b/d. However, only a few succeeded (Clawson 1998; Richardson 1998; Simonson 1998).

Kenneth H. Hunter, Jr., for instance, built upon his father's success by creating a number of vehicles through which he promoted and executed deals that contributed production to a portfolio that ranked him forty-ninth among California producers in 1990 with an average production of 466 b/d. In addition to buying, operating, and selling numerous properties, Hunter on average undertook two or three drilling projects annually. During the 1980s, Hunter, who operated as a proprietor and as a principal in several partnerships, began to transfer his properties to his Hunter Living Trust, a process that he completed during the 1990s.

As the list of the ninety-seven tri-county operators with production in 1980 shows, many more small firms adopted a conservative position, operating the producing wells that they operated in 1965, albeit at lower levels of output. For example, the Ojai Oil Company, which had operated in Ventura county from 1900, did little to expand either production or operations. In the early 1980s, company president Ted Off conducted his own study of small firms that operated locally from 1960–80 and found that all but two or three had gone bankrupt. He calculated that it would require at least $10 million to undertake a drilling program that would have an acceptable chance of success. Concluding that the nature of the business was such that a small entrepreneur realistically could expect to make one big find and profit from it until production diminished and firm folded, Off decided that further investment in oil exploration and production was too risky a venture for a firm of Ojai's size. Therefore, while the firm continued to produce oil from eleven wells—9,034 barrels for the year, down from 10,742 barrels in 1965—Off invested the firm's capital in self-storage facilities (Off 1998).

In similar fashion, Lloyd Corporation remained content to operate its existing wells, while it reinvested earnings in commercial property development. As of 1970 the firm was no longer one of California's top twenty-five producers. At the end of the 1970s, Lloyd began to exit the industry as an operator. In October 1978 it transferred most of its Ventura wells to Getty. By December 1980, the firm operated twenty-one wells, ten of which were producing crude oil. Its output for the year averaged only 479 b/d, 418 b/d of which came from its unit interests in the Ventura field (see table 12). With the May 1983 transfer of its Oxnard wells to Chevron, the firm no longer functioned as an operator. Though the firm focused on commercial property development, however, it retained a royalty and working interest in the Ventura field properties that it transferred to Getty (Conservation Committee of California Oil Producers 1971; Conservation Committee of California Oil Producers 1981; Clawson 1998).

In the early 1980s, the oil industry was whipsawed by a rapid shift in the economic signals that guided business decision making. Spurred by the 1979 oil crisis associated with the Iranian revolution, and aided by crude oil price deregulation in 1981 by the Reagan administration, oil activity nationwide surged in 1980–81. The average for crude oil reached $31.77 per barrel: a tenfold increase in a decade. In 1979–80, oil industry revenues were up 56

percent. Operators reevaluated many projects that were previously economically marginal (Olien and Olien 1984: 142–143). In 1981, at the peak of the boom, banks and drilling funds invested $22 billion in the oil industry (*Business Week* 1985). Just as quickly, conditions reversed themselves, plunging the industry into disarray. With recession and a slump in oil prices came restructuring, mergers, and bankruptcies. Between 1982–85, a quarter of the nation's independents sold their producing assets, went bankrupt, or were acquired (*Economist* 1986a).

Though operators enjoyed real increases in prices during the 1970s, they also faced higher operating, regulatory, and financial costs. Owing to inflation and competition for scarce resources, the average cost of services and equipment doubled from 1974–76, and then increased annually at a 33 percent rate from 1976–79. Costs varied by region and type of project, but these constituted substantial cost increases when set against the 6.3 percent annual increases of the decade prior to 1972. The cost of leasing land also soared, as majors, applying their capital budgets to U.S. exploration and production, spent millions of dollars on leases, bidding up prices. Further, the typical duration of a lease shortened from five to three years, and royalties rose from one-eighth or one-sixth to three-sixteenths or one-fourth. Interest rates also soared. The prime lending rate increased from 10.81 percent in 1974 to 18.87 percent in 1981. Independents bore the brunt of these costs, often borrowing at one-to-four percent over prime, with the requirement that they keep up to 20 percent of the loan on deposit. Many independents accepted the higher costs, feeling that sustained higher crude oil prices would justify the expense (Olien and Olien 1984: 144–146).

At the same time, federal and local regulation of the oil industry increased. By 1980 there were more than fifty federal land-use acts that impacted onshore operations. Additional regulations applied to drilling on federal lands (Bradley 1996: 296–303). Whereas the oil industry spent less than half a billion dollars in 1966 to comply with environmental regulations, it spent more than $4.5 billion in 1982 (VC II: 6.1.9 [figure 6.1.1]). As noted, operators also faced increased regulations and permitting conditions at the county level. In this respect, the restrictions put on offshore activity had "spillover" effects on terrestrial operations. Regimes varied by jurisdiction, but the trend across the tri-county area was toward greater stringency, even in Ventura county. The effect on existing properties was often minimal. However, regulations increased the cost of producing crude oil across the tri-county region. New projects were subject to much a stricter permitting process that often required operators to mitigate the environmental impacts of their projects.

Changes in federal tax policy also reduced profit margins for operators. The 1980 windfall profits tax on crude oil production (which actually applied to income rather than profits), reduced the capital available for upstream operations and, since it was extremely complicated to assess and calculate, encumbered operators with significant—up to 25 percent—increases in record keeping and staff expenses. Thus, despite the increase in crude oil prices, after-tax profit margins, even before the boom ended, were little or no better than they were during the disappointing 1960s (Bradley 1996: 319–331; Olien and Olien 1984: 146–149). From 1969–86, the federal tax code also steadily reduced or eliminated depletion allowances and deductions for intangible, mostly variable, drilling expenses. Exemptions for independents

remained in place during this period, so that even though taxes on all oil operations increased, majors were hit hardest by the changes (Bradley 1996: 332–343).

The federal government also tinkered with crude oil prices. Under the Economic Stabilization Act of August 1973, crude oil fell into four categories: "old" oil that was in production as of 1972, "released" oil (oil from old reservoirs produced in excess of 1972 production), "stripper" oil, and "new" oil. Only "old" oil was price-capped under the act. Later in the year, under the Emergency Petroleum Allocation Act, the cap on "old" oil was increased. The 1976 Energy Policy and Conservation Act (ECPA) folded "old" oil and "released" oil into a "lower-tier oil" category. Both "new" and "stripper" oil became "upper-tier" oil, the price of which was regulated. Six months later the Energy Conservation and Production Act deregulated the price of "stripper" oil, which by 1977 was fetching $14 per barrel. Other upper-tier oil retained a ceiling of $13 per barrel. Lower-tier crude oil was held to an average of $5.25 per barrel. Well completions and wildcatting subsequently fell. However, the price caps of the ECPA lasted only forty months. During 1980–81, wildcatting surged, for the reasons noted, exposing independents to the changes in market conditions that followed (Olien and Olien 1984: 141–143).

The merger movement of the 1980s had a significant effect on the ownership of tri-county producing assets. At the state level, mergers yielded unprecedented concentration in producing assets, owing to the fact that the most significant mergers combined some of California's leading firms. Texaco's $10.1 billion acquisition of Getty in January 1984, Mobil's purchase of Superior for $5.7 billion in May 1984, and Chevron's $13.2 billion acquisition of Gulf in June 1985 concentrated local producing assets in the hands of major firms. Other deals, such as DuPont's $7.6 billion acquisition of Conoco in August 1981, simply meant a change in ownership.

Equally significant, by 1985 the tri-county area was making the transition from a primary to a secondary extractive region. Offshore projects were going forward, but it was unclear whether new leasing would take place. Federal OCS activity excepted, the potential returns that majors could earn on their continued investment in the area's fields were diminishing. The size of the local industry was diminishing, along with the decline in exploration activity and production levels. As a result, majors began to reduce their tri-county presence. For instance, Bush Oil (formerly Norris Oil) acquired ARCO's Rincon property in 1982. In 1983 Sage Energy of San Antonio acquired Shell's Saticoy and South Mountain properties. The year before, Shell closed its Ventura district office, consolidating its operations in Bakersfield. Still, before the collapse in oil prices in 1986, which accelerated the decline of the region and prompted the majors to leave the area, the structure of the tri-county industry remained similar to prior periods, with half a dozen dominant majors, a couple dozen large independents, and numerous small firms.

Urban Development and Economic Diversification

From the 1960s on, increased urbanization and economic diversification diluted the importance of oil activity to the tri-county area, even in the Santa Maria and Ventura districts. Accelerated urbanization in non-oil producing areas, such as east Ventura county, amplified the trends. The isolated and sparsely populated Cuyama Valley district was an exception. It remained, well, isolated and sparsely populated, and dependent on traditional activities such as ranching and petroleum extraction.

From 1966–85, the suburbanization of east Ventura county accelerated, further shifting relative amounts of economic activity produced in the Ventura district. Fast-growing Simi Valley and Thousand Oaks served not just as "bedroom communities" for Los Angeles, but increasingly as hosts for high-technology and other "clean" businesses. Thousand Oaks, for instance, is home to Amgen, the world's biggest biotechnology company. Ventura county as a whole became increasingly professional and middle-class, with the service sector employing one-fourth of the labor force in 1985. Indeed, Union Oil, as a large landholder in the Simi valley, engaged more in real estate development than in oil extraction in the eastern part of the county.

Ventura county communities also initiated efforts to increase tourism. This proved to be problematic for the city of Ventura, whose principal beach area had been devoted to oil transportation infrastructure facilities and, with the completion of the U.S. 101 freeway in the mid-1960s, was separated from the central business district. In similar fashion, military bases, public utility installations, and industrial port facilities restricted beach access at Port Hueneme and Oxnard. The U.S. 101 freeway, which Reith (1963: 185–186) applauded for its role in reducing residential congestion and improving access to other cities of the Los Angeles metropolitan area, also split the center of Camarillo, much as business and city government leaders initially desired, but later tried to reverse. At the same time, towns such as Fillmore, Ojai, and Santa Paula tried to attract tourists on the basis of their historical and small-town setting. Ojai, historically a cultural and spa destination for the affluent and artistically minded, achieved the best results among these communities. Fillmore, Santa Paula, and other towns of the Santa Clara valley continued to depend on agriculture. Relative to the towns and cities of the Conejo and Simi valleys, these towns lagged in terms of income, population growth, and educational levels (VC I: 50–78; Molotch, Freudenburg, and Paulsen 2000: 800–803, 808–809).

The oil industry remained a significant part of the county's economy, offering perhaps better evidence of the boom that the Ventura district was experiencing than production figures alone. The number of wage-paying jobs in mining and petroleum, for instance, increased from 1,938 in 1970 to 4,118 in 1985, according to the Regional Economic Information Service. The Ventura county oil and gas direct payroll tripled from 1969–85, to $125 million. Other, more labor intensive, sectors grew faster. Hence, in 1985 the extractive sector made up only two percent of the county's employment, up from one percent in 1970. However, the ratio of wage-paying jobs in the extractive sector to the hospitality and tourist sectors was relatively stable, fluctuating within a range of 75 percent to 90 percent. Further, the oil industry did

better than agriculture, which fell from eight percent to three percent of the economy from 1970–85, and the federal government sector, which fell from fifteen percent to seven percent. Property taxes on oil and gas mineral rights reached $13.4 million in 1985, up from $7.6 million in 1977, which kept the oil industry the county's largest property taxpayer (VC I: 53–56; VC II: Section 2.2).

During the environmental era, Santa Barbara continued along its distinct urban development path. Its increasingly educated, professional, and environmentally minded citizens preserved its central core, that is, State Street and the waterfront, in a way that drew residents together and attracted tourists. Unlike Ventura, the city of Santa Barbara delayed the coming of the U.S. 101 freeway throughout the 1970s and 1980s, rejecting a number of Caltrans (California's department of transportation) proposals as damaging to the waterfront and central business districts before compromising on a 1986 proposal to construct a partially raised freeway that allowed State Street to retain its access to the beach (Molotch *et al.* 2000: 809–812). The city council and residents also rejected the qualitative growth model that Thomas Storke and other business leaders had supported, in favor of no-growth initiatives.

In contrast, during the 1970s, Santa Maria replaced its historic downtown district with a modern shopping center. The redevelopment plan met little resistance, but the bid for urban renewal failed to generate the commerce that local business and political leaders expected. None of the displaced and relocated local businesses survived. Moreover, the project created a "weak" civic space relative to San Luis Obispo and Santa Barbara. As the researchers who authored SB I observe, this is important, as the factors that make up a locale interact to determine the character of a place. Civic events happen in Santa Maria and surrounding communities, for instance, but they are much more dispersed than in Santa Barbara (SB I: 94–97).

Given its county level of analysis, SB I did not provide a richly textured description of the relationship between oil and the communities of the Santa Maria district during the oil boom. Certainly it is inaccurate to characterize the period from 1966–85 as a period of decline simply on the basis of production figures. From 1978–85, Santa Barbara county tax revenues from both onshore and offshore oil production and the construction of support facilities surged (from less than $1.5 million to $12.6 million overall), suggesting that the oil industry increased in importance during the 1970s and early 1980s, in line with state, national, and international trends. However, for reasons already noted, the gradual decline in production from the peak period of the 1950s administered no shock to the local economy. Vandenberg air force base continued to have a significant presence and influence in the economy of north Santa Barbara county. Retirees, both military and civilian, constituted an increasing part of the population. At the same time, the Santa Maria district, like the Oxnard plain and the Santa Clara valley in Ventura county, remained heavily invested in agriculture. During the 1980s, vintners began to establish a wine making sector, which has proved to be a successful and rapidly growing specialty trade, and one that adds additional value by attracting tourists.

By the 1960s, tourism was becoming a driving factor in the economy of San Luis Obispo city and county. The Hearst Corporation's donation of Hearst Castle to the state of California in

1958 brought national attention to the county as a tourist destination, and was a key factor spurring the growth of nearby coastal communities. The completion of the Pacific Coast Highway in 1964 enabled tourists access to coastal communities such as Morro Bay. Non-military public employment also surged in the 1960s, with employees valuing highly the area's quality of life and natural amenities. Cal Poly continued to exert a strong influence on San Luis Obispo's cultural, intellectual, social, and economic development. Further, with its construction of its downtown Mission Plaza, the city also rejected the proposal of business boosters to extend the U.S. 101 freeway through the central business district. As a civic space, Mission Plaza preserved and extended San Luis Obispo's character as a scenic, small town (SLO I: 39–45).

During the environmental era, San Luis Obispo and other communities, such as Morro Bay and Pismo Beach, also in the southern part of the county, developed significant economic, social, and cultural interests in the area's scenic and recreational amenities. As retirement communities and tourist towns, they opposed industrialization, including the kind that accompanied offshore oil activity. Even working class towns such as Nipomo and Paso Robles, with relatively high unemployment, relatively low educational levels, and affordable housing, increased their dependence on tourism. Several communities, such as Arroyo Grande and Atascadero, developed into middle-class suburbs. They especially attracted public employees and their families, who subsequently acted to preserve the county's small-town life and "unique social amenities," such as undeveloped hillsides, vineyards, and old growth trees—artifacts of an idealized rural past (SLO I: 50–62)

The city of San Luis Obispo maintained its dominant influence on county politics. As a middle-class suburb, a tourist town, and a retirement community that developed independently of oil activity and the influence of the oil industry, it attracted residents who were keen to preserve the city as a distinct geographical, cultural, and social place. Quality of life emerged as an important issue for a critical mass of residents, including small business owners. With it came strong opposition to economic and industrial "forces" that could threaten the character and economic base of the city (SLO I: 62–65).

Part III. Decline and Other Recent Developments, 1986–2001

The "Crash of '86," during which crude oil prices collapsed to $9–10 per barrel, broke the stasis in local production and industry structure that prevailed during the environmental era. With it, the industry in the tri-county and, indeed, all of California, entered a period of decline. The decline along California's central coast, however, was relatively steeper than it was for the state overall. Production levels fell in all of its producing districts, as it was no longer cost effective for companies to commit resources to maintaining production levels in the region's mature fields. Moreover, there was little opportunity to expand offshore operations. Majors that had spent much of the 1970s diversifying their businesses were now restructuring their operations to refocus on their core businesses. The "Crash of '86" also eliminated many large independents and oil and gas subsidiaries of non-oil industry conglomerates. When market conditions improved in 1988, majors refocused their resources on areas that promised much higher returns than the tri-county region could offer. In doing so, they accelerated a process of withdrawal that increasingly left the area's onshore and offshore reserves in the hands of "third generation" large independents—a process that continues at the present.

During the second half of the 1990s, the offshore oil industry boomed worldwide. In the context of falling domestic production—from 7.4 million b/d in 1990 to 5.9 million b/d in 2001 (Easterbook 2001a), increasing demand, and higher, if highly unpredictable, oil prices, oil and oil service companies invested billions of dollars in the search for oil. Worldwide oil consumption stood at 75 million b/d worldwide in 2000, and was rising at a rate of two percent annually (Easterbrook 2000). Americans were now using 875 gallons of gasoline annually per licensed driver (Easterbrook 2001b). Remarkable advances in technology have enabled operators to find and produce oil in the deep waters of the Gulf of Mexico and elsewhere to meet this demand. Tools, such as horizontal drilling, 3-D and 4-D modeling of reservoirs, and real-time monitoring of producing wells, have also made possible the extension of the life of mature fields and promise to double primary recovery rates to 50–60 percent (*Economist Technology Quarterly* 2001).

The third, and final, part of this study focuses in particular on the corporate strategies of the production-oriented large independents that remain active in the tri-county region. It also considers the environmental challenges posed, and the business opportunities created, by the abandonment and remediation of oil fields and storage, transport, and processing sites. Further, it discusses recent technological advances and their implications for the oil industry and the recovery of oil generally. The study closes with a consideration of the possible implications of the intersection of the demand for oil, technological advances, and trends in national energy policy for the life of the tri-county extractive region. It includes a discussion of the expected responses of local communities to proposed expansion in oil activity, offshore activity in particular.

The Decline of the Tri-County Extractive Region

In the wake of the "Crash of '86," the California oil industry faced dire circumstances. For the first time since 1978, California production fell. From a record 423.9 barrels in 1985, output fell to 407.3 million barrels a year later, initiating a trend of gradually declining production that continued into the twenty-first century. Production from onshore fields declined from 354.7 million barrels in 1985 to 307.4 million barrels in 2000. Production was essentially stable throughout the 1990s, however, and even increased slightly during the mid-1990s. With no new exploration activity and little development work, output from state offshore leases declined inexorably, from 34.6 million barrels in 1986 to 18.3 million barrels in 2000. In contrast, production from federal offshore leases fluctuated significantly from 1986–2000. With the completion of a number of much-delayed projects, offshore production from federal leases increased from 28.7 million barrels in 1986 to 72.4 million barrels in 1995. This was sufficient to reverse temporarily the decline in overall production, from 343.7 million barrels in 1993 to 351.3 million barrels in 1995. From 1996–2000, however, federal OCS production declined significantly, to 35.9 million barrels. Declines in the Hondo and Point Arguello fields led the downward trend. As a result, overall California production fell (State of California Division of Oil, Gas, and Geothermal Resources 2001).

With the top five fields in the state in terms of production, and seven of the top eleven overall, the San Joaquin valley remained the top producing region of the state, and the only onshore region that continued to attract significant capital investment from major operators. Four offshore fields—Wilmington, in state waters, and Hondo, Pescado, and Point Arguello, in federal waters—constituted the other leading fields in 2000. Enhanced recovery programs, steam injection in particular, were important elements in the industry's upstream operations, accounting for 59 percent of output statewide (State of California Division of Oil, Gas, and Geothermal Resources 2001).

For the tri-county area, the "Crash of '86," spurred a rapid decline in onshore production. As figure 11 shows, the Santa Maria district experienced the most precipitous fall in output—almost 60 percent in five years. The Ventura district decline was more gradual—some 40 percent in the decade from 1986–95. Across the area's producing districts, many wells were shut-in, and remain so as of 2000. A few onshore and state offshore fields, as well as several storage sites were abandoned. Some of them required extensive remediation, most notoriously Union's Guadalupe field and Union's Avila and San Luis Obispo tank farms in San Luis Obispo county. Public policy continued to stymie the development of offshore leases, and several platforms were removed from the Santa Barbara channel. As of 2000, tri-county production, not including production from federal OCS leases, stood at about one-sixth of its 1953 peak and 38 percent of 1980's output (but it was still 111 percent of production in 1925, the year that the Ventura field boomed).

And as production and prices fell, so did the value of oil assets and, therefore, county revenues from property taxes. In Ventura county, for instance, taxes paid on mineral rights fell from a peak of almost $14 million in fiscal year 1985 to about $5 million in fiscal year 1996. In fiscal year 1998, total property taxes in Ventura county paid by oil firms equaled $6

million. The oil industry paid an average of about one percent of the county's tax revenues during the 1990s, down from a peak of 55 percent in fiscal year 1953. As table 13 shows, only one oil company, Aera Energy, appears among the county's leading property taxpayers for fiscal year 2000. Likewise, revenues from mineral rights and oil-related infrastructure in San Luis Obispo county fell from a fiscal 1985 peak of $1.9 million to about $1 million in fiscal 1996. Owing to offshore development, property tax revenues in Santa Barbara county charted a slightly different path. After falling from a fiscal 1985 peak of $12.6 million to less than $8 million in fiscal 1991, revenues recovered to 1985 levels by fiscal 1996 (SB II, SLO II, VC II: section 2.3).

Table 13. Leading Ventura County Property Taxpayers, Fiscal 2000

	Tax	Net Property Value
1. Amgen	$8,591,624	$821,087,705
2. Southern California Edison	4,929,698	448,075,981
3. GTE California	3,699,986	330,815,551
4. Imation Corporation	2,370,599	215,508,955
5. Proctor & Gamble Paper Products	2,229,048	183,912,744
6. Pacific Bell (including subsidiaries)	1,901,666	171,989,876
7. Aera Energy	1,554,938	146,699,747
8. Oaks Shopping Center	1,334,376	127,175,490
9. Southern California Gas	1,290,726	116,741,680
10. Technicolor Videocassettes	820,072	76,974,749

Note: Aera's tax and net property value includes the Shell California Pipeline Company.
Source: Tax Collector's Office, County of Ventura, Web site, 2001

Majors reduced their tri-county exposure, or left the area altogether. Many "second generation" independents disappeared. Oil prices recovered in the late 1980s, but crashed again in the mid-1990s, only to recover again at the end of the decade. With the exception of the Ventura field and the Santa Ynez OCS Unit, tri-county production at the beginning of the twenty-first century was increasingly consolidated in the hands of "third generation" large independents and a dwindling band of locally based small firms.

Majors brought several federal OCS fields into production, including Sockeye in 1986 (Chevron), Point Pedernales in 1987 (Union), Point Arguello in 1991 (Chevron and Texaco), and Pescado in 1994 (Exxon). These large projects more than doubled production from federal leases in the Santa Barbara channel, to a peak of 69.4 million barrels in 1995. As noted, output slid rapidly thereafter, owing to a combination of flush production, strategic redirection on the part of operators, and regulatory constraints on additional development. As of 2000, production in the Hondo, Pescado, and Point Arguello fields, stood at 11 million, 7.1 million, and 6.6 million barrels, respectively (State of California Division of Oil, Gas, and Geothermal Resources 2001). Overall production at Point Arguello field was especially disappointingly, as Chevron, the operator, reduced its estimates of the field's ultimate recovery from 500 million barrels to 200 million (Trujillo 1998). Still, crude oil production from federal leases accounted for 50 percent or more of the tri-county area's production

during the 1990s, and more than two-thirds as of 2000. In terms of reserves alone, the federal OCS remains the only area of the extractive region that has potential for significant expansion in the future.

The failure to secure environmental permits and to overcome other legal obstacles quashed several other offshore projects, including ARCO's three-platform Coal Oil Point project in state waters, Shell's Platform Julius in the San Miguel OCS field and its Platform Hercules in the Molino (natural gas) state offshore field, and Union's Platform Hayley project in the Point Conception field (Cowan and Hagar 1983; Galloway n.d.; Williams 1988). Harmony and Heritage, installed in 1989, were the last two platforms to be placed in the Santa Barbara channel (Sollen 1998: 253 [Appendix E]). Several fields that were discovered in the 1970s and 1980s remained undeveloped, and thirty-six leases from lease sales 53 and 68 remain undeveloped in the Santa Maria basin (Galloway n.d.; Burns 1997; U.S. Department of the Interior 2001).

However, development activity continued from existing platforms. During 1999 and 2000, operators drilled almost two dozen wells from platforms in the Santa Barbara channel. As discussed below in the section on technological developments, operators used extended-reach technology to drill many of these wells. Advanced technology also came into play with respect to Nuevo's 1997 discovery of the Tranquillon Ridge offshore field.

At the same time, as output declined or ceased in several offshore fields, operators abandoned production and removed platforms. In 1992 Chevron and Exxon ceased production in both Summerland and Carpinteria offshore fields. Chevron, the operator, worked with local, state, and national agencies to dismantle platforms Hazel, Hope, Heidi, and Hilda between 1994 and 1996 (Chevron 1997). The plugging of wells associated with these fields continued through 1998 (Trujillo 1998).

Onshore fields were abandoned or shut-in as well. Two of the oldest producing fields in the Ventura district, Piru and Santa Paula, ceased production in 1994 and 1997, respectively. By 2000, production in the Fillmore field was shut-in, and production in several other minor fields in the Simi Valley area had all but ceased. For environmental reasons, Guadalupe field was shut down in 1994, after a "whistleblower" called regulators' attention to the leaking of petroleum and diluent into the Guadalupe and Nipomo dunes (Beamish 2000; Beamish 2001). Still, as of 2001, all of the area's major fields were still producing oil. Production in the Ventura field, which fell from 7.4 million barrels in 1986 to 4.56 million barrels in 2000, remained large enough to retain the investment of majors Shell and Mobil (now ExxonMobil), operating as of 1997 as Aera Energy. Indeed, the field accounted for one-third of the region's output (federal OCS production excluded), enabling Aera to retain the top position among tri-county operators.

As in earlier periods, production from the region's mature fields remained responsive to operator investment and activity, which in turn the price of crude oil dictated. Large independents, pursuing a contrarian strategy, were willing to consolidate producing properties and undertake substantial development work to stabilize or revive production in a number of

fields. Under the stewardship of Vintage Petroleum, for instance, production of the Bardsdale field increased from 49 thousand barrels in 1996 to 291 thousand barrels in 1997, and production at the Orcutt, San Miguelito, South Mountain, and Zaca fields stabilized. Ongoing development work by Berry Petroleum sustained output at Montalvo West at average of 295 thousand barrels throughout the 1990s. Production at Rincon field revived, from 690 thousand barrels in 1994 to 1.1 million barrels in 1997, owing largely to development work by Vintage Petroleum. Stocker Resources, which acquired the Arroyo Grande field in 1997, increased the output of the field to 615 thousand barrels in 2000, nearly triple its level of 1986.

As figure 11 suggests, these field-by-field reversals were sufficient to reverse temporarily the nadir in onshore production reached in 1995. The extent of the revival, however, suggests the limits of operators to revive the output of a mature extractive region. At the same time, operators demonstrated their ability to extend the life of the tri-county area's fields, given favorable demand conditions.

With prices collapsing once again during 1998–99, however, many operators shut in or reduced production and abandoned wells, giving back the gains in production achieved in the previous years. Output in Cat Canyon field, for instance, which had increased from 888 thousand in 1995 to more than one million barrels in 1997, fell rapidly to 550 thousand barrels in 2000. At nine million barrels, production from the Ventura district constituted two-thirds of the tri-county region's total output from onshore and state offshore fields. This ratio was up from 50 percent in 1980, reflecting the relatively rapid rate of decline of the other producing districts.

Industrial Activity and Corporate Strategy: Majors Out, Independents In

The end of the oil boom nationally had significant local effects. The reduction in production reduced the number of operators, service and support firms, and jobs in the energy sector. Mergers, acquisitions, and bankruptcies shuffled assets. Majors restructured their operations. This often entailed consolidation of local district offices. With onshore decline ensured and expectations for offshore growth not materializing, majors accelerated their sale of tri-county producing assets as well. In combination with the liquidation of assets on the part of independents who were now bankrupt or no longer involved in oil and gas production, the area's producing assets were transferred into the hands of new firms who emerged as the leading operators in a declining extractive region. By 2000, with two exceptions, the tri-county industry was shorn of its top layer majors.

The "Crash of '86" provoked retrenchment among majors and independents alike. Firms reduced their capital spending by one-quarter or more. Many firms without downstream operations or non-oil-related income—that is, most independents—faced bankruptcy or liquidation if measures to cut costs and reduce debts failed to solve cash flow problems. Further, heavy borrowing squeezed firms such as Occidental, Phillips, Texaco, and Unocal,

which had either fended off hostile takeovers or had involved themselves in huge mergers.[52] Majors with strong balance sheets and substantial cash flow, such as Chevron, Exxon, Mobil, and Shell, relied on profits from downstream operations to see themselves through the crisis. Yet even these firms cut their capital budgets by 25 percent. With the number of oil wells drilled nationally falling to its lowest level in forty years, the thirteen largest oil companies together logged their first loss on domestic operations since the 1960s (*Economist* 1986a; *Economist* 1986b; *Economist* 1986c; *Oil and Gas Journal* 1986; West 1986).

During the 1970s, many majors used their profits to invest in non-oil related businesses. By the mid-1980s it was evident that they were not particularly good at operating these acquisitions. The end of the oil boom prompted a return to core competences and therefore the sale of many of these assets. Firms also laid off employees, cut operating cuts, and implemented systems to improve their monitoring of prices and operations. Majors refocused exploration and production operations toward finding gigantic fields and applying enhanced recovery techniques to mature, but still productive fields. Firms also adjusted the size and scope of their businesses to fit better with declining demand for their products. For many firms, the "Crash of '86" induced a second round of retrenchment.

The experience of ARCO illustrates the process. From 1977–79 the firm decentralized its business into eight wholly owned subsidiaries, including ARCO Oil and Gas, which conducted its upstream operations in California. During 1984–85, ARCO wrote off $2 billion worth of assets, reduced capital spending, sold its 1,350 service stations that lay east of the Mississippi, and cut several thousand employees from its payroll. After this round of restructuring, the firm concentrated on upstream activities, West coast refining and marketing, chemicals, and its coal mining business (*Economist* 1985a; *Economist* 1985b). The "Crash of '86" prompted additional cuts. Within a year ARCO divested its interests in some 700 oil and gas fields (Beck and Bell 1996; *Economist* 1987a). Among tri-county producing districts, the company maintained its presence until 1995. In 1990 it transferred its interests in Cuyama South field to Stream Energy. In 1993 it transferred its interest in South Elwood offshore field to Mobil.

The crash also eliminated many "second generation" independents. For Argo Petroleum, for instance, the collapse of oil prices proved fatal. To finance its growth, Argo borrowed heavily through convertible debentures. Despite retaining a good credit rating and enjoying ongoing business success—it ranked 173rd in assets among the top 400 publicly-owned oil firms in 1986—Argo was unable to service the interest on the securities. After a firm bought up the debt in the secondary market and subsequently demanded payment, Argo's bank foreclosed on the Sespe properties that the firm used to secure the debentures, forcing it into bankruptcy. Argo's management sought a merger partner. In July 1987, however, Seneca Resources of Houston bought the loan and acquired Argo's Sespe and Ojai properties (Basenberg 1998; Smith 1988). Firms such as Sage Energy, Triton Energy, Coastal Corporation, and Union Pacific Resources, opted to sell their California properties in order to concentrate their investments elsewhere, either domestically or internationally.

[52] Unocal was the holding company for Union Oil Company of California, which the company's management created in 1983 to thwart a takeover threat from corporate raider T. Boone Pickens (Pederson 1990: 247–266).

As early as the third quarter of 1987, somewhat higher oil prices and poor profits from refining and marketing motivated firms to focus again on upstream investments. With the cost of drilling for oil now two-thirds 1985 levels, and with majors having found enough oil to replace only 41 percent of what they produced in 1986, exploration rebounded. In 1988 spending on upstream activity increased 15 percent. Better extraction techniques, computers, and competition between oil service firms suppressed the costs of exploration and production. Firms now found producing crude oil using enhanced recovery methods to be cheaper than buying one another's reserves (*Economist* 1987c; *Economist* 1988).

The renewed focus on upstream activities spurred additional retrenchment and restructuring. With upstream costs again rising at the end of the 1980s, firms aimed to lower costs, increase the returns on exploration, and rationalize layers of management. For instance, Texaco cut eleven layers of management to five. As part of the process, it closed its Ventura district operations, folding them into its regional center in Denver. Only the year before, it had built a new Ventura office and had renovated another one. The move entailed the transfer of 145 of 315 employees (Moraga 1990). Likewise, Chevron decided not to occupy a new office building in Oxnard. Rather, it consolidated its California operations in Bakersfield, abandoning a partially built office building in Ventura and transferring or laying off 200 employees in the process. At the time, Chevron had only offshore interests locally, having transferred its onshore properties in the Santa Maria and Ventura districts between 1987–92. Exxon also reduced its tri-county staff, from a peak of 400 in mid-1980s to 150 by 1993. Its also shuttered its regional offices in Thousand Oaks, into which it had moved only twelve years before, in the expectation of an offshore boom that never materialized (Simon 1993). These moves dovetailed with the sale of its tri-county interests, the Santa Ynez Unit excepted.

These moves were symptomatic of the relative decline of the tri-county extractive region. Yet they also reflected the problems that integrated majors faced in the decade after 1986, as a number of discontinuities destroyed many of the advantages that they held (Bleakley, Gee, and Hulme 1997). The discontinuities were unprecedented, and included the growing availability of significant technologies—among them, floating production, storage, and offloading, 3–D and 4–D seismics, subsea completions, and horizontal drilling—efficient global spot markets, and innovative financial and risk management products. As a result, from 1991–96, the performance of majors lagged Standard & Poor's 500 market index, and annual revenue growth averaged only two percent. By contrast, firms such as Koch Industries and Tosco captured most of the industry's growth and shareholder value, enjoying revenue growth rates of more than 20 percent. These firms often grew through the acquisition of assets that majors designated to be nonstrategic. From 1989–95, majors divested $13 billion of these assets, $7 billion of which were purchased by up and coming firms at cheap prices at the bottom of the business cycle.

To address this situation, majors reorganized their upstream businesses to push corporate responsibility down the organization, introduce competitiveness, and increase commercial skills (Bleakley, Gee, and Hulme 1997). For example, Shell reorganized its California operations in April 1987 as Shell Western Exploration and Production (SWEPI). In 1995, it again reorganized its state operations, this time as Cal Resources. More recently, majors

formed strategic alliances. As Ernst and Steinhubl (1997) argue, alliances had financial advantages, enabling firms to bypass or reduce the valuation, tax, and regulatory issues associated with acquisitions and divestitures, and allowing parent companies to retain oil reserves as a hedge against prices. Designed to cut costs and foster competitiveness, alliances also allowed operators to share best practices and technologies to extract crude oil from existing reserves.

In June 1997, for example, Shell and Mobil formed Aera Energy, a consolidated joint venture designed to improve economies of scale and skill transfer, and retain market leadership in mature areas historically dominated by majors (Ernst and Steinhubl 1997; Kraul 1997). Potential benefits included greater physical resource utilization (equipment, pipeline and storage infrastructure, and so on), more intensive exploitation of existing properties, shared best operator practices, improved bargaining power with suppliers, lower operating costs, and maintenance of market leadership in a region increasingly conceded to independents such as Nuevo Energy and Vintage Petroleum. In the case of California, alliances also made sense, given the fact that extracting crude oil from mature fields presented operators with a set of unique challenges and that the industry structure remained fragmented. As of June 2001, Aera employed 1,100 people and had oil production of 250,000 b/d, mostly in Kern county. It also retained production in Orange, Ventura (the Ventura field), Monterey, and Fresno counties (Aera Energy 2001). As recent deals, involving Texaco and Monterey Resources, Exxon and Mobil, and Chevron and Texaco, have shown, however, majors still see advantages in traditional mergers and acquisitions as a way of consolidating ownership over California's producing properties and applying new production techniques and technologies to increasing their output.[53]

Majors also declared the tri-county region, and even all of California, nonstrategic, as a result of a change in direction. In perhaps the most striking deal, Unocal sold its upstream California interests in 68 oil and gas fields and eleven offshore platforms to Nuevo Energy for $481 million. Roger C. Beach, Unocal's chairman and CEO, argued that the deal provided the firm with "the flexibility … to move ahead with new growth opportunities" abroad (Unocal Corporation 1996). Its California assets were mature, returning an average of sixty cents per barrel of crude oil equivalent (BOE). By comparison, Unocal's Far East and U.S. Gulf operations were earning more than $3 per BOE produced. The move was part of Unocal's strategic transformation from a mid-sized major to a large exploration and production firm with an international focus. Indeed, the firm's 1996 annual report proclaimed "A New Unocal." As Beach framed it, "when the company was founded in 1890 [California] was an oil frontier" (Unocal Corporation 1996a). Now it sought to invest in "high-value growth opportunities" worldwide (Unocal Corporation 1997a).

In April 1997 Unocal continued its "transformation" by exiting California completely. In a deal worth some $2 billion, Unocal sold its refining, transportation, and retail marketing assets to Tosco, a Stamford, Connecticut corporation that was the largest independent refiner in the country, with revenues of $10 billion. The assets included refineries in San Francisco, Los

[53] Though, as Ernst and Steinhubl (1999) note, with the exception of the 1977 Texaco-Monterey Resources deal, these mergers were primarily designed to facilitate expansion into risky overseas markets.

Angeles, and Santa Maria, various terminals, bulk plants, and pipelines, and a retail marketing business that included 1,100 company-controlled sites and 250 unbranded, non-controlled sites in six western states: an indication of the physical infrastructure accumulated from more than one-hundred years of doing business (Unocal Corporation 1996b; Unocal Corporation 1997c). However, the deals did not eliminate its liability for the work required to remediate several sites.

More muted were numerous other transfers from long-time majors and large independents to "third generation" independents, who aimed to acquire existing producing properties and develop them using recovery methods such as horizontal drilling and steam-assisted gravity drainage processes (SAGDs). They included Union's sales of selected Santa Maria and Ventura district properties to Saba Petroleum between 1992–95, Shell's 1992 sale of its Santa Maria district properties to Vintage Petroleum, the 1993–94 sales of the Rincon and San Miguelito properties of Conoco, Santa Fe Energy, and Mobil to Vintage, and a May 1995 deal in which Texaco sold its interests in nine oil and seven gas fields in California to Vintage for $26.7 million (Unocal Corporation 1997a; Vintage Petroleum Company 1997).

For the majors, the development of California's offshore fields was a strategic objective throughout the 1970s and 1980s. As Chevron chairman George Keller (1983) put it, "a vigorous, ongoing program of offshore development" would offset declines in onshore production and help to maintain the state's "key role" in maintaining domestic crude oil supplies. Yet, by the 1990s, the landscape had changed. Gaining approval for offshore projects was more than ever a protracted and economically costly process. With the Gulf of Mexico and other areas offering the returns on investment that the shareholders of these public companies demanded, the majors decided that developing federal leases in the Santa Barbara channel could no longer be justified (cf. Benton 1998; Chevron 2000; Chevron 2001; Unocal Corporation 1997a). By the mid-1990s, offshore California was no longer a strategic area for most of the majors that had dominated the state's oil industry. Public policy seemed to ensure that the development of federal leases was essentially frozen in time. Consequently, the majors relinquished undeveloped leases and transferred assets to "third generation" independents. With Chevron's 1999 sale of its offshore properties to Venoco and Arguello, all of the operated properties in the Santa Barbara channel were in the hands of these firms, with the exception of ExxonMobil's Santa Ynez Unit.

Oil Service and Support Firms

Oil service firms were also severely affected by the "Crash of '86." By July 1986, the average number of rotary rigs in use plummeted to 663, down from a December 1981 high of 4,530. Daily rig rates fell to an average of $7,000, down from $40,000 five years before. Rigs that cost $40 million in 1981 were selling for less than $10 million in early 1987. As a result, the oil service sector restructured. The five largest firms—Schlumberger, Halliburton, Dresser Industries, Baker International, and Hughes Tool—laid off one-third of their staff and wrote off $3.4 million in assets (*Economist* 1987b).

This retrenchment had local effects. For instance, Hughes, the new parent company of Vetco-Gray, shut down the latter's Ventura operations, affecting 360 employees. A skeleton staff stayed on as Ventura Tool Company, for the purpose of selling inventory and servicing equipment in the field. The reduction in the number of oil service firms initiated a trend that continued for a decade. Among Ventura Avenue firms tracked by researchers, only twenty-one remained in business in 1996. Overall, 108 firms were still doing business in the Ventura district, another 36 were active in the Santa Maria district, and eight were still located in Santa Barbara. By comparison, in Bakersfield 531 oil service and support firms were listed, reflecting the shift in California onshore production to the San Joaquin valley (VC II: 3.1.10, 3.1.11).

Of the service and support firms that remained in business, Molotch, Woolley, and Jori (1998) found that only one-third remained static, that is, in the business of servicing oil activity in the tri-county area. The remaining firms adapted to the era of decline in several ways. One-fifth of the firms surveyed continued to engage in their traditional businesses, but branched to other locations. That is, rather than relocating to the Gulf region, for instance, firms such as Tidewater Marine Supply, Petroleum Helicopters, and Port Hueneme Marine Supply Company continued to operate or base their businesses locally. Almost 30 percent of the firms surveyed diversified into non-oil-related applications of their core businesses. Diving Systems International, for instance, developed a range of diving products to complement the fiberglass diving mask that had become a standard in the oil industry. Finally, almost one-fifth of the firms surveyed transformed themselves through a process that involved both branching and diversifying.

The researchers found that the region's amenities, including climate, beaches, cultural attractions, and recreational activities, were factors motivating these firms to base their operations in the tri-county area, rather than simply leave the area. The effect of this adaptation was to mitigate the local economic effects of the crash and subsequent decline of the extractive region. Thus the research of Molotch *et al.* provides further evidence that the boom-bust model of mineral extraction does not apply to a coastal California region that diversified economically, was increasingly connected to the national and global economy, and offered a physical and cultural environment that entrepreneurs deemed so attractive that they found ways to make their businesses "work" from the area.

At the same time that numerous oil and oil service firms, such as Benton Oil and Gas, Fortune Petroleum, and Vetco-Gray, were relocating to the San Joaquin valley, the Gulf region, or elsewhere, remediation in the tri-county region fueled the growth of an environmental consulting sector. Such firms produced environmental impact reports, apply "cutting edge" remediation strategies, and developed technology to clean up oil infrastructure. The research team that produced SB II, SLO II, and VC II compiled an inventory of the environmental engineering firms (SIC 8711M) and environmental protection organizations (SIC 8641C) in the cities of San Luis Obispo, Santa Barbara, Santa Maria, and Ventura. As reported in section 3.4 of each report, they found that Santa Barbara had the most environmental consulting firms (48), followed by Ventura (31), San Luis Obispo (14), and Santa Maria (11). As in the case of oil operators doing business in the tri-county area, the professionals who ran

consulting firms often located their enterprises on the basis of lifestyle preferences rather than simply on the basis of proximity to oil infrastructure. After all, both of the region's leading producing districts lay within an hour's drive of Santa Barbara.

To assess whether the environmental regime that regulates oil activity in the tri-county region, coupled with the "environmental consciousness" of the local population, contributed to the proliferation of these firms, researchers compared these findings to U.S. cities that matched the tri-county area's principal cities on various levels: population, community character, history of industrialization, and size of oil service industry. The latter was defined in terms of the number of local oil field equipment supply and rental firms (SIC 7359L), oil field contractors (SIC 1629L), and oil and gas field services (SIC 1389). Ventura had 108 such firms, followed by Santa Maria (36), Santa Barbara (8), and San Luis Obispo (3). For comparison purposes, the team selected "oil hub" cities (Bakersfield [California], Corpus Christi, Galveston, and Lubbock [Texas], Oklahoma City and Tulsa [Oklahoma], and Shreveport [Louisiana]), university cities (Boulder [Colorado], Eugene [Oregon], and Santa Cruz [California]), and "old" industrial cities (Flint [Michigan] and Youngstown [Ohio]). All of the cities were mid-sized, with no community containing more than 400,000 people.

The researchers found that the ratio of environmental consulting firms to oil service firms in all four tri-county area cities exceeded the ratio for any other "oil hub." (Neither the university cities nor the "old" industrial cities had any oil service firms with which to establish a ratio.) Ventura's ratio of 0.287, the lowest in the tri-county area group, exceeded Lubbock's ratio of 0.192, the highest of any "oil hub." Santa Barbara had the highest ratio (6.0), followed by San Luis Obispo (4.667), and Santa Maria (0.306). On the basis of population, the tri-county area cities also scored relatively well: an average of 3.52 consulting firms per 10,000 people. By comparison, the "oil hubs" averaged 1.15 per 10,000 people; the university cities averaged 1.8; and the "old" industrial cities averaged 0.83. One "oil hub" (Bakersfield) and two university towns (Santa Cruz and Boulder) had higher per capita ratios than Santa Maria, which had the lowest per capita ratio among tri-county area cities (1.64). However, Santa Barbara, Ventura, and San Luis Obispo, with 5.57, 3.56, and 3.3 consulting firms per 10,000 people, respectively, ranked the highest of all the cities tested.

The results showed that environmental consulting was a relatively robust sector in the tri-county region. The area's communities are proximate to a highly regulated industry and are populated by a critical mass of people who are sensitive to, and increasingly concerned about, the effects of industrialization and urbanization on the natural environment. Its communities share characteristics with both "oil hubs" and university towns: a mix that researchers thought would ensure the continued growth of environmental consulting within the regional economy.

With offshore oil activity in the Gulf of Mexico and elsewhere in recovery as of 1995, oil service firms such as Schlumberger and Halliburton became increasingly involved in planning projects with operators. Service companies restructured the scope of their services to take a more proactive role in the development process through so-called integrated wellhead solutions and new business partnerships and alliances. The new approach was dubbed "intelligent reservoir management systems" (IRMS), which integrate a number of

communications tools that acquire, transmit, store, retrieve, and analyze data for the purpose of improving the reliability and versatility of active reservoir management. Chevron, for one, embarked on a research venture with Schlumberger to develop next-generation tools to increase recovery rates from existing reservoirs (Chevron 2001). Service companies offer operators reduced operating costs, improvement in well performance and increased recoverable reserves (Furlow 1998; *Offshore* 1997; Schlumberger 1997). The extent to which this trend will be replicated in California will depend on the nature and extent of future activity in the Santa Barbara channel and elsewhere along the coast.

A Transformed Structure of Industry

The end of the oil boom broke the stasis in the tri-county industry that had prevailed for two decades. After sustaining roughly 150 operators in the field, the size of the industry shrank by one-third in terms of operators (see figure 7). Exploration all but ceased. Although most fields remained active, many wells were shut-in or abandoned. Moreover, during the 1990s, operators consolidated production in many onshore fields. This strategy, along with the decline in production itself, resulted in a severe drop in the number of firms with production from onshore or state offshore leases. Only 62 operators were producing oil from these areas as of December 2000, down from 118 in 1965, and 97 in 1980. Except for the Ventura field and the Santa Ynez Unit, majors no longer had a tri-county presence (though they continued to dominate production statewide). For the tri-county, the era of the decline has been characterized by retreating majors and surging independents.

The "third generation" independents that figured prominently in the tri-county industry include out-of state firms, such as Hallador Petroleum, Nuevo Energy, Plains Resources, Seneca Resources, and Vintage Petroleum. There were also several California-based firms, such as Benton Oil and Gas, Fortune Petroleum, Saba Petroleum, and Venoco. They joined several "first" or "second" generation survivors, such as Berry Petroleum and McFarland Energy, as leading operators in both California and the tri-county region. As table 15 shows, they account for more than half of the region's production from onshore and state offshore fields. This market share is not replicated for California as a whole. As table 14 shows, majors account for two-thirds of output statewide, on the strength of their performance in the San Joaquin valley. As table 15 also shows, market share at the tri-county level remains fragmented.

Table 14. Leading California Crude Oil Operators, 2000

	Production (Mbbls)	Percentage of State Total
1. Aera Energy	90,165	33.2
2. Texaco Exploration and Production	40,216	14.8
3. Chevron USA	34,144	12.6
4. Occidental Petroleum of Elk Hills	17,577	6.5
5. Texaco California	16,699	6.2
6. THUMS Long Beach	13,626	5.0
7. Nuevo Energy	12,141	4.5
8. Stocker Resources	5,776	2.1
9. Berry Petroleum	5,650	2.1
10. Vintage Petroleum	4,749	1.7
11. Seneca Resources	3,121	1.1
12. Tidelands Oil Production Company	2,503	0.9
13. Breitburn Energy	1,982	0.7
14. Venoco	1,764	0.6
15. ExxonMobil	1,696	0.6
16. McFarland Energy	1,578	0.6
17. Oxy USA	1,430	0.5
18. MacPherson Oil Company	1,193	0.4
19. Crimson Resources Management	1,132	0.4
20. Signal Hill Petroleum	994	0.4
21. Greka SMV	769	0.3
22. TRC Operating Company	555	0.2
23. San Joaquin Facilities Management	547	0.2
24. Kenneth H. Hunter, Jr., Trustee	479	0.2
25. Brea Canyon Oil Company	426	0.2
Total Four Majors (Aera, Chevron, ExxonMobil, Texaco)	2,920	67.4
All Other Companies	88,591	32.6
Total California	1,511	100.0

Note: Federal OCS production not included. Production from unit operations allocated 100 percent to the unit operator.

Source: California Division of Oil, Gas, and Geothermal Resources 2001

Table 15. Leading Tri-County Crude Oil Producers, 2000

	Producing Wells As of 12/31/00	Production (Mbbls)	Percentage of Tri-County Total
1. Aera Energy	467	4,563	33.7
2. Vintage Petroleum	941	3,417	25.2
3. Venoco	49	1,464	10.8
4. Stocker Resources	106	615	4.5
5. Seneca Resources	134	460	3.4
6. Nuevo Energy	83	378	2.8
7. Hallador Petroleum	66	311	2.3
8. Greka SMV	161	306	2.3
9. Berry Petroleum	22	256	1.9
10. Sierra Resources	72	233	1.7
11. Rincon Island Limited Partnership	30	208	1.5
12. Chase Production Company	44	152	1.1
13. Kenneth Hunter, Jr., Trustee	24	139	1.0
14. The Termo Company	26	97	0.7
15. Torch Operating Company	33	75	0.6
16. B. E. Conway Energy	37	74	0.6
17. Mirada Petroleum	61	67	0.5
18. Crimson Resources Management	26	66	0.5
19. Phoenix Energy	44	52	0.4
20. Gato Corporation	17	47	0.3
21. CBASE Corporation	25	30	0.2
22. Joro	16	29	0.2
23. J.P. Oil	16	26	0.2
23. Richards Oil	20	25	0.2
25. Bentley-Simonson	11	21	0.2
Total Four Majors (Aera, Chevron, ExxonMobil, Texaco)		4,563	33.7
Total Large Independents		7,440	54.9
Total All Other Companies		1,552	11.4
Total Tri-County Region		13,555	100.0

Note: Federal OCS production not included.
Source: California Division of Oil, Gas, and Geothermal Resources, 2001

The business goals of these independents fit with the maturity of California's extractive regions. As a survey of their annual reports and Form 10-Ks indicates, they aimed to acquire existing onshore and offshore properties, and use new methods and technologies to recover crude oil in an environment of steady or rising demand. They also consolidated properties to achieve operational efficiencies, and remained poised to acquire additional properties with "upside potential," which may come up for sale, as "megamajors," such as ChevronTexaco, reevaluate their California portfolios (Dain Rauscher Wessels 1999). Many of them operated in other areas of California (see table 14). Indeed, most of the leading independents in tri-

county area allocated much of their capital spending to properties in the San Joaquin valley.[54] Increasingly, they established an offshore presence. Not all of them survived the 1990s. Collectively, however, they demonstrated an ability to boost or sustain production in mature fields, thereby mitigating the impact of majors' departures and the stalled Pacific OCS program. They also showed that the declining phase in the lifecycle of an extractive region provided opportunities for entry on the part of firms that did not exist prior to 1980, and enabled the continued presence of independents who adjusted to changing business conditions.

This section profiles the leading independents operating in the region and offers examples of independents that did not succeed locally during the 1990s. It also provides examples of up-and-coming small firms that have demonstrated that growth is possible in the era of decline. The focus of the discussion is on corporate strategy and how well firms have executed it.

Tulsa-based Vintage Petroleum incorporated as a private company in 1983. It aimed to acquire at favorable prices producing oil and gas properties whose reserves and production could be expanded through subsequent exploitation projects, such as workovers, recompletions, secondary recovery operations, and development or exploratory drilling programs. The firm's business strategy also included exploring underdeveloped properties, and maintaining a low cost operating structure and financial flexibility. The successful execution of this strategy depended (and depends) on internal factors, such as operating at low cost and applying technical expertise, and external ones, including favorable prices, other market conditions, and the regulatory environment. Vintage maintained this strategic direction even as it began to acquire international properties during the mid-1990s (Vintage Petroleum Company 1997; Vintage Petroleum Company 2001b).

Vintage Petroleum's initial core areas included East Texas, the Gulf coast, and the Mid-Continent. After going public in 1990, California became the firm's primary geographic focus (Vintage Petroleum Company 1997). In a series of deals from 1992–95, as noted, Vintage acquired numerous properties in the Santa Maria and Ventura districts. With $648 million in assets as of December 31, 1996, Vintage ranked fifty-second on *Oil and Gas Journal*'s table of U.S. energy firms, the OGJ 200 (Beck and Bell 1996).

Among large independents operating in California, Vintage's focus on the tri-county area stands out. The acquisition in December 1999 of Nuevo Energy's Ventura district properties reinforced the trend. The $29.6 million deal offered Vintage the opportunity to rationalize its assets and achieve operational efficiencies, since Nuevo's Ventura assets lay adjacent to properties that Vintage operated (Vintage Petroleum 2001a).

As of December 31, 2000 Vintage operated in eleven states, and had interests in 3,592 productive oil and gas wells (2,827 net), 1,550 of which were located in Kern, Ventura, Santa

[54] Kern county is the largest producing county in the United States with 577,000 b/d crude oil production as of April 1997. It accounts for almost two-thirds of the state's overall production (four-fifths of the state's onshore production), almost half of California's natural gas output, and five of California's twenty-two refineries (Petroleum Committee, Greater Bakersfield Chamber of Commerce 1997).

Barbara, and Sacramento counties. California constituted 16 percent of the firm's total proved reserves and 46 percent of its U.S. proved reserves. Among tri-county operators it ranked second, with one-quarter of the area's production (see table 15). It had also identified numerous workovers and recompletion opportunities in the San Miguelito and Rincon fields, and infill drilling locations and waterflood opportunities in San Miguelito field (Vintage Petroleum Company 2001b; Vintage Petroleum Company 2001c).

Nuevo Energy, a public corporation established by Torch Energy Advisors in 1990, was another prominent "third generation" independent in the tri-county area.[55] Like Vintage, Nuevo aimed to increase production and reserves in mature fields, primarily through secondary and tertiary recovery methods. During the 1990s, California became the firm's core exploitation area. With its acquisition of Union's upstream assets in 1996, Nuevo became a leading operator in the state and in the tri-county region. Indeed, with $864 million in assets as of December 1996, Nuevo was a leading national energy company as well (Beck and Bell 1996; Nuevo Energy Company 1997a; Nuevo Energy Company 1997b). As of 1999 about half of Nuevo's California production came from Kern county. The rest was split between properties in the coastal region and Los Angeles basins. With interests in thirty-one onshore fields and nine offshore fields, 2,600 producing wells, and 10.1 million barrels of production, Nuevo ranked seventh among California operators (Dain Rauscher Wessels 1999; Nuevo Energy Company 2000a).

As of 2000, the firm intended to maintain its presence in the state by acquiring and exploiting producing properties and applying technological expertise to geographically focused and familiar areas. The firm had more than 1,300 low-risk exploitation projects that would be profitable if the price that it received for its oil was at least $18.50 per barrel (Nuevo Energy Company 2000a). To execute its development strategy, Nuevo developed a proprietary "triple completion" procedure, involving steamflooding at varying steam pressures in different producing zones to reduce steam-to-oil ratios. The technique results in lower drilling costs and higher reservoir yields, and was utilized in the Cymric field in the southern San Joaquin valley (Morgan Stanley Dean Witter 2000). To improve its performance in the area of exploration, Nuevo planned to take a comprehensive, rather than ad hoc, approach to the searching for oil in California. It also planned to expand its exploration program, focusing on two or three promising trends on existing acreage and working to gain entry into new exploration programs within other identified areas. The firm had no plans, however, to drill prospect wells onshore in the tri-county region (Nuevo Energy Company 2000a).

The success of Nuevo, Vintage, and other "third generation" independents has come largely from acquisition and exploitation. Most acquisitions have been in "geologically complex" fields that historically have produced large volumes of oil and gas. Further, neither Nuevo nor Vintage hesitated to sell properties when opportunities presented themselves—as evidenced by Nuevo's sale of its interests in thirteen mature, non-core fields and one gas processing plant in Ventura county (which were purchased in 1996 and 1999 in deals with Unocal and

[55] Torch Energy Advisors, founded in 1978, was the parent company both of Torch Operating Company, a private firm, and Nuevo. Both firms operated producing properties in the tri-county region during the 1990s. They are now separate entities.

Texaco) to Vintage, and Vintage's simultaneous $70 million sale of its Sacramento gas properties to Calpine (Dain Rauscher Wessels 1999; Vintage Petroleum Company 2001a).

Surging prices for crude oil can substantially bolster the resources available to independents in a very short period of time. For Nuevo, discretionary cash flow increased 171 percent, to $99.6 million, in 2000 over 1999, reflecting a 32 percent increase in realized crude oil prices during 2000 (to $14.75 per barrel). To continue its drilling program and accelerate its exploration program, Nuevo allocated $181 million in its 2001 capital budget, up from $140 million in 2000. Another $141 million was allocated for exploitation projects. Nuevo planned to devote 65 percent of the budget to onshore fields in Kern and Los Angeles counties and another 26 percent to the development of the Santa Clara and Pitas Point OCS fields. To streamline operations, improve performance, and reduce costs, Nuevo also planned to hire several dozen people to perform key operations and environmental safety and regulatory compliance functions in-house. This would increase its total number of employees to 110, spread among offices in Houston, Bakersfield, and Orcutt. This marked something of a reversal of the firm's heavy emphasis on outsourcing, which Nuevo had considered to be one of its key strategic advantages (Nuevo Energy Company 2000b; Nuevo Energy Company 2000c; Nuevo Energy Company 2001b; *Wall Street Transcript* 1999).

As the detail of Nuevo's capital budget suggests, large independents increasingly operated offshore. Nuevo purchased both onshore and offshore assets in its 1996 deal with Unocal. Other firms took a staged approach, moving from onshore fields to offshore properties. For instance, Plains Resources, which operates through wholly owned subsidiaries that focus on specific properties in particular areas, acquired Los Angeles-based Stocker Resources in 1992. Stocker's initial investment in the tri-county region was the Arroyo Grande field, which it purchased from Aera Energy in 1998. In 1999 Plains went offshore through another subsidiary, Goleta-based Arguello, which acquired Chevron's 26 percent working interest in the Point Arguello field and its onshore support facilities (Plains Resources 1999; Plains Resources 2001). During 1994–95, Carpinteria-based Venoco, founded in 1992, acquired three onshore properties in California, including the Santa Clara Avenue field in the Ventura district, for the purpose of using new technology to increase production in mature fields. Between 1997–99, Venoco acquired ten additional fields and related infrastructure, including the South Elwood field from Mobil and Chevron's interests in the Sockeye and Point Arguello fields (Venoco 1996, 1997a, 1997b, 1998).

The acquisition of Chevron's offshore properties provided Venoco with the opportunity to consolidate infrastructure among producing fields: something in which local government officials and citizens' groups have been interested since the 1970s (Sollen 1998: 155–162). In June 2000 the firm announced its "Elwood Reduction Plan." Under the plan, Venoco would stop using barges to transport crude oil produced from Platform Holly to Long Beach and San Francisco, remove the offshore marine buoys used to load barges, remove storage tanks and other marine terminal facilities (and return the 17.5 acre tract on which they stood to UCSB), reduce the processing of natural gas from seep tents at Coal Oil point at the Elwood Onshore Facility (using Platform Holly as the processing point instead), and install a pipeline to ExxonMobil's Las Flores Canyon facility (Venoco 2000). A year later, Venoco modified the

plan to eliminate processing at the Elwood Onshore Facility altogether. Rather, all processing of natural gas would occur on Platform Holly, with the product sent through an existing pipeline to the onshore facility operated by the Gas Company, a California utility. Venoco planned construct a subsea pipeline to transport crude oil to the Rincon Onshore Separation Facility, of which Venoco owns part (Venoco 2001b).

Given the conclusions of the majors regarding California production, the strategy of firms such as Nuevo and Vintage has been a contrarian one. As the Web sites and annual reports of Berry Petroleum, Plains Resources, Venoco, and other coastal operators show, other independents have emulated it. With market capitalizations at the end of 2001 ranging from $250 million to $1 billion, the large independents currently operating in California are generally well-positioned to profit from the extension of the lifecycle of the state's extractive regions. At the same time, their individual success is not ensured. The upstream segment of the oil industry remains highly competitive. As sellers of oil and gas to refiners, marketers, and distributors, all of these firms are price-takers, and therefore are often buffeted by decreases in oil prices and other external factors. The recent electricity crisis in California, for instance, persuaded Berry Petroleum to revise downward its projections for capital spending for fiscal year 2001 from $25 million to $11 million (Berry Petroleum Company 2001).

A number of California independents with a tri-county presence during the 1990s, such as Petrominerals and Saba Petroleum, did not survive. Others did not find California's low margins or regulatory climate to their liking, could not operate profitably, or did not believe that the majors have left enough for them to chew on, as it were, to justify their continued presence. As Alex Benton, founder and former CEO of Benton Oil and Gas, put it in a 1998 interview, majors are "as smart as anybody, and they're just as efficient as anybody. They don't leave much behind." Both Agoura Hills-based Fortune Petroleum and Carpinteria-based Benton Oil and Gas, for instance, decamped to Houston, after sustaining losses from local operations. Still other firms, such as Breitburn Energy, McFarland Energy, and Pyramid Oil, retreated from the region, but continued to operate elsewhere in California (Adamson and Bergstrom 1998; Fortune Petroleum Company 1997; Greka Energy Corporation 2001a; McFarland Energy 1996; Petrominerals Corporation 1997; Pyramid Oil Company 1996; Saba Petroleum Company 1996).

The firms that exited the tri-county area transferred their producing assets to other independents that could operate them profitably. Seneca Resources, for instance, bought Fortune Petroleum's properties in the Sespe field of Ventura county. B. E. Conway, an Orcutt-based entrepreneur, acquired the Santa Maria district properties of Petrominerals (Adamson and Bergstrom 1998). The Santa Maria properties of bankrupt Saba, including the Santa Maria asphalt refinery that it refurbished and reopened in 1995, formed the core assets of Greka SMV, a wholly owned subsidiary of New York-based Greka Energy Corporation. As of 2000, Greka was another "third generation" independent among the leading operators in the tri-county region (see table 15). In a $17.75 million deal that was consummated in July 2001, Greka increased its tri-county investment through the acquisition of Vintage Petroleum's Santa Maria district interests in five fields and 110 producing wells (Greka Energy Corporation 2001a; Greka Energy Corporation 2001b).

The search by Benton Oil and Gas for local natural gas reserves were of particular interest to the research team that produced SB II, SLO II, and VC II, since it served as the basis for a scenario-building exercise that discussed future directions in offshore development activity and probable local reactions to it. Since SB II, SLO II, and VC II were published, the Molino project, as it was known, ended unsuccessfully. It may be instructive to revisit the project.

Benton began life in 1988 as a Ventura firm, seeking to acquire oil and gas reserves with low geological risk and substantial reserve potential. After operating in the Gulf region and internationally, Benton returned to California in 1997 with its signing of an agreement with Molino Energy to acquire 40 percent of the latter's interest in three state offshore leases that lay along the south Santa Barbara county coast. Since their development in the early 1960s, about 70 billion cubic feet of natural gas had been produced from the leases. Benton served as operator on a project that sought to reach these natural gas structures by drilling horizontally from Gaviota. Benton and Molino saw great potential in the project. Benton believed that it could "significantly impact our reserves and production" (Benton Oil and Gas Company 1997).

The project garnered much attention from local government agencies and interest groups during the permitting process. In 1985 Shell offered a proposal to tap the structures from a new platform. This proposal had been rejected. Benton favored a site that would have required voter approval, but local opposition to Mobil's Clearview project persuaded Molino and Benton to use Gaviota. In March 1998 operators spudded an exploratory well. Benton planned to spend $5–12 million on additional wells, but the initial effort, which cost $4 million to drill, proved disappointing. In the fourth quarter of 1999, in the context of adverse conditions for the energy sector generally and difficult times for Benton specifically, Benton's management decided to focus on properties with existing production. Thus the company wrote off more than $9.2 million in capitalized expenses associated with the project and a $3.1 joint interest receivable due from Molino (Benton Oil and Gas Company 1998, 1999, 2000a).

Having suffered a loss of $32.3 million on sales of $89.1 million in 1999, on top of losing $183.6 million on sales of $82.2 million the year before, Benton retrenched, cutting its exploration budgets and administrative costs. In June 2001, the firm relocated its headquarters from Carpinteria to Houston (Benton Oil and Gas Company 2000a, 2000b, 2001). The Molino project did not prove to be a robust test case for estimating the level of possible future oil activity off the shores of California. At the same time, it suggested that a moderate level of new activity was possible in south Santa Barbara county (SB II: section 8).

Small entrepreneurs, many of whom had been active for a number of years in the area, continued to operate producing assets—only now the extractive region supported far fewer of them, as figure 8 suggests. The goals and activities of small firms remained much as they had before. Yet they faced numerous challenges, including a dwindling portfolio of economically viable properties and regulation that raised the cost of doing business. With their numbers as a whole reduced in step with the decline in production, small entrepreneurs nonetheless remained active, even though their expectations were diminished relative to previous phases

of the extractive cycle. Entry occurred on the part of new entrepreneurs, demonstrating that as long as there remained crude oil reserves to produce, there existed a place for small operators. As figure 10 suggests, in the era of decline, a majority of small firms were increasingly based in the tri-county region. Often, their principals had years of experience locally. Many had family members who had previously worked in the industry.

For instance, R. Scott Price, son of C. Ray Price, a prominent Ventura agent and entrepreneur during the 1950s and 1960s, had interests in several firms (Adamson and Bergstrom 1998). He was president of Mirada Petroleum and South Mountain Resources of Ventura, and a partner in Petroleum Engineering of Oxnard. In a series of deals, he acquired a portfolio of producing properties in several Ventura basin fields during the 1990s. Price also served as managing partner for the Hamp Company, in which his father had been a partner, winding up the firm in 1994 and arranging the transfer of its assets to South Mountain Resources. As table 15 shows, Mirada Petroleum was a leading tri-county operator as of 2000, with 66,311 barrels of production from wells in six Ventura district fields.

Despite the decline in the extractive region, the resourceful entrepreneur could remain in business. For his part, Cecil Basenberg carried on after the demise of Argo, acquiring a property from Chevron in the Ramona field of the Ventura district. He created CBASE Corporation as his primary business vehicle, and added to his Ramona field portfolio by acquiring a property from Mobil in a December 1990 deal. Chevron had put its property up for bid. Basenberg acquired it after the successful bidder failed to perform. In the case of the Mobil deal, Basenberg put a deal together with his partners and proposed an offer, which Mobil accepted (Basenberg 1998). By 1995 Basenberg was operating twenty-eight producing wells in the Ramona field and had grown CBASE into a 100 b/d firm. As table 15 shows, CBASE was a leading tri-county operator as of 2000, with 30,215 barrels of production.

As Chevron's auctioning of its Ramona property suggests, majors looking to exit the region sometimes sold properties that small firms could obtain. Competition among small entrepreneurs for these properties was intense. Basenberg, for instance, sought to acquire the entire Ramona field, which would have constituted a property was large enough to secure external financing for additional developmental work. However, Scott Price beat him to a twenty-well property owned by Texaco. The example illustrates the difficulty that small firms faced in piecing together discrete properties.

For others, the attractiveness of remaining in the oil business declined in step with the tri-county region's reserves. Like Ojai Oil (discussed in Part II), many small operators simply chose to operate properties that they acquired or retained from earlier periods. They confined capital spending to maintaining or managing the output of existing wells. Entrepreneurs who may have invested in development work in earlier times often adopted this approach. For instance, H. Lynn Hall, Jr. found the business environment for the small operator increasingly frustrating, and therefore sold Central Lease, the firm that his father had founded in the late 1950s. When the new owners experienced financial difficulties, however, Hall bought back in 1990 the Sespe property he once operated. Thereafter he conducted business as H. L. Hall and Sons. As of 1998, the property was producing 30 b/d from three wells. Ironically, having

spent a career moving from project to project as a wildcatter, and then dealing in leases, the Central lease that his father acquired from Union in 1957 proved to be Hall's most profitable project. During the 1960s, 1970s, and 1980s, it provided a stream of stable production from half a dozen large, shallow wells (Hall 1998).

A few entrepreneurs engaged in substantial development efforts. One example was Cliff Simonson. He worked for many years as a contract operator and as a petroleum property manager. For several years he ran a small, Ventura-based oil service firm. In 1992 Simonson sold it to Saba Petroleum, and accepted a position as vice-president of operations. In 1994 he set out once again as a small entrepreneur. He became one of three partners in Bentley-Simonson, which in 1997 drilled three wells. Simonson aimed to develop reserves sufficient enough to meet the financing criteria of banks or venture capitalists, many of whom remained interested in development work and acquisitions, but in projects that required at least five million dollars—twice the amount of financing that a business the size of Simonson's typically sought. Thus the challenge for the partnership was to develop reserves even as prospects became more scarce and conventional financing remained difficult to attract (Simonson 1998).[56] By 1999, however, Bentley-Simonson had acquired properties in the San Joaquin valley and had grown to become the twenty-fifth largest producer in California, operating properties with more than 464,000 barrels of output.

After 1986 the opportunities for all firms operating in the tri-county area diminished. For majors, returns on investment were insufficient to warrant their continued investment in all but the most productive fields. They therefore sold most of their producing properties to independents, which had lower return on capital requirements and lower operating costs. During the 1990s technological advances that could increase or sustain the output of mature fields became cost effective for operators who remained interested in development projects. "Third generation" large independents increasingly controlled the region's producing properties. Small firms, which were more often than not now based in the tri-county area, often carried on much as they did during the environmental era, operating existing leases and engaging in some developmental work. Yet a number of entrepreneurs demonstrated the desire and ability to grow firms in an era of decline, suggesting that proprietary capitalism could be sustained in the upstream oil industry under increasingly challenging conditions.

Unocal and the Environment: A Special Case of Corporate Delinquency?

When Unocal disposed of its California assets, it left behind millions of dollars in actual and potential liability for environmental matters, including the remediation of the town of Avila Beach and the Guadalupe/Nipomo dunes. As Beamish (2000, 2001) has argued, the damage done to these ecologically sensitive areas resulted from almost forty years of organizational failure. In the case of the Guadalupe and Nipomo dunes, the contamination and the apparent lack of transparency on the part of Unocal regarding the facts of the case did much to damage

[56] As the Bentley-Simonson example suggests, during the 1990s small firms faced significant challenges in the execution of business plans that were predicating on acquiring and developing mature properties. Timothy Marquez and Rod Eson, founders of Venoco, used credit cards and loans from families and friends to finance their 1994 acquisition of the Whittier field (Venoco 2001a).

the local reputation of Unocal, which historically played a leading role in the coastal industry. Together with the September 1997 leak of 500 barrels of oil from Platform Irene, which was caused by a broken pipeline weld and happened soon after Unocal transferred the asset to Nuevo (Johnson 1997), these events fit into a pattern of Union behavior that included a 1926 fire and spill of crude oil at a tank farm in San Luis Obispo and the 1969 Santa Barbara channel oil spill from the firm's Platform A. Further, as Beamish (2001) suggests, local residents, especially those in the San Luis Obispo area who garnered little "payoff" from oil activity, based their perceptions of the oil industry overall on Union's (and regulators') handling of these events.

Discovered by Continental in 1947, Union began producing oil at Guadalupe in 1953. To facilitate the flow of crude oil from gathering lines to Union's Nipomo refinery, field workers injected diluent, a kerosene-like distillate, into wells (Stormont 1956). After the refining process, diluent was sent back to the field, where it was stored until it was needed. Chronic leaks of the oil and diluent mixture contaminated ground water, the beach, and the local habitat. The spill accumulated unremarkably over a number of years. It went unreported outside the field until 1990, although leaks of diluent from the late 1970s were turning the ocean brown and bubbling up on the sand. Beamish (2000) argues that the leaks were part of the field workers' routine of work and, as such, they were not monitored. Over time "a culture of silence" formed, owing to the way in which upstream activity was organized hierarchically within the field, with promotion dependent on seniority. In this case Union was the sole operator, having bought out Thornbury Drilling Company of Santa Paula, which developed the Nipomo extension of the field during the early 1950s (State of California Division of Oil and Gas 1950; State of California Division of Oil and Gas 1965: 71–73). Workers were aware of the spill, but remained silent, owing to both a fear of losing their well-paid jobs and a lack of feeling of responsibility for the leaks. That is, given the organizational structure and the fraternal social order that governed relations among field workers, it was up to field superintendent to report the spill outside the field. Indeed, field foremen to whom workers began reporting the spill during the 1980s refused to report the matter even to field supervisors. Thus the spill remained unreported, even though management at the field level began to track its extent and volume informally during the 1980s. Moreover, the "whistleblower" who reported the spill to external sources in 1990 was ostracized.

Union may have saved money by not replacing or repairing the lines that were the source of the leaks. Yet the field-level behavior described by Beamish cost Unocal millions of dollars in terms of both lost diluent and cleanup costs. Unocal Corporation (1997b) charged $230 million to earnings (on record revenues of $5.3 billion) in fiscal year 1996 for environmentally related expenses overall, which included provisions for future remediation costs identified by Unocal, principally for costs related to active company properties and to the cleanup of Guadalupe oil field and Avila Beach. Similar expenses were $370 million in 1994; $170 million in 1995, $180 million in 1997, $200 million in 1998, $70 million in 1999, and $160 million in 2000 (see table 16). Moreover, as table 16 shows, at the end of each fiscal year, Unocal set aside reserves for environmental remediation obligations, grouped into five categories, with Guadalupe, Avila Beach, and the San Luis Obispo tank farm sites falling into the category, "Inactive or closed company facilities." Roughly one-third to one-half of these

amounts were booked to current liabilities in any given year. At the end of 2000, Unocal estimated that environmental-related costs may increase by as much as $245 million above the $123 million reserve—a figure that applies only to cases in which Unocal has been able to determine that it is liable and has quantified the liability. Unocal had also accrued $465 million for estimated future costs related to the abandonment and removal of wells and production facilities.

Table 16. Environmental Reserves Set Aside by Unocal, Fiscal 1996–2000

	(Millions of Dollars)				
Category	**1996**	**1997**	**1998**	**1999**	**2000**
Superfund and similar sites	27	24	16	9	14
Former company-operated sites	26	27	16	10	0
Company facilities sold with retained liabilities	60	74	64	44	51
Inactive or closed company facilities	77	110	166	95	102
Active company facilities	60	33	50	44	46
	250	268	312	202	213

Source: Unocal Corporation, *Form 10-K* (various years)

Unocal also paid $1.5 million in civil penalties in 1994 and another $43.8 million following settlement with the state of California for the civil case in 1998. Unocal's compliance with a cleanup and abatement order issued early in 1998 by the Central Coast Regional Water Quality Control Board began thereafter—a twenty-year project (Cone 1998; *Oil and Gas Journal* 1994; Unocal Corporation 1998b). As Beamish (2000) observes, complete removal of the contamination is not possible.

Evidence of contamination at Avila Beach coincided with the reporting of the Guadalupe/Nipomo spill. In 1992, 140 barrels of crude oil spilled into the ocean and on beach adjacent to Unocal's Avila Beach tank farm. The revelation of a 9,500-barrel plume of diesel fuel below the town of Avila Beach followed soon thereafter, and the beach was closed. The state of California forced Unocal to buy most of the central business district and excavate it (Beamish 2001). "Project Avila" took eighteen months to complete, with the town's Front Street reopening in September 2000. The bluffs on which Unocal's tanks sat remain heavily contaminated (Sneed 2000a; Sneed 2000b). Further, the contaminated land beneath Union's tank farm that burned in 1926, spilling or consuming up to three million barrels of crude oil, remained an issue during this period well, as cleanup costs tied to the site prevented development of the abandoned property.

The cost in terms of reputation was substantial, not just for Unocal, but for all coastal operators. Not only did it take many years for the spill to be reported, but local residents felt betrayed by both Unocal and government officials in the handling of the case, once the spill was made public. The immediate threat to public health was not as large a factor as the sense of institutional betrayal in the context of other related events and perceived threats to the natural and social environment posed by the behavior of Unocal and regulators (Beamish 2001). The spill fed perceptions that oil was incompatible with the way of life in coastal San

Luis Obispo county. Indeed, the Guadalupe and Avila Beach cases reinforced views shaped during the 1969 Santa Barbara oil spill, the fight over Diablo Canyon nuclear power plant, and hearing related to various federal OCS lease sales.

Union, then, has been responsible for at least four of the most notorious pollution events in the history of oil activity in the tri-county region. Though Beamish (2000) points to Union's behavior as an example of systemic organizational failure, more comparative work needs to be done to determine whether or not Union's organizational behavior is representative of the industry. As far as using diluent to facilitate the transporting of crude oil through pipelines in concerned, for instance, Beamish notes that Standard (later Chevron) stopped using diluent in California in the early 1970s, owing to its value in other applications. Rather, the company used steam injection to enhance recovery in its producing properties, and used diluent to make jet fuel and other products. However, to the extent that Beamish's research may be generalized, it may be hypothesized that technology alone will be unable to deliver pollution-free crude oil extraction, storage, transportation, and refining. It is likely that additional pollution events will occur in the tri-county area long after the departure of Union from the area.

As prior research and reporting suggests, some level of pollution will be a legacy of oil practices and technologies employed during the exuberant era. During the 1990s, for instance, the state of California initiated a project to remove industrial debris from, and abandon several improperly plugged wells in, the Summerland field. Between 1993–95, the SLC and the U.S. Coast Guard led efforts to abandon these wells. As state-funded divers discovered in 1979, operators also left industrial debris submerged at Elwood and other areas along the south Santa Barbara county coast (Sollen 1998: 13–14, 18–20). Citizens' concerns about air pollution led to the closure in 1984 of Shell's Ventura Avenue ammonia plant, which at the time was being used by Petrochem U.S.A. to produce ship fuel (VC I: 100–102). Pipeline failures led to several spills in Ventura county, including a January 1993 spill on Texaco's property in the Ventura field (8,800 barrels) and a December 1993 spill of 2,000 barrels of crude oil from a gathering line in the Oxnard field into McGrath lake and McGrath state beach (VC I: 106–107). Given the extensive and aging infrastructure among the area's producing districts, it is probable that similar events will occur in the future.

Recently, newcomers such as Venoco and Nuevo Energy, and majors such as Shell, have insisted on their environmental responsibility and corporate citizenship bona fides. As a look at almost any recent annual report or Web site shows, the principal oil companies that are active in California pay at least lip service to protecting the environment. Many firms discuss at length the efforts that they have made in doing so, and have developed any number of metrics to demonstrate ample progress in this regard (cf. Aera Energy [2001]; Chevron [2000, 2001]; ExxonMobil [2001], Nuevo Energy [2000]; Occidental [2000, 2001]; Royal Dutch/Shell Group [2001]; Venoco [2001a]). Nuevo (2000), for instance, aims to operate "at or above the highest regulatory standards to protect the environment and health and human safety." The company aims "to continuously improve [its] environmental and safety record," and believes that the perfect scores that platforms Irene and Gilda recently received from MMS inspectors provides evidence of its commitment and progress. Venoco (2001a) insists

that its commitment to environmental sensitivity "just ain't lip service," and offers several examples to demonstrate the firm's environmental awareness.

Since all oil companies are profit-motivated, such statements may be seen as self-serving to some degree. After all, environmental sensitivity is surely a minimum standard for doing business along the California coast. Yet it is evident that the professional and managers associated with these firms are sincere in their commitment to the environment and the way of life in the communities in which they do business. That is, in many respects, they "get it." (This study, however, performed no research to quantify this commitment to environment responsibility.) Given the contamination of Avila Beach and Guadalupe Dunes, and other oil-related pollution events that have occurred along the central California coast, there is a historical record that bolsters local skepticism of such corporate pronouncements, especially in south San Luis Obispo and south Santa Barbara counties, which are also home to many residents and citizens groups who believe that oil activity is per se environmentally insensitive.

The issue here is not so much the actual level of pollution—prior research, for instance, has performed no cost-benefit analysis of the regulatory regime with which companies are required to comply—but local perceptions of oil activity and its compatibility with social and natural environments. As such, oil companies face a challenging task, should they desire to persuade opponents of offshore oil development that such activity can proceed on an environmentally sensitive basis. With technological advances extending the life of the extractive regions and making possible the discovery and development of additional offshore reserves, local opposition remains perhaps the most important factor in determining the level of future oil activity in the Santa Barbara channel.

Technological Advances and the Future of the Tri-County Oil Industry

One of the major "discontinuities" that the oil industry experienced after 1986 was the introduction, and growing availability, of significant, often computer-based, technologies (Bleakley *et al.* 1997). Historically low oil prices and the global demand for petroleum products, growing at an average rate of two percent per year, motivated majors, oil service firms and other vendors to develop new technology to improve recovery from existing fields, lower finding costs, and reduce risk to operators (Schlumberger 1997). Horizontal drilling, multilateral wells, floating production, storage, and offloading, 3-D seismic surveys, and subsea completions were some of the technologies that revolutionized the oil industry.

An overview of some of the key milestones in the offshore segment of the industry suggests the magnitude of technological change. By 1989 advances in computer power and technology permitted the commercial use of 3-D seismic surveys in offshore areas. In 1991 the first horizontal well was drilled offshore. In 1994 the first successful floating production unit was installed in the Gulf. In 1996 the first through-tubing multilateral intervention occurred and the first spar-type offshore production unit was installed. In 1997 offshore production exceeded 5,000 feet in depth (Le Blanc 1997a). By 2001 drillships were spudding exploration

wells in nearly 10,000 feet of water and directional wells were extending 25,000 feet (*Economist Technology Quarterly* 2001).

Owing to these, and many other, advances, costs fell and oil recovery became more efficient. The average "finding and development" and "lifting" costs of oil fell appreciably: the former to one-third of the twenty dollars per barrel level it was in the early 1980s, the latter to less than four dollars per barrel (*Economist Technology Quarterly* 2001). Exploration and development drilling success rates increased significantly. Exploration success rates increased from 23 percent in the 1970s to 29 percent in the 1990s: a significant increase given the difficulty of more recent targets, according to Rauch (2001). Computer technology reduced the percent age of dry development wells to twenty, down from seventy twenty years earlier (Schlumberger 2000). Horizontal drilling and enhanced recovery methods facilitated the intensive development of existing fields, from where 89 percent of the reserves added to the domestic stock since 1993 came (Rauch 2001). Moreover, the reserves developed during this period constituted fully eleven percent of all the crude oil reserves that oil companies produced domestically since inception of the industry in 1859, according to the U.S. Department of Energy (Rauch 2001). Technology also reduced the time required to begin production from offshore leases, by 50 percent or more (*Offshore* 1997).

The diffusion of technology was rapid. When 3-D seismic surveys were introduced, for instance, they provided majors with a competitive advantage, as far as offshore Gulf exploration was concerned. By the late 1990s, the more than 130 independents that were operating in the region had access to 3-D technology from vendors such as Landmark Graphics (Bleakley *et al.* 1997). Indeed, technology largely drove the global offshore oil boom of the mid-to-late 1990s; much of it was developed for deepwater exploration and production in the Gulf of Mexico. By 2000, 3-D seismic surveys and other cutting-edge technologies were becoming cost effective for medium and smaller-sized independents that were operating onshore. Although many of the technologies discussed in this section were developed outside California, operators often adapted technology or developed new techniques to address the geophysical conditions presented by the state's oil fields. Technological advances enabled California majors and independents to delineate new reserves, execute their development and redevelopment strategies, and increase production in many fields.

At the same time, substantial room for technological improvement remains. The average recovery rate for an oil field stands at a rather low 30–35 percent, even though as much as 70 percent of the oil in the average reservoir is thought to be recoverable (*Economist Technology Quarterly* 2001; Rauch 2001). Schlumberger, for one, believes that new techniques and technologies can lift recovery rates to 50–60 percent within a decade (*Economist Technology Quarterly* 2001). Obviously, this remains to be seen. Further, technological advances have not stemmed depletion rates in mature fields, which average 7–8 percent, and run as high as 15–20 percent. For instance, from 1986–98, depletion rates at Prudhoe Bay, Alaska for wells drilled prior to 1989 averaged 18 percent (Simmons and Pursell 1999). Indeed, as Simmons and Pursell suggest, the broad application of 3-D seismic surveys and horizontal drilling

during the 1990s may have accelerated rates of decline in field output. Thus drilling new wells remains "a critical component of maintaining production volumes" (114).

Of particular relevance for this study, technological advances expanded, and continue to expand, the areas in which offshore activity may occur. As suggested, technology has proved capable of reviving and extending production in existing fields in the Santa Barbara channel, and tapping new fields from existing infrastructure. This section presents further evidence of this trend. And while it is unclear the extent to which technological advances may stimulate public policy debate or drive changes in policy, Lima's (1994: vi) observation that "technology is the single most important factor affecting the politics and policy of offshore energy development" seems to be as relevant today as it was during the environmental era.

Many of the significant post-1986 technological advances were linked to computers. Indeed, 3-D seismic data generation and processing was at the forefront of the technologies and techniques that were responsible for improving the search for oil under conditions that prevailed following the collapse of oil prices (Von Flatern 1996). Commercial use of 3-D seismic processing—a quantum leap over earlier 2-D technology—began in 1975. By 1989, however, only about five percent of the wells drilled in the Gulf of Mexico, for instance, used the technology (Rauch 2001). Yet from 1990–2000, the cost of analyzing a fifty-square-mile survey fell from $1 million to less than $100,000 (Rauch 2001). And from 1991 workstations were powerful enough to enable geoscientists to model seismic data in three dimensions (Le Blanc 1997a). As of 1996, 80 percent of the wells drilled in the Gulf used it (Rauch 2001). 3-D seismic surveys also facilitated the rejuvenation of mature onshore and offshore fields, as operators could tap reserves missed by traditional approaches. Because the technology lowered lifting costs, it also became economical for operators to exploit smaller, marginal fields that they had ignored. Further, 3-D technology shortened cycle times, by removing the need for repeated surveys. In addition, 4-D, or time-lapse 3-D, surveys enabled production managers to see fluid movements, missed deposits, and infill drilling opportunities (Von Flatern 1996). By the late 1990s, 3-D seismic data acquisition, modeling, and interpretation had markedly improved the efficiency of exploration (Le Blanc 1997a). And continuous improvement in the technology and increases in processing power promise to make 3-D seismic surveys increasingly sophisticated and cost effective. ExxonMobil, for instance, recently developed seismic-imaging techniques that enable reservoirs to be visually displayed in minutes, rather than the months required in the mid-1990s (*Economist Quarterly Technology* 2001).

It is hard to overestimate the impact of 3-D seismic surveys on the oil and gas industry. As George (1996a) put it, "No other factor has been more influential in the growth of production internationally." Indeed, continuous improvement in 3-D seismic technology opened up new possibilities of data acquisition and analysis to the geophysicist, making possible levels of development not envisioned in 1986 (George 1996a). For instance, improvements in computer software and power enabled visual displays of 3-D seismic data, allowing geoscientists and engineers to work collaboratively and iteratively, merging their respective workflows. This approach simplified the drilling process, reduced cycle times, and boosted operational efficiency (Nesser and Pohlman 1998; Scott 1998). As Rauch (2001: 49) argues,

advances in information technology made "knowledge, not petroleum … the critical resource in the oil business." In the estimate of McKinsey, a consultancy, the net benefit to the global oil industry from 3-D seismic imaging now equals some $11 billion annually (*Economist Technology Quarterly* 2001).

The integration of computer technology and oil development motivated majors and independents alike to seek joint ventures and alliances with firms that supplied the desired technology. As Don Evans, Chevron's vice president of technology and environmental affairs, puts it: "Innovation moves along a wide front, much of it happening outside our industry" (Chevron 2001: 18). Thus, for its part, Chevron identifies technological developments and then gives collaborators inside or outside the firm the responsibility of applying them to its business. Computer technology has been at the core of many of its projects. In 2000, for instance, Chevron invested in InViso, a start-up specializing in microdisplays. The technology replicates 19-inch color monitors, allowing field professionals access to office workstations that display seismic sections, processing diagrams, and other data (Chevron 2001). Large independents also have gained access to cutting-edge technology by establishing relationships with vendors. Nuevo Energy, for instance, recently signed a multi-year contract with Landmark Graphics, giving it access to state-of-the-art software solutions for geological, geophysical, and engineering applications (Nuevo Energy Company 2000a).

From the late 1980s, directional drilling also had a significant impact on exploration and production. Although the first horizontal well was drilled in 1939, it was not until the early 1990s that drilling one became cost effective. By replacing two to five vertical wells at less than twice the cost, horizontal wells allowed operators to tap new reservoirs from existing infrastructure and to revive production in mature fields (Rauch 2001). Operators predominantly employed horizontal drilling techniques to recover deposits left behind in mature fields by traditional methods. Recently, operators have used directional drilling to enhance reservoir recovery as well. This trend owes to developments such as short radius motors, coiled tubing, and multilateral well technology (McMillan 1999). Greka SMV, for instance, used proprietary short radius drilling technology to redevelop wells in Cat Canyon field (Greka Energy Corporation 2001a). Notwithstanding the failure of the Molino project, discussed above, technological advances have made extended-reach drilling the technique of choice for operators seeking to develop or revive production in the Santa Barbara channel.

Computers have played a key role in improving the effectiveness of horizontal drilling, which is much more complex than its vertical counterpart. Indeed, vendors have produced software programs with the capability of increasing the output and efficiency of engineers engaged in horizontal drilling operations by 50 percent or more. The programs do so by improving the reservoir selection process, optimizing well placement, calculating drilling parameters, and helping users to identify and solve field problems (or avoid them altogether) (Maurer 1996).

More recently, multilateral well technology promises further efficiencies in the effort to develop fields more intensively. As is the case with extended-reach drilling, multilateral drilling technology reduces the number of wells needed to develop a field (Le Blanc 1997a).

Multilateral wells also can bring many wells to a single surface facility, and are therefore particularly attractive to offshore operators. Enabling technologies have included top-drive drilling motors, which promise to supplant rotary rigs offshore. Continuous improvement in both behind-the-bit measurement tools, which communicate bit direction and location on a real-time basis to the surface, and real-time logging tools have improved the efficiency of, and lowered costs associated with, the technology. By the end of 1996, operators had completed several hundred multilateral wells from onshore sites. Technological improvements promised to enable its mainstream use from offshore locations soon thereafter (DeLuca 1997; Von Flatern 1996).

Improvements in measurement-while-drilling (MWD) and logging-while-drilling (LWD) technologies, steerable drilling motors, drilling steering tools, and other technologies have pushed extended-reach drilling to the 10,000-kilometer mark, enabling operators to drain outlying flanks and access adjacent, unconnected reservoirs from existing facilities. This development is particularly relevant to offshore activity, since offshore lease blocks are somewhat larger than five square kilometers in size, making it possible for an operator using extended-reach drilling to tap a dozen surrounding blocks from a central lease (Le Blanc 1996a; Schlumberger 1997; Schlumberger 2000).

During the 1990s, horizontal drilling, long-reach lateral wells, 3-D seismic surveys, improvements in pumping capability and hydraulics, and other improvements in drilling became more cost effective for small operators. Yet much of this technology still remained too expensive for routine use, and therefore it was not used extensively by the small entrepreneurs who engaged in development work in the tri-county area. (As noted, for large independents the use of these new technologies was critical to the execution of their development strategies.) This owed to the fact that, even as the cost of these technologies fell, the projects executed by these entrepreneurs generally remained too small to justify their use. As of 1998, for instance, a 3-D seismic survey cost tens of thousands of dollars daily. (With improvements in computing power and software, the cost continues to fall, and therefore promises to become more accessible to small operators.) While small firms used some of the more advanced technology for particular projects, they generally relied on traditional technology to accomplish their goals during the era of decline (Clawson 1998; Richardson 1998; Simonson 1998).

With respect to platform technology, continuous improvement in tension-leg, spar, and floating production technology addressed many of the technical and economic limits to producing oil and gas in deepwater (Le Blanc 1997a). Shell, for instance, utilized a tension-leg design for its $1.5 billion Ursa platform, which the firm installed in 3,800 feet of water in the Gulf of Mexico (*Economist Technology Quarterly* 2001). Spars emerged as the newest generation mobile offshore drilling unit. Named for its shape, spars are characterized by a hull that extends far below the water line, which enables the unit to remain stable in rough waters. Like semisubmersible rigs, spars may be converted to producing units. Spars promise to allow operators to drill in depths of 10,000 feet (LeBlanc 1996c, 1997b).

In the interest of conserving cash flow, operators have become increasingly keen to automate platform control systems and processes. The ultimate goal for vendors and operators is to have processes and operations controlled remotely through one system. Under systems that were tested in the North Sea, eastern Canada, and elsewhere outside of the United States, platform maintenance operations were conducted from onshore facilities. Gulf operators, whose platforms are typically less sophisticated and produce less oil than those installed in the aforementioned international areas, have resisted the installation of these systems to date, arguing that their cost can not be justified. As Greenberg (1998b) suggests, in the near future, firms that install larger, more complex projects in deepwater areas may be receptive to the technology. Given the relative stasis and smaller scale of offshore activity in the Santa Barbara channel, it is unlikely that this technology will be transferred to the region in the near future.

Offshore production in general will gradually move to the seabed. Separation technology, dual-gradient drilling, and cuttings handling are already available for commercial use. Technologies such as continuous string drillpipe injection, the recirculation of drilling fluids at the seabed, and seabed gas and water separation/injection facilities are also reducing the physical size of production facilities, and are facilitating the shift of infrastructure from the surface to the sea bottom (Le Blanc 1997b, 1997c). Autonomous underwater vehicles, now in use, will increase in number, size, and capacity. Reservoir monitoring will increase in importance. Digital systems for wells and long-lived sensors will be extended into deepwater fields to create "intelligent" oil fields that will link daily production to operators' cash flow models (Schmidt 1999).

To date, technology has had little overall impact on abandonment planning. The mechanical abandonment of wells remains "somewhat of an afterthought to many operators" (Kelm and Slocum 1998: 66). Cost and regulatory requirements shape operator decision making regarding how to abandon a well and who should do it. And given current environmental liability, there has been increased interest in the process. However, numerous operators have yet to adopt industry best practices, which aim to protect the remaining reserves and minimize the risk of water intrusion and surface or sea pollution. Achieving these goals incurs costs that operators do not always wish to assume. That is, the "tragedy of the commons," or the incentive to externalize costs associated with industrial activity, remains a key consideration with respect to well abandonment. Kelm and Slocum (1998) observe: "It is often easier to meet the regulatory requirements than to physically ensure the long-term protection of the environment and the remaining reserves." They note that operators favor the use of "rigless" abandonment techniques, with cranes replacing rig derricks and torches replacing tubing and casing tongs. This may limit up-front costs, but at an increased long-term risk to both the environment and the financial well-being of the operator.

Industry experts and observers acknowledge that technology alone can not prevent blowouts during offshore drilling operations (Flak 1997; Greenberg 1998a). As Furlow (1997) reports, only in the late 1990s did the well control industry shift its approach to the virtual prevention of uncontrolled events. The industry has become professionalized. Well control personnel are increasingly well educated, use sophisticated operations management software, and

generally take a preventive approach (in contrast to the traditional "You Light 'Em We Fight 'Em" approach). Traditionally Houston-based, the leading firms in this sector are also forming global alliances. Independent operators are especially interested in effective approaches to well control, since few of them can afford to fight a blowout that lasts even days. Yet blowouts may occur, even with better planning and engineering, faster response times, and state of the art equipment, because human error cannot be eliminated. As Beamish (2000) has shown, these errors are often rooted in organizational culture and routines of work, and change is difficult to implement.

The technological advances discussed in this section were mainly driven by developments outside the tri-county region. In two areas, platform abandonment and environmental site remediation, local factors motivated technological change.

A number of technologies were developed to meet regulations regarding the abandonment of platforms in Santa Barbara channel (SB II: 7.8–7.11). Two platforms were abandoned in state waters in 1986; another four were removed in 1996. The technologies developed for the removal of the platforms, which were three to five times larger than contemporaneous platforms installed in the shallower Gulf, included hydraulic grippers, which were adapted to special buoyant lift rigging that could handle 500-ton lifts, and heavy-duty "A" frames. Twenty structures remain in place. Their removal will be an expensive and arduous process, and one that has to address mechanical challenges and meet environmental requirements on pollution emissions. To date no platforms in OCS waters in the Santa Barbara channel have been removed, but they must be removed if and when production ceases.[57] Given the advances in technology discussed in this section, however, it is likely that production will continue indefinitely, given trends in market demand.

During the 1990s, the tri-county region also served as a laboratory for technologies that addressed the remediation of abandoned sites. For instance, new bioremediation technologies were employed in the cleanup of Guadalupe dunes. Other technologies deployed at the site included high-integrity physical barriers (bentonite walls) to prevent drifts of oil and diluent, vacuum-enhanced drop tube technologies to suck out oil and diluent, on one hand, and pump in oxygen to enhance the growth of petroleum-eating microbes, on the other, and biosparging, which involved forcing air and microbes into contaminated areas (SLO II: 7.8–7.11).

Technology and the Santa Barbara Channel

Rather than simply operate their California offshore properties on a low-cost basis until production dwindles to unprofitable levels, majors and "third generation" independents aim to develop them within the existing regulatory regime, using the latest technological advances. As Frank Holmes, coastal coordinator for the Western States Petroleum Association recently observed, "[t]here's still a lot of oil left" in the Santa Barbara channel (Quoted in Trujillo 1998).

[57] Between 1953–90, 788 platforms were removed from the federal OCS in the Gulf of Mexico (Gramling 1996: 68 [table 3.1]).

Operators used extended-reach drilling and 3-D seismic surveys to discover a new field and tap an undeveloped one. In 1997 Nuevo Energy discovered the Tranquillon Ridge field. The play was set up by a 3-D seismic survey and Nuevo's drilling of a well from Platform Irene (Dain Raucher Wessels 1999). ExxonMobil used extended-reach technology to drill four development wells in the Sacate OCS field—discovered in 1970—from Platform Heritage. The success of this effort obviated plans to develop the field from a new platform (State of California Division of Oil, Gas, and Geothermal Resources 2001). At the close of the twentieth century, operators were proposing to use extended-reach technology to develop the Cavern Point and Rocky Point OCS units from existing infrastructure in the Santa Barbara channel, and to increase production in several fields. In the view of the regional director of the Minerals Management Service, such advances in technology were enabling operators "to gain access to ever more oil and gas accumulations from existing facilities," which "could increase production off California with minimum additional risk to the environment and other uses in the area" (U.S. Department of the Interior 2000).

New technology has been used to expose errors or inefficiencies in the approaches taken by previous operators in several fields, and to revive production in these areas. In Dos Cuadras field, for instance, a 3-D seismic survey showed that the field's major faulting ran west to east, rather than southwest to northeast—the pattern on which Union developed the field. The survey gave Nuevo the opportunity to develop the untapped portion of the field, and to change the waterflood pattern to increase recovery in so-called unswept zones (Dain Rauscher Wessels 1999). Further, the strategies used by consortia led by Chevron and Phillips to develop the geologically complex Carpinteria field (which straddles state and federal jurisdictions) also reduced production levels and the duration of wells. Inefficiency of completion methods and the commingling of production from several zones led to water encroachment, prompting Chevron, the operator, to abandon a number of wells prematurely and relinquish its lease with the state of California. Phillips and Chevron recovered only 19 percent of the estimated 500 million barrels of the original oil in place (Coombs *et al.*1999; Kendall n.d.).

In 1996 Santa Barbara-based independent Pacific Operators Offshore (POO) acquired the state lease that Chevron relinquished. (In 1990 POO had acquired the federal lease that contained platforms Hogan and Houchin from Phillips.) In collaboration with the SLC, the U.S. Department of the Interior, and Los Alamos National Laboratory, POO initiated a reservoir redevelopment project. Through vertical and horizontal redrilling operations that tapped bypassed reserves, the project team increased production in a section of the field by 850 b/d (Coombs *et al*. 1999; Kendall n.d.).

POO secured funding from the U.S. Department of Energy for two projects. The first one was a reservoir management project. One of the U.S. government's policy goals of the project was to develop information technology "bridges" on wide area networks and the Internet between service firms and smaller, independent producers that generally did not have the expertise among their staffs to support the use of state-of-the-art modeling tools. For Los Alamos scientists, the Carpinteria project served to demonstrate the possibilities in the area of technology transfer and distribution to independent producers and vendors of software tools

for the oil industry. To that end, Los Alamos scientists acted as systems integrators and providers of expert user support to POO, SLC, and MMS personnel. They also developed data stores and application interfaces for wide area network and Internet distribution in support of both independent producers and public policy (Kendall n.d.).[58]

The reservoir management project, which began in 1994, used 3-D modeling and simulation to identify redevelopment targets. The second project was a field demonstration to facilitate the funding of the initial redevelopment work. The analytical work, which included the use of a state-of-the-art software package to develop a 3-D geological model, led to a redevelopment plan that included horizontal and vertical redrills, numerous workovers, extended reach drilling into state leases, and a pilot waterflood project (Coombs *et al.* 1999; Kendall n.d.).

The effort enabled POO to revive production in a portion of the field. By 1997 reservoir modeling had identified zones for redevelopment. In 1998 POO mobilized a rig on Platform Hogan. Two vertical redrills obtained the data needed to drill four horizontal wells. MWD tools and "geosteering" techniques aided the drilling process. The 850 b/d increase in production resulted from these efforts. In 1999 four additional horizontal wells—lateral offsets to the initial wells—were planned. The drilling rig was then to be moved to Platform Houchin for additional redrills and workovers. The pilot waterflood project and fifteen extended-reach wells from Platform Hogan into state leases were to follow (Coombs *et al.* 1999).

As the Carpinteria redevelopment case suggests, technology is making possible an expansionary period of oil development in the Santa Barbara channel—and is making possible the tapping of reserves contained within state waters from infrastructure in OCS waters. At the same time, the regulatory environment, expressing the values of many coastal communities, restricts development. For instance, Nuevo proposed developing the Tranquillon Ridge field, estimated to contain 130 million barrels of oil, from Platform Irene, using extended-reach drilling. The platform has seventy-two slots and, as of 2000, only fourteen producing wells. Nuevo calculated that the field could be developed with an additional two dozen wells. But much of the field's structure is contained within a state lease, and state law bans new offshore development. Under the law, passed in 1994, the SLC could issue Nuevo a permit to proceed with its development efforts if Nuevo demonstrated that it could drain the state lease from federal waters (Dain Raucher Wessels 1999; J.P. Morgan Securities 2000; Petrie, Parkman 2000).

In October 1999 the SLC deemed Nuevo's permit application complete, paving the way for the environmental review process, public hearings, and approvals from Santa Barbara county, the SLC, and MMS. In June 2001, however, a federal judge in Oakland ruled that the California Coastal Commission had authority under the CZMA to review thirty-six lease extensions that MMS issued in November 1999 upon the completion of the California Offshore Oil and Gas Energy Review (COOGER), a study that served as the basis for the U.S.

[58] Researchers from Los Alamos National Laboratory have been active in other areas that support oil and gas activity. For instance, scientists designed a so-called microdrilling rig that promises to replace traditional drilling rigs with a coiled tubing system that can be transported on a tandem trailer, using a pickup truck (Rauch 2001).

government's plan for future offshore development. (Nuevo has interests in twenty-four of the leases, which were suspended from 1993–99, while the COOGER study was conducted.) In July MMS issued new lease suspensions while it complied with the court order. Phillip Gobe, Nuevo's interim president and CEO, believed that Nuevo's offshore exploration and development plans would be approved and that the firm would "move forward with delivering a critical resource into California's energy market … in an environmentally responsible way" (Nuevo Energy 2001c).[59] The case remains unresolved as of this writing.

To the extent that Vintage, Nuevo, and other large independents are successful in the execution of their onshore exploitation strategies in the tri-county area and elsewhere in California, they will generate capital that they may choose to invest in additional offshore development, should the opportunity to do so arise. In the meantime, several large independents also acquired international offshore concessions and are using the latest technology to explore and develop them. For instance, Nuevo acquired offshore concessions from Congo and Ghana, and used 3-D seismic technology to survey these properties and facilitate the exploitation process. In so doing, the firm gained knowledge and expertise regarding the operation of offshore properties at the same time that it attempted to pursue its development and exploitation strategy in the Santa Barbara channel (Dain Rauscher Wessels 1999; Nuevo Energy Company 2001a).

The Future of the Tri-County Extractive Region

The tri-county region is well past its peak as an onshore extractive region. Yet even after operators developed the area's onshore and tidelands fields to the maximum extent possible, given technology, available capital, and market conditions, lots of oil remains in the ground—at least fifty years worth in the area's mature onshore fields, given current rates of depletion, technology, and prices. As this study has shown, technology spurred the development of the region's oil fields, sustained their production, and mitigated the social and economic effects of their decline. In the future, wells and fields will be abandoned. A number of factors, including depletion, increasing real estate values, and fluctuations in prices, will determine the pace of the process. Given advances in technology and trends in the future demand for petroleum products, the decline of the tri-county extractive region will continue to be gradual, with short-term price- and technology-driven reversals in production likely to occur. As Rauch (2001: 48) notes, "human ingenuity grows more plentiful," even as "resources grow scarcer and thus more expensive." If the predictions of the leading oil service firms are correct, and technology boosts reservoir recovery rates appreciably, the lifecycle of the coastal region may be extended indefinitely.

Offshore leases contain lots of oil as well. As noted in the introduction, thirty-six undeveloped leases the Santa Barbara channel alone may contain more than one billion barrels of crude oil and more than 900 billion cubic feet of natural gas reserves (Nuevo Energy

[59] In June 2000, the U.S. Supreme Court awarded Mobil and Marathon $156 million for their not being able to develop the leases that they held off the coast of North Carolina. This may set a precedent for compensation, should Nuevo fail to gain approval for the development of its California leases.

Company 2001c). In contrast to the region's onshore fields, operators were unable to develop OCS leases to their maximum extent. Thus the expected level of development of OCS activity did not materialize. As SB II (85) notes, this owed to a number of factors, including the price of oil, the local political environment, optimistic industry forecasts and estimates, and the relative attractiveness of extractive regions elsewhere. Thus offshore activity also had lower than expected social and economic impact on the communities along the coast.

As the discussion above suggests, technological advances are making possible the intensive development of the oil and gas resources in the Santa Barbara channel, and operators have shown their interest in investing in the effort. U.S. policy remains biased toward the development of domestic sources of energy. At a time of rising demand (reflected in higher prices) and the breakdown of technological barriers, the opposition of local and state interests, expressed in the existing regulatory regime, prevents the maximum development of the region's offshore oil and gas reserves. These interests perceive that oil activity, and the industrial development that accompanies it, is incompatible with community values and environmental protection. Thus with respect to offshore resource development, political factors remain more determinative of the level of activity than economic and technological ones. Technological developments outside the region, as summarized above, suggest how future development may proceed. To the extent that Lima's model holds for future development, advances in technology may create pressure to develop these fields more intensively.

Whatever the level of future onshore and offshore oil activity, its contribution to local economic development will surely diminish. In the Santa Maria and Ventura districts, where significant amounts of oil development occurred throughout most, if not all, of the period covered by this study, suburbanization, population growth, and economic diversification continue to dilute the impact of the oil sector, even if it were to expand production moderately in existing areas. In the San Luis Obispo and Santa Barbara districts, urban development will continue on a model that values, among other things, the rural or small-town character of communities, recreation, tourism, professional firms, and "clean" technology. As this study has detailed, the San Luis Obispo district never enjoyed much of a payoff from oil activity. In the Santa Barbara district, prior to the inception of the offshore era, significant development occurred only during the interwar period, and production was flush. For more than three decades, the residents of both of these districts have sustained their resistance to oil activity. Given perceptions of industry negligence in several prominent cases, the presence of environmental NGOs and newspapers, concerned citizens' groups, and scrutinizing county and city officials, it is difficult to construct a scenario whereby oil development will make a significant contribution to the coastal communities of these districts. While increases in offshore production may be possible, given technological advances, the regulatory regime in place will surely resist the building of infrastructure that would support the maximum development of the offshore resources that lie off the coasts of both districts.

For each of the three counties that comprise the region, the research team that produced SB II, SLO II, and VC II considered three possible scenarios for offshore development: no new projects, one new slant drilling project, or two new slant drilling projects. The Molino Project

undertaken by Benton Oil and Gas in 1998 indicated how such projects would proceed in Santa Barbara county—a model to which the scenario building exercise in SB II conformed. The authors of SLO II and VC II made speculations based on the political and regulatory environment described in the respective volumes. Quite properly, given the diminished importance of the oil and gas sector in the diversified tri-county economy, each of the studies concluded that the economic impacts of each of these scenarios would be minor. The exercise also provided an opportunity to review the political factors involved in project approval among the three counties that would be impacted by any slant drilling from an onshore location. As the discussion in Part III suggests, however, the scenarios that the researchers considered did not encompass all the possibilities of offshore activity. Given the technological advances and changes in the upstream structure of industry described above, operators may be able to respond more robustly to market incentives to develop the region's oil reserves than the scenario building detailed in SB II, SLO II, and VC II suggested.

Two trends apply to future offshore and onshore oil development: consolidation of producing properties and enhanced resource recovery from existing fields. During the 1990s, technological change, business strategy, and external demand factors intersected in ways that suggest that substantial oil development is possible in existing offshore and (some) onshore areas. The independents that increasingly have assumed control of local upstream activities initiated a process of consolidation that will continue in the future—though a certain amount of fragmentation will persist, given leasing patterns, path dependency in land use, and other factors. The savings associated with consolidation will provide additional capital that operators may invest projects that will stabilize yields and extend the lifecycle of selected fields. New configurations of offshore infrastructure promise to reduce the impact of offshore operations. This trend was made possible by departure of all but one of the majors from California offshore production. At the same time, the rationalization of offshore facilities may make capital available that operators may devote to the enhancement of production from existing platforms.

The consolidation of operations also provides operators the opportunity to conduct enhanced recovery projects using the latest technology. Waterflooding, steam injection, and other techniques will increase in importance. Meanwhile, new drilling techniques also provide a way of enhancing recovery in mature fields, as numerous onshore examples suggest. With respect to reviving production in offshore areas, horizontal drilling from onshore sites remains a possibility, even in the wake of the failure of the Molino project. More likely, Nuevo's proposed Tranquillon Ridge project and POO's Carpinteria reservoir recovery project point the way to future developments in this area.

These initiatives also demonstrate the robustness of the Lima's model, even under conditions of strict environmental regulation. Proven reserves remain undeveloped off the California coast and technological advances have expanded the opportunities to recover them. New entrants in the local structure of industry have demonstrated the capacity and desire to do so. Futures advances in technologies, such as subsea completions and floating production, may provoke renewed debate regarding offshore development policy, as operators and national policymakers pitch advanced technological solutions to oil and gas recovery to resisting local

residents and state and local officials. In the short-term, the visibility of new projects in existing fields should be marginal, as the infrastructure is in place to recover proven reserves with the technologies discussed above. Nonetheless, as recent events show, all proposals to develop production in the Santa Barbara channel will likely be resisted.

Of course, any projects that require new facilities, either onshore or offshore, are sure to be resisted vigorously. Local officials and citizens are unlikely to be persuaded by the arguments of operators that offshore development can proceed without damaging the environment or that such activity will appreciably benefit the local society and economy. Further, as Lima (1994) has shown, offshore oil activity in the Santa Barbara channel is largely confined to areas adjacent to communities that find such activity to be incompatible with their values. Any development of areas known to contain commercial quantities of oil and gas, but which to date have not been developed, will depend on the capacity of new technology to drain reserves from existing facilities and the ability of operators to gain approval to engage in such activity within the existing regulatory regime.

Abbreviations Used

LCL Lloyd Corporation Letters. Lloyd Corporation Archive. Huntington Library. San Marino, California.

RBL Ralph B. Lloyd Letters. Lloyd Corporation Archive. Huntington Library. San Marino, California.

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The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Royalty Management Program** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.