

CHAPTER 1: INTRODUCTION

This study considers criteria that may be applied for siting gas processing facilities in the midwestern and northwestern region of Santa Barbara County, and for the southwestern region of San Luis Obispo County. Since the early 1940s, gas processing needs in this area have been served by Unocal's Battles Gas Plant, located just east of the City of Santa Maria. By the 1980s, however, new oil and gas discoveries in the Santa Maria Basin offshore suggested a future need for additional gas processing capacity and modern facilities onshore. Upon approval of the first offshore oil and gas project in this area, Santa Barbara County initiated this study to provide guidelines for siting future, consolidated gas processing capacity in the area.

Major gas processing facilities can pose adverse impacts to the public and the environment. These facilities (which include offsite transportation of hazardous materials) convert raw gas into sales-quality gas and other by-products such as propane, butane, heavier gas liquids, and sulfur. Experience has shown that careful planning can help to eliminate or substantially reduce adverse impacts. Proper siting of facilities is key to this process.

This study considers portions of two counties -- Santa Barbara County and San Luis Obispo County -- because the issues of siting facilities affect both counties. While this study has not been officially endorsed by the County of San Luis Obispo, the planning staff of that county has extended considerable guidance and assistance during its preparation.

Additionally, this study is not intended to substitute for a comprehensive environmental review, as required under the California Environmental Quality Act (CEQA), once a gas processing facility is proposed. Advanced siting studies such as this one, conducted prior to an actual project application, can serve as useful guide and planning tool, however. The screening and siting criteria contained within facilitate the CEQA process by providing a methodology to conduct an alternative-sites analysis, a requirement which two recent landmark cases -- *Goleta Valley v. Board of Supervisors* and *Laurel Heights Improvement Association v. Regents of the University of California* -- have broadly expanded. Our goal is to consider siting strategies that maximize the protection of the public health, safety, and welfare, and that maximize protection of the environment as offshore oil development moves northward in our region.

The geographic focus for this study comprises approximately 832 square miles in the western portion of Santa Barbara County (north of the Santa Ynez Mountains) and about 154 square miles in the southwestern corner of San Luis Obispo County (Figure 1.1). This area, fully described in Chapter 2, is adjacent to a vast offshore area on the Pacific Outer Continental Shelf (POCS) recently leased by the Department of the Interior to several oil companies for the purpose of developing offshore petroleum reserves. Significant discoveries of oil and gas have already been made in the area. In State Tidelands waters from Point Conception north to the Santa Maria River, however, State Lands Commission staff state that oil and gas development appears to be unlikely through the end of this century.¹

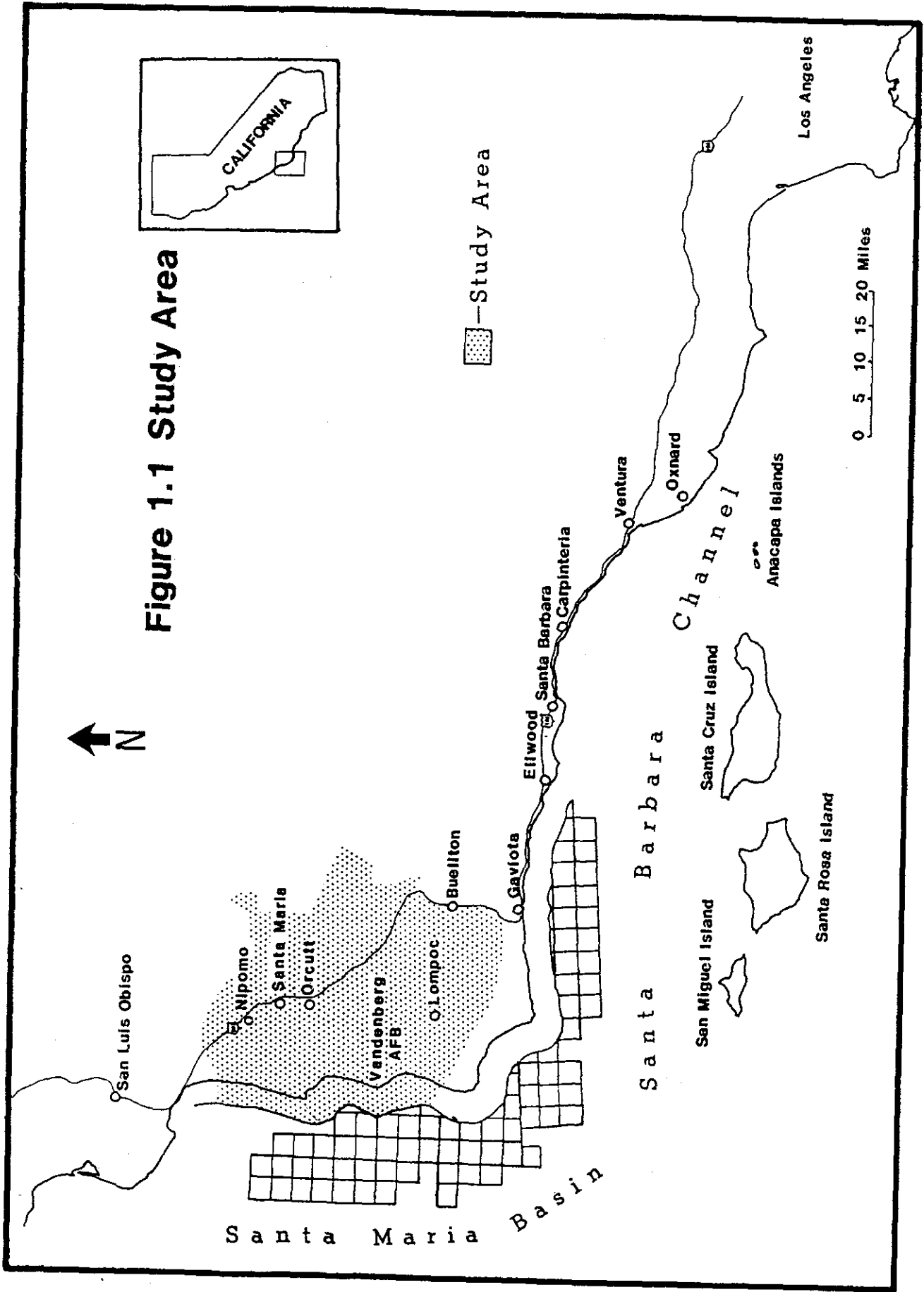


Figure 1.1 Study Area

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We begin the study by identifying the Study Area, describing its salient characteristics, and describing current and future oil and gas activities in Chapter 2. In Chapter 3, we identify and analyze issues pertinent to the selection of appropriate gas processing sites. We have organized these issues under nine categories: (1) public safety (including hazards associated with material transportation), (2) land use (current and future), (3) air quality, (4) ecology, (5) hydrology, (6) geology, (7) aesthetics and noise, (8) cultural resources, and (9) infrastructure and emergency services. Comprehensive screening and siting criteria that address each issue are the end result of this effort. These criteria are intended to provide a functional approach for selecting appropriate gas processing sites.

The screening criteria represent broad, exclusionary criteria which, upon application, can provide a preliminary screening of the Study Area to identify candidate areas. In comparison, the siting criteria are more detailed, pertaining to specific characteristics of a proposed facility and specific characteristics of a proposed site. Upon application, the siting criteria can provide a basis to identify candidate sites and to compare several alternative candidate sites once a gas processing facility has been proposed. The criteria will reveal several advantages and disadvantages that distinguish the sites from one another. The attributes and adverse impacts of each site can then be balanced qualitatively based on regional values.

In Chapter 4, we conclude this preliminary site selection phase by applying the screening criteria to identify only candidate areas at this time. These areas, coupled with the siting criteria, are intended to give direction to prospective applicants. Siting criteria are best used to choose the most suitable sites for more detailed analysis and comparison in a project Environmental Impact Report and a project Risk Assessment; the attributes and shortcomings of each site will become much clearer in the context of a detailed project proposal.

In developing this study, we have received assistance from a Steering Committee formed specifically for this project. We extend our appreciation to this committee for the considerable time and effort that they dedicated to this study. The committee includes representation from:

County of San Luis Obispo, Department of Planning and Building
County of Santa Barbara, Resource Management Department, North County
County of Santa Barbara, Petroleum Office
County of Santa Barbara, Fire Department
Santa Barbara County-Cities Area Planning Council
City of Santa Maria, Community Development Department
City of Lompoc, Planning Department
City of Guadalupe, Planning Department
California Department of Conservation, Division of Oil and Gas
Vandenberg Air Force Base, Directorate of Environmental Management
Unocal Oil and Gas Division, Unocal Corporation
Shell Western E & P, Inc.
Conoco, Inc.

The remaining part of this chapter provides selected background information for the study.

Section 1-A: INITIATION OF STUDY

Historically, recovery of petroleum in northern Santa Barbara County and in southern San Luis Obispo County has been limited to development of onshore oil fields. Much of the gas recovered in these operations presently is used onsite as fuel for oil production, while most producers send the remaining gas to Unocal's Battles Gas Plant for processing and sales. This plant, which Unocal began operating in the early 1940s east of the City of Santa Maria, is the only complete gas processing facility in the area. Battles is designed to process a maximum of 30 million standard cubic feet of gas per day (although permits limit daily throughput to a maximum level of emissions and further limit throughput from offshore sources to a maximum of 13 million standard cubic feet daily from the Point Pedernales field). Battles also separates propane, butanes, other gas liquids, and sulfur from the raw gas. The propane and butanes are transported to market by truck, while the other gas liquids are blended with crude oil for pipeline shipment to Unocal's Santa Maria Refinery (crude oil upgrading facility) in San Luis Obispo County and then to Unocal's Rodeo Refinery in the Bay Area.

In 1981, the U.S. Department of Interior's lease sale #53 on the POCS opened the offshore area known as the Santa Maria Basin to exploration and potential future development. Two additional lease sales (numbers RS-2 and 73) followed in 1982 and 1983 respectively. By the spring of 1987, the first development of these Santa Maria Basin leases, Unocal's Point Pedernales project, began operations. This project is situated in the central Santa Maria Basin on lease number P-0441. As shown in Chapter 2, Unocal sends its POCS oil production to a newly constructed processing facility located northeast of the City of Lompoc, while the gas goes to the Battles Gas Plant.

In the southern Santa Maria Basin, Chevron and Texaco have installed three platforms; Chevron has also constructed an oil and gas processing facility on the southern coast of Santa Barbara County at Gaviota. One other oil development project is currently proposed for the Santa Maria Basin. That project is Shell Western's San Miguel Project, situated in the northern sector of the basin, west of Point Sal. Several other development platforms, however, are anticipated in the future, particularly in the northern Santa Maria Basin where the Minerals Management Service has consolidated 25 leases into 5 units.²

Considering both future prospects to develop larger volumes of gas in the Santa Maria Basin and the age of Unocal's Battles Gas Plant, Santa Barbara County and Unocal formally agreed as a condition of their Final Development Plan to initiate a siting study for a consolidated gas processing facility. As stated in Condition A-21:

"Prior to approval of the Final Development Plan, Union shall enter into an agreement with Santa Barbara County to determine the scope, scheduling and funding of a siting study to determine a suitable location for a consolidated gas processing facility for combined Central and Northern Santa Maria Basin gas production. The study would analyze both the technical and environmental feasibility of locating a consolidated gas plant to accommodate estimated gas production. Union and the County would coordinate with other local governments in the scoping of the study as appropriate.

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If a new consolidated facility becomes available during the life of the project, Union shall be required to use the new facility for its offshore gas processing needs. The Battles Gas Plant shall be used to process offshore production of 13 MMSCFD [million standard cubic feet daily] maximum. Should offshore gas production entering the Battles Plant increase to a level greater than 13 MMSCFD, allowable under this permit, Union shall be required to process gas associated with the development of the Point Pedemales Field in a new consolidated gas plant."

Since the execution of this permit, however, considerable attention has focused on the potential hazards of transporting sour gas from producing fields to processing facilities. Sour gas is the term applied to raw gas that contains significant amounts of hydrogen sulfide -- a toxic compound that occurs naturally in some petroleum reservoirs. As described fully in Chapter 3, the issue of safely transporting sour gas raises a basic question with regard to consolidation: How much of the Study Area can one consolidated processing facility serve safely? Because the geographic area addressed in this study is relatively large and contains several producing fields both onshore and offshore, two or perhaps three consolidated processing facilities may be preferable. This approach minimizes potential hazards of sour gas transportation by locating processing operations closer to producing operations minimizes hazards of sour gas transportation. We therefore compare the alternative of two or three consolidated processing facilities to that of one consolidated processing facility as part of this study.

Section 1-B: FUTURE DEMAND FOR NATURAL GAS IN CALIFORNIA

According to the 1987 Fuels Report, published by the California Energy Commission (CEC), natural gas fulfills approximately 25 percent of California's energy requirements.³ Californians currently consume an average of 4.6 billion cubic feet of natural gas daily.⁴ Future statewide demand for natural gas, according to the CEC report, will increase significantly (see Figure 1.2).

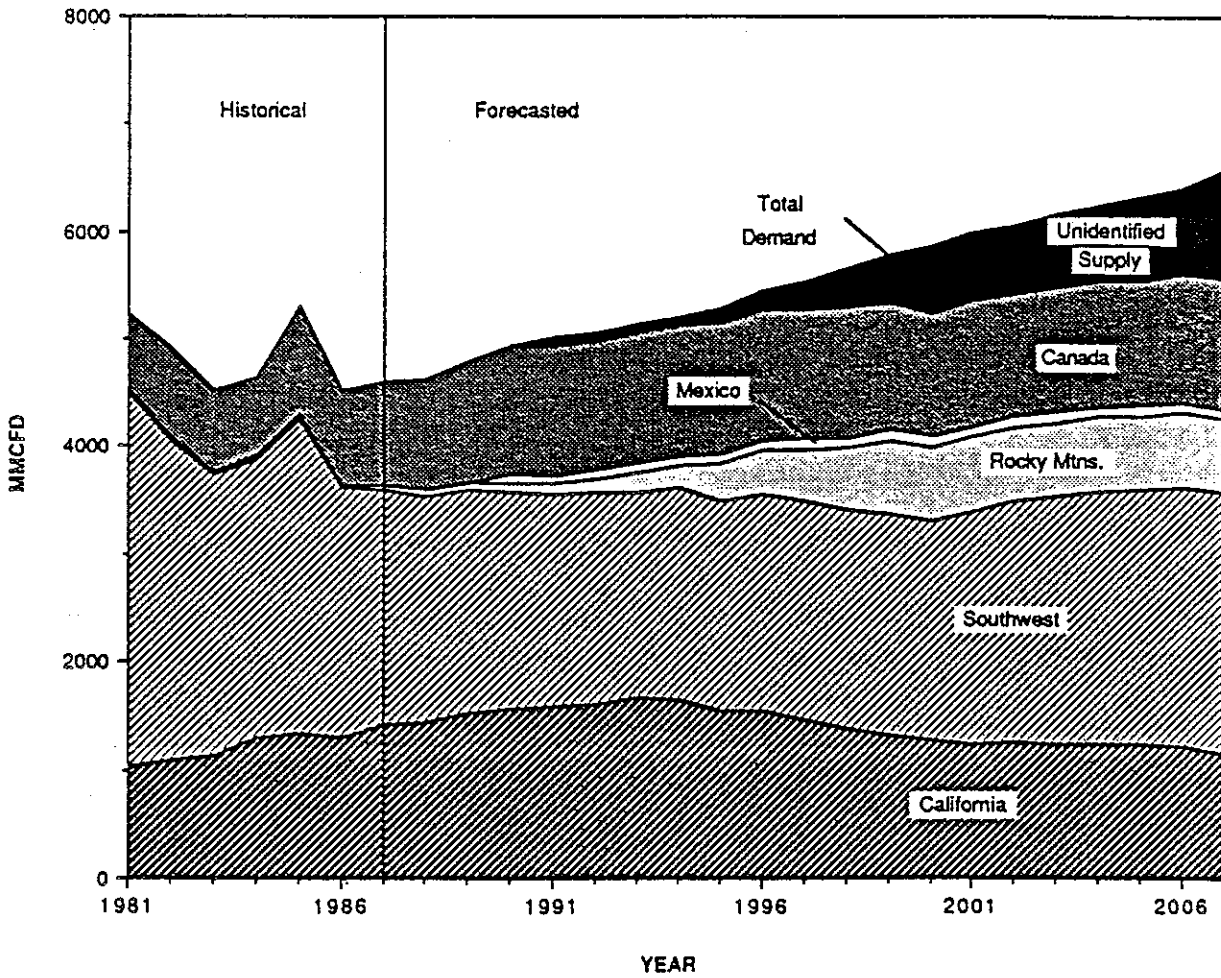
Increasing demand stems largely from electric power plants and from thermally enhanced oil recovery operations in the San Joaquin Valley. In both instances, requirements to improve air quality are driving the transition to natural gas which is a much cleaner burning fuel than fuel oil. Additional increases in demand may occur in the future as natural gas replaces other less-clean fuels to improve the state's air quality.

Despite already significant statewide production of natural gas, California imports most of its gas from outside sources. California oil and gas fields provide approximately 30 percent of the state's natural gas demand.⁵ Although statewide production in the near future is estimated to increase, the CEC Fuels Report projects that state production will begin to decline in the mid 1990s, providing only about 16 percent of California's natural gas requirements by 2007.⁶

As gas from the more traditional suppliers decreases, other regions will assume an increasing share of the California market. Other potential sources of natural gas supplies, according to the CEC report, include: offshore California, Mexico, and additional supplies from Canada, the Rocky Mountains, the Southwest, and the Gulf Coast. Exactly how much gas might be available to California from these sources depends on several variables such as regional

FIGURE 1-2⁷

**CALIFORNIA NATURAL GAS MARKET
SOURCES OF SUPPLY**



competition for supplies, availability of transportation infrastructure, and new development. Recently, a four-year regulatory dispute between private interstate pipeline companies and gas utilities was settled, perhaps clearing the way for at least two new interstate pipelines for transporting natural gas from outside regions to Southern California.

Section 1-C: A TYPICAL GAS PROCESSING OPERATION

The remaining portion of this chapter provides a brief description of gas processing in general. The physical and chemical characteristics of both oil well streams and gas well streams will vary among reservoirs. A typical well stream, however, contains a complex mixture of gases, hydrocarbon liquids, water vapor and free water, solids, and other components. Production from oil wells commonly involves primary separation of gas from the oil emulsion at or near the production site. After separation, disposition of the gas depends on several factors, including the physical and chemical characteristics of the raw gas, the characteristics of the subsurface formation, gas market variables, and environmental constraints. Options include injecting it back into the subsurface formation, using the gas onsite to fuel production equipment, flaring it onsite, or sending it to a processing facility via pipeline.

Gas processing involves treatment of raw gas to remove valuable hydrocarbon components, to remove and treat unwanted components to prevent contamination of the environment, and to prepare the gas and gas liquids for sale. Table 1.1 illustrates the major components of raw natural gas; methane constitutes the major component of sales-quality or processed gas.

Figure 1.3 illustrates the basic components of a gas processing facility; however, specific facility components and design characteristics do vary considerably among facilities. For example, some facilities such as the Phillips Tajiguas Gas Plant located between Gaviota and Goleta do not have a sulfur removal plant and, therefore, cannot process sour gas (i.e., gas contaminated with hydrogen sulfide). Other facilities, such as the sour gas facility operated by the Pacific Offshore Pipeline Company in Las Flores Canyon are not designed to separate propane and butanes from the gas liquid stream. Rather, the raw gas liquids are shipped to another facility for further processing.

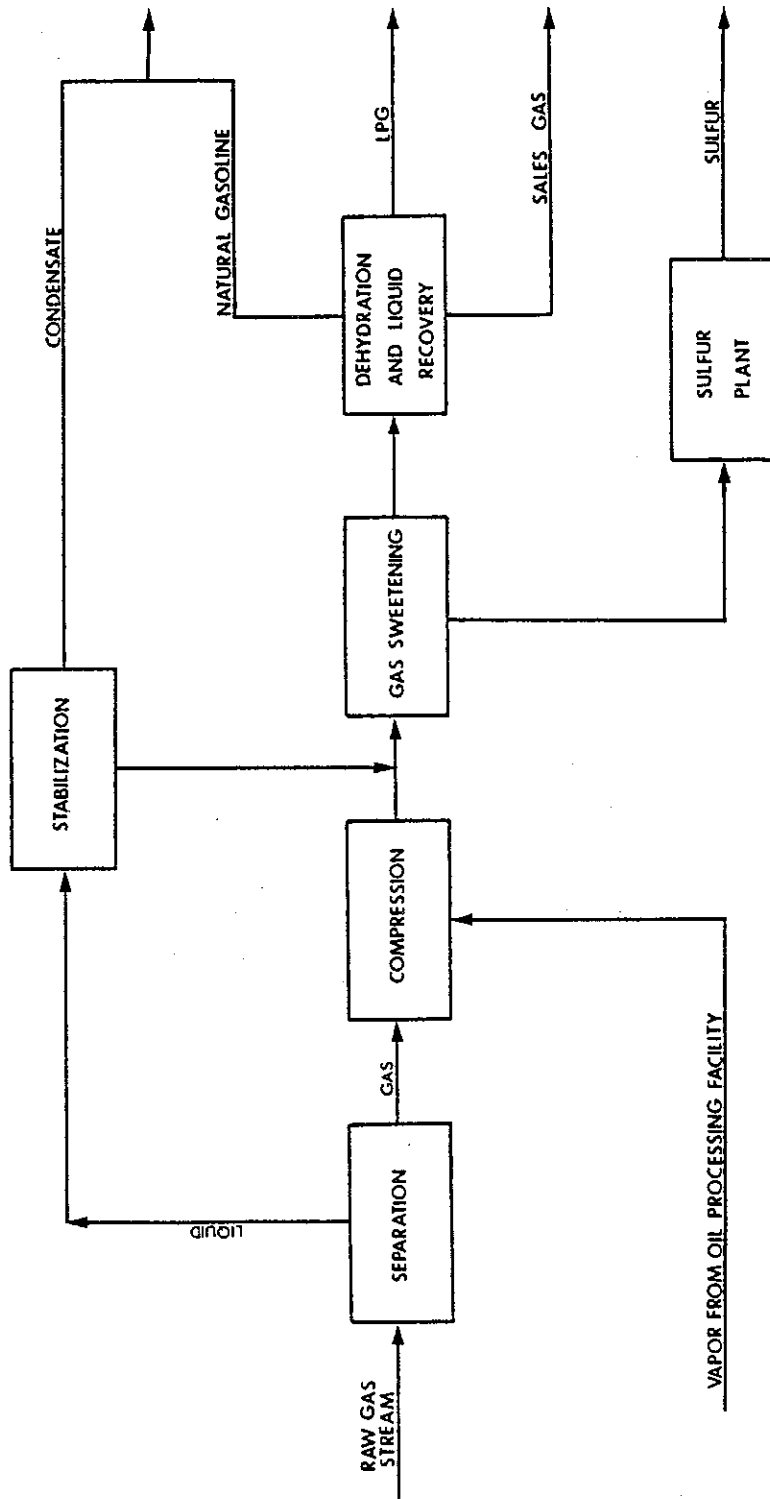
A gas plant may include all or some of the following components:⁸

- o Condensate knockout vessels to separate condensate from the gas stream.
- o Scrubbing system to remove hydrogen sulfide and carbon dioxide from the gas stream.
- o Glycol dehydration system.
- o Low-temperature separation system to remove liquified petroleum gas and other gas liquids (natural gasoline) from the gas stream.
- o Sulfur recovery plant for converting hydrogen sulfide to elemental sulfur.
- o Tail-gas incinerator to oxidize the sulfur compounds not removed in the sulfur plant.

**Table 1.1
Major Components of Raw Gas⁹**

<u>Component Hydrocarbons</u>	<u>Chemical Formula</u>	<u>How Utilized</u>
Methane	CH ₄	Gaseous state; used as fuel.
Ethane	C ₂ H ₆	Gaseous state; mixed with methane as gaseous fuel and used alone as chemical feed stock.
Propane	C ₃ H ₈	Liquified fuel or chemical feed stock. Pressure storage required.
Butanes	C ₄ H ₁₀	Liquified fuel or chemical feed stock. May also be constituent of natural gasoline. Pressure storage required.
Pentanes	C ₅ H ₁₂	Constituents of natural gasoline. Pressure storage not required.
Hexanes	C ₆ H ₁₄	Constituents of natural gasoline. Pressure storage not required.
<u>Component Non-Hydrocarbons</u>		
Hydrogen Sulfide	H ₂ S	Poisonous gas constituent of natural gas. Removed and converted to elemental sulfur.
Carbon Dioxide	CO ₂	Removed from natural gas if in excess of sales specification.
Nitrogen	N ₂	Inert gas that has no heating value in natural gas; ordinarily not removed from sales gas.
Water	H ₂ O	Removed to meet sales gas water dewpoint specification.

FIGURE 1.3



SIMPLIFIED GAS PROCESSING FLOW DIAGRAM

Siting Gas Processing Facilities

- o Caustic scrubber to remove low levels of H₂S in hydrocarbon stream.
- o Separation and treatment unit for liquified petroleum gas and other gas liquids (natural gasoline).
- o Storage tanks and transportation facilities for the liquified petroleum gas and other gas liquids.
- o Storage and loading facilities for the produced sulfur.
- o Compressor unit for processing and shipping of gas.

Components of a gas facility that are major consumers of electrical energy include propane refrigeration compressors, vapor recovery and gas booster compressors, fans for air coolers, air blowers for sulfur plants and waste incinerators, and various pumps. Gas processing systems generally consume a portion of the gas production to fuel steam generation. Components that are major consumers of steam include reboilers for glycol regenerators, and reboilers for the fractionation columns and condensate stripper.¹⁰

Sources of air emissions from a gas processing system include the sulfur plant, tail-gas treating unit, the glycol regenerator, leaking valve stems, flanges, packing glands, mechanical seals, relief valves, and stack gas emissions from the gas-fired heaters. Liquid effluents from a gas processing system include sour water, sulfur plant tail-gas scrubber discharges, and spent caustic from the gas liquids treating system.¹¹

Section 1-D: REFERENCES

1. Pers. Comm. with Susan Livenick, State Lands Commission staff, May 19, 1989.
2. Unitization of leases, a practice established by the Department of the Interior Minerals Management Service, consists of "...pooling all interests, ownership, and control in a producing field or part of a field to ensure conservation of natural resources and to protect correlative rights in the national interest. A "unit agreement" provides for a single operator or company to develop and operate several leases as if they were one." This definition is found in Minerals Management Service, OCS Information Report MMS 87-0078, Pacific Summary/Index: June 1, 1986 -- July 31, 1987, (Vienna, VA: Minerals Management Service, 1987), page 34.
3. California Energy Commission, *Fuels Report*, December 1987, page 1.
4. *Ibid.* page 1.
5. *Ibid.* page 12.
6. *Ibid.* page 12.
7. *Ibid.* page 13.

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8. County of San Luis Obispo, *op. cit.*, October 1986, page A 1.0-11; correspondence from D. Yesland, Shell Western E&P, Inc., April 28, 1989.
9. Beggs, H. Dale. *Gas Production Operations*. Tulsa: Oil & Gas Consultants International Inc. (Distributed by Gulf Publishing Company, Houston, Texas), page 221.
10. County of San Luis Obispo, *op. cit.*, October 1986, page A 1.0-13.
11. County of San Luis Obispo, *op. cit.*, page A 1.0-14. Natural gas, pentanes, hexanes, and heavier gas liquids are the major components of natural gasoline. Propane and butanes (isobutane and normal butane), or liquified petroleum gases, are often removed and marketed separately. Sales-quality gas is shipped from the processing facility to the consumer via pipeline. Liquified petroleum gases and natural gas liquids may be shipped from the facility via pipeline, train, truck, or marine vessel.

Siting Gas Processing Facilities

Siting Gas Processing Facilities Screening and Siting Criteria

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