3.0 ALTERNATIVES

Several alternatives to SES' Long Beach LNG Import Project (the proposed action) were evaluated to determine whether they would meet all or most of the project objectives, be feasible, and reduce one or more of the impacts identified for the proposed action. These alternatives include the:

- no action or no project alternative;
- alternative system locations;
- LNG terminal alternative locations;
- pipeline alternatives;
- dredge and fill alternatives; and
- vaporizer alternatives.

Based on NEPA and CEQA regulatory guidance (see Title 40 CFR Part 1502.14 and California Code of Regulations Title 14, section 15126.6, respectively) the evaluation criteria for selecting alternatives to consider in this EIS/EIR include whether they:

- are technically and economically feasible and practical;
- avoid or substantially lessen one or more of the significant environmental effects of the proposed project; and
- accomplish all or most of the project objectives of providing the LA Basin and southern California markets with: 1) a new source of up to 1 Bscfd of natural gas; 2) up to 150,000 gpd of LNG for vehicle fuel; and 3) storage capacity of up to 320,000 cubic meters of LNG (see section 1.1).

Using the evaluation criteria discussed above and subsequent environmental comparisons, each alternative was considered to the point where it was clear that the alternative was either not reasonable, would result in substantially greater environmental impacts that could not be readily mitigated, or would not avoid or substantially lessen one or more of the significant environmental effects of the proposed project. Those alternatives that appeared to offer environmental advantages or that would result in less than or similar levels of environmental impact were reviewed in greater detail.

The analysis was based on information provided by SES, aerial photography, U.S. Geological Survey (USGS) topographic maps, other publicly available environmental data, and agency consultations.

3.1 NO ACTION OR NO PROJECT ALTERNATIVE

The actions triggering this environmental review were SES' applications to the FERC for a section 3 authorization and to the POLB for a Harbor Development Permit. This environmental review will also satisfy the NEPA responsibilities of the ACOE in considering issuance of section 404 and section 10 permits for activities associated with the project and of the Coast Guard for issuance of an LOR. In addition, this document may be used to meet the CPUC's CEQA responsibilities in considering authorization of the intrastate facilities associated with the project (i.e., the C_2 pipeline and electric distribution facilities).

In analyzing a proposed project in a joint CEQA/NEPA format, the ACOE must distinguish the scientific and analytical basis for its decisions from the CEQA lead agency's decision. The ACOE baseline condition for determining significance of impacts is primarily dependent on the baseline condition that is defined by examining the full range of construction and operational activities the applicant could implement and is likely to implement without permits from the ACOE. This baseline includes all of the construction and operational impacts likely to occur without ACOE permits (i.e., air emissions and traffic likely to occur without issuance of permits to dredge or modify shoreline structures). The determination is based on direct statements and empirical data from the applicant, as well as the judgment and experience of the ACOE. For the proposed Long Beach LNG Import Project, the ACOE has determined, in consultation with the FERC and the POLB, that the proposed project cannot be constructed without permits from the ACOE. Therefore, the no action or no project analysis presented herein is reasonably the ACOE's baseline for future permit decisions.

The FERC, POLB, ACOE, Coast Guard, and CPUC have two alternative courses of action in considering proposed projects. They may: 1) deny the respective applications; or 2) approve the project with or without conditions. If the FERC, POLB, ACOE, Coast Guard, or CPUC deny SES' applications, the short- and long-term environmental impacts identified in this EIS/EIR (both positive and negative) would be avoided. However, should the no action or no project alternative be selected, the objectives of the proposed project would not be met. Specifically, SES would not be able to provide a new supply of natural gas and LNG to southern California. It is purely speculative to predict the actions that could be taken by other suppliers or users of natural gas and LNG in the region as well as the resulting effects of those actions. Because the demand for energy in southern California is predicted to increase (see section 1.1), customers would likely have fewer and potentially more expensive options for obtaining natural gas and LNG supplies in the near future. This might lead to alternative proposals to develop natural gas delivery or storage infrastructure, increased conservation or reduced use of natural gas, and/or the use of other sources of energy.

It is possible that the infrastructure currently supplying natural gas and LNG to the proposed market area could be developed in other ways unforeseen at this point. This might include constructing or expanding regional pipelines as well as LNG import and storage systems. Any construction or expansion work would result in specific environmental impacts that could be less than, similar to, or greater than those associated with the Long Beach LNG Import Project. An analysis of the most reasonably foreseeable natural gas and LNG system alternatives has been included in section 3.2.

Increased costs could potentially result in customers conserving or reducing use of natural gas. During the energy crisis of the 1970s, numerous aggressive energy conservation programs were developed in California. Regulators in the state have demanded that gas and electric companies implement aggressive, cutting edge conservation programs and have promoted public programs encouraging energy conservation. Although it is possible that additional conservation may have some effect on the demand for natural gas, conservation efforts are not expected to significantly reduce the long-term requirements for natural gas or effectively exert downward pressures on gas prices (EIA, 2003). It seems more likely that higher natural gas prices would adversely influence the regional economy by reducing realized household incomes and business profits (Greenspan, 2003).

Denying SES' applications could force potential natural gas customers to seek regulatory approval to use other forms of energy. California regulators are promoting renewable energy programs to help reduce the demand for fossil fuels. One of these programs provides funding for emerging technologies such as: photovoltaic (direct conversion of sunlight to electricity), solar thermal electric (the conversion of sunlight to heat and its concentration and use to power a generator to produce electricity), fuel cell (the conversion of hydrogen or hydrogen rich gases into electricity by a direct chemical process), and small wind turbines (small electricity-producing, wind-driven generating systems with a rated output of 50 kilowatts or less). Another program, the Geothermal Program, promotes the research, development, demonstration, and commercialization of California's enormous earth heat energy sources. While renewable energy programs can contribute as an energy source for electricity, they cannot at this time reliably replace the need for natural gas or provide sufficient energy to keep pace with demand. Further, the aggressive acceleration to use more renewable energy generation is predicted to take 6 to 15 years and, even then, only account for 20 percent of the state's energy needs (CEC, 2003).

Compared to other fossil fuels such as coal or oil, natural gas is a relatively clean and efficient fuel that can reduce the emission of regulated pollutants [e.g., NO_x, sulfur dioxide (SO_2), and particulate matter having an aerodynamic diameter of 10 microns or less (PM_{10})] or unregulated greenhouse gases (e.g., CO_2). Given that there are emissions associated with producing, processing, transmitting, and distributing natural gas and other fossil fuels, it is difficult to exactly quantify the impact of an LNG import project on local and regional air quality. However, credible estimates of air emissions can be developed based upon reasonable assumptions regarding burning natural gas delivered by the project compared to burning fossil fuels that would likely be utilized if the gas from the project was not available. Table 3.1-1 lists the emissions that would result from the combustion of approximately 1 Bscfd of natural gas in southern California markets and the corresponding emissions that would result if an equivalent amount of energy were generated using fuel oil or coal in lieu of natural gas (inside or outside of California). It is clear from the table that the use of either fuel oil or coal would increase emissions significantly. To comply with current air emission regulations, emission control technologies could be required that could limit the economic viability and/or affect the location of any new oil- or coal-fired facility. For example, it is conceivable that California's demand for electricity would increasingly be met by oil- or coal-fired facilities outside of California (e.g., Mexico) if new sources of natural gas are not developed.

TABLE 3.1-1

Comparison of Air Emissions from Burning Fossil Fuels [a]

	Emission Rate (tons per year)					
Fossil Fuel	SO_2	NO_x	PM_{10}	CO	CO_2	C
Natural Gas	110	16,555	1,325	16,445	18,333,333	5,000,000
Fuel Oil	86,643	33,113	1,878	17,440	26,583,333	7,250,000
Coal	231,785	115,893	5,133	3,618	34,833,333	9,500,000

[a] The emissions generated by coal, fuel oil, and natural gas were estimated using the most recent Best Available Control Technology (BACT) Analyses found on the U.S. Environmental Protection Agency Reasonably Available Control Technology/BACT/Lowest Achievable Emission Rate Clearinghouse for boilers with heat input ratings between 100 and 250 million British thermal units (MMBtu) per hour. The emissions from each fuel source are estimated based on a total annual fuel use of 146,000,000 MMBtu per year (1 billion standard cubic feet per day, 365 days per year, 1,000 Btu per cubic foot).

SO_2 = sulfur dioxide
NO_X = nitrogen oxides
PM_{10} = particulate matter having an aerodynamic diameter of 10 microns or less
CO = carbon monoxide
CO_2 = carbon dioxide
C = carbon

Denying SES' applications could also limit the availability of LNG as an alternative vehicle fuel in the LA Basin and southern California. Although it is difficult to quantify the specific differences in air emissions between LNG and diesel fuel, any potential environmental benefits associated with greater availability of LNG for vehicle fuel (see section 4.9.8) would not be realized with the selection of the no action or no project alternative.

3.2 ALTERNATIVE SYSTEM LOCATIONS

Alternative system locations (system alternatives) would make use of other existing or proposed LNG or natural gas facilities to meet all or most of the stated objectives of the proposed project. A system alternative would make it unnecessary to construct all or part of the proposed project although some modifications or additions to the existing or proposed facilities may be necessary. These modifications or additions would result in environmental impacts that could be less than, similar to, or greater than those associated with construction of the Long Beach LNG Import Project. Ultimately, the point of identifying and evaluating system alternatives is to determine whether potential environmental impacts associated with the construction and operation of the Long Beach LNG Import Project could be avoided or reduced by using another system.

As noted above and described in section 1.1, the objectives of the Long Beach LNG Import Project are to provide markets in southern California, particularly the LA Basin, with a new source of up to 1 Bscfd of natural gas, a reliable source of LNG for vehicle fuel, and a large natural gas storage facility that can reduce fluctuations in the local supply. Natural gas is currently supplied to southern California markets by four interstate pipeline systems; some LNG is supplied via trucking from existing facilities located in several western states. Although the only existing LNG import terminals in the United States are along the east and gulf coasts, there are currently several proposals to build onshore or offshore LNG import terminals along the west coast (both in the United States and in Mexico). The analysis below examines the existing and proposed LNG and natural gas systems that currently or could eventually serve southern California markets, and considers whether those systems avoid or substantially lessen one or more of the significant environmental effects of the Long Beach LNG Import Project and could meet all or most of the project objectives.

3.2.1 Pipeline System Alternatives

Currently, interstate pipeline systems deliver about 5.7 Bscfd of natural gas to markets in southern California (EIA, 2003). A majority of this natural gas comes from production areas in the Rocky Mountains or central United States via pipeline systems owned by Mojave Pipeline Company, Kern River Gas Transmission Company, Transwestern Pipeline Company, and El Paso Natural Gas Company (El Paso) (see figure 3.2.1-1). These existing interstate natural gas pipelines are operating at or near capacity and are not currently capable of delivering an additional 1 Bscfd of natural gas to southern California.

Questar Southern Trails Pipeline Company has proposed and received approval from the FERC for another interstate pipeline that would eventually extend from northwestern New Mexico to Long Beach. This new natural gas pipeline system would involve converting an existing crude oil pipeline and constructing some new pipeline segments and compressor stations. A portion of this pipeline has been converted and is already providing natural gas; the in-service date for the entire system is unknown. As originally proposed, the western half of the pipeline would have a capacity of about 120 MMscfd, well below the volume that would be supplied by the Long Beach LNG Import Project.

North Baja Pipeline, LLC (North Baja) is currently considering an expansion of its pipeline system in southeastern California to allow up to 2 Bscfd of natural gas to be delivered to an interconnect with the SoCal Gas system in Blythe, California. Additional discussion of this pipeline system alternative, which is directly related to an LNG system alternative, is included in section 3.2.2.2.

Non-Internet Public

DRAFT ENVIRONMENTAL IMPACT
STATEMENT/ENVIRONMENTAL IMPACT REPORT
FOR THE
LONG BEACH LNG IMPORT PROJECT

Docket No. CP04-58-000, et al.

Page 3-5
Figure 3.2.1-1

Public access for the above information is available only through the Public Reference Room, or by e-mail at public.referenceroom@ferc.gov

The primary distribution system that delivers gas from the interstate pipelines serving southern California is operated by SoCal Gas. Other secondary distribution pipelines, all of which receive the majority of their natural gas from SoCal Gas, are operated by San Diego Gas and Electric (SDG&E), the City of Long Beach Energy Department, and the Los Angeles Department of Water and Power. SoCal Gas is capable of receiving up to 1 Bscfd of natural gas at its Salt Works Station in Long Beach (the proposed delivery location for the Long Beach LNG Import Project), but may not be capable of receiving these volumes at other locations on its system without construction of new facilities. However, it is impossible to identify the specific nature of these new facilities without more information from SoCal Gas. To provide this information, SoCal Gas would have to complete a system capacity study for the defined gas supply scenario(s), identifying receipt and delivery points, and source and volumes of natural gas delivered to the receipt point. That said, assuming there are available natural gas supplies other than those derived from LNG, it is theoretically possible that an existing or proposed pipeline system could be expanded or modified to deliver an additional 1 Bscfd of natural gas to the LA Basin and southern California markets.

Any expansion or modification of an existing pipeline system of sufficient magnitude to provide a new source of up to 1 Bscfd of natural gas would, at a minimum, require several hundred miles of new large-diameter pipeline loop[1] and the construction of new compression facilities to increase the existing capacity of those systems. Expansion of existing pipeline systems would likely entail impacts on water resources, upland vegetation, wetlands, wildlife habitats, land use, and air quality in California and other states.

Regardless of the type of pipeline facilities that might be needed to deliver the volumes proposed by the Long Beach LNG Import Project, no pipeline system alternative is capable of meeting two of the project's objectives, which are to provide a stable source of LNG for vehicle fuel and the storage of up to 320,000 cubic meters of LNG to address fluctuating energy supply and demand.

3.2.2 LNG System Alternatives

There are currently no existing LNG import facilities serving southern California or the west coast of the United States. As described previously, markets in southern California historically have received LNG via truck from existing natural gas liquefaction facilities in the western United States; none of the natural gas currently used in California is derived from imported LNG. In the future, LNG and natural gas could be supplied to the region via proposed LNG import terminals in California and Mexico. A discussion of existing and proposed LNG facilities is presented below.

3.2.2.1 Existing LNG Facilities

To improve air quality in California, truck and bus fleets are being encouraged to replace diesel-fueled vehicles with LNG-fueled vehicles or other clean burning fuel systems. This has resulted in demand for LNG that is projected to rise from an estimated current average use of between 15,000 and 50,000 gpd to as high as 195,000 gpd by mid 2006 (Powars and Pope, 2002). Nearly all of the LNG currently used in California is trucked in from a liquefaction plant in Topock, Arizona. This plant includes a natural gas liquefier owned by El Paso Field Services and an LNG storage and truck loading facility owned by Applied LNG Technologies USA (ALT). Although the ALT-El Paso Field Services facility is able to produce up to 86,000 gpd of LNG, currently only about one-third of this is available for California fleet vehicles.

[1] A loop is a segment of pipeline that is installed adjacent to an existing pipeline and connected to it at both ends. The loop allows more gas to be moved through the system.

Aside from the ALT-El Paso Field Services liquefaction plant, there are a number of other LNG facilities that have occasionally provided LNG to California. There is one LNG liquefaction facility operating in California. The Quadren Cryogenics facility in Robbins (northwest of Sacramento) produces ultra-high-purity methane for the specialty gas market and does not typically supply substantial quantities of LNG for vehicle fuel. Currently this facility is able to produce about 4,000 gpd of LNG. Although Quadren Cryogenics is exploring the expansion of its facility to provide additional volumes of LNG for the transportation-fuel market, details of the specific schedules and volumes provided by an expansion are confidential. There are also four other out-of-state natural gas liquefaction facilities that have historically provided limited volumes of LNG to California. These include the ExxonMobil Corporation nitrogen rejection unit near Shute Creek, Wyoming; the BP p.l.c. nitrogen rejection unit near Painter, Wyoming; the Pioneer Natural Resources USA nitrogen rejection unit near Santana, Kansas; and a Williams Field Services NGL plant near Durango, Colorado.

Even assuming that all of their production capacities were dedicated to providing LNG for transportation fuel, the existing ALT-El Paso Field Services and Quadren Cryogenics facilities could not satisfy the projected future demand for LNG in California. Extensive use of out-of-state facilities could provide some additional LNG to California. However, the significant trucking distances to California (600 to 900 miles) would limit the economic feasibility of using out-of-state facilities as well as likely increase the risks of LNG truck accidents, highway congestion, and air pollution from tanker truck emissions. These out-of-state facilities may also have existing contractual arrangements that would preclude them from being able to make the required deliveries. Regardless, the use of these existing LNG facilities could not satisfy the project objectives of providing markets in southern California, particularly the LA Basin, a new source of up to 1 Bscfd of natural gas and the storage of up to 320,000 cubic meters of LNG to address fluctuating energy supply and demand.

3.2.2.2 Proposed LNG Facilities

There are currently over 50 LNG import terminals that have been proposed and/or are being considered at various coastal locations throughout North America. At least 12 of these LNG import projects are along the west coast including sites in Mexico, southern California, Oregon, and Canada. Additionally, several relatively small-scale projects in California have been proposed that would involve liquefying natural gas that is available from local sources. This analysis is limited to those projects that could provide LNG to the California market. Although LNG facilities under the jurisdiction of another country would inherently not provide the same security of supply that a facility in the United States would, the nearby projects in Mexico were also evaluated for possible environmental advantages.

Mexico

Two LNG import terminal projects are proposed for the Tijuana-Rosarito area of northern Baja California, Mexico (see figure 3.2.1-1). These terminals would be between 135 and 150 miles south of Los Angeles and could indirectly serve the greater southern California market. The projects include proposals by ChevronTexaco Corporation (ChevronTexaco) and Sempra Energy LNG/Shell International Gas Ltd. (Sempra/Shell). Such projects need to obtain several key approvals to site an LNG facility in Mexico. These include a permit from the Comisión Reguladora de Energía (CRE), an environmental permit obtained from the Secretaria de Medio Ambiente y Recursos Naturales (SEMARNAT), and a local land use authorization. The CRE, or Energy Regulatory Commission, has regulatory authority over public and private activities in the electricity and natural gas industries. Approval of a CRE application is required for any new LNG terminal to be built. The SEMARNAT, or Secretariat of the Environment, Natural Resources and Fishing, has sole jurisdiction over those acts that affect two or more states in Mexico. The agency is responsible for examining environmental impacts of new projects. The ChevronTexaco and Sempra/Shell projects have obtained a majority of the necessary regulatory approvals. Table 3.2.2-1 includes a description of these two proposed Mexican LNG import projects and their current permitting status.

TABLE 3.2.2-1

Proposed LNG Projects in Baja California, Mexico

Project Name (Location)	Sponsor	Project Description	Project Schedule and Permitting Status
Terminal GNL Mar Adentro (offshore Rosarito)	ChevronTexaco	Offshore LNG import terminal facility located 8 miles off the coast of Mexico near the Coronado Islands. The project would have an LNG storage capacity of 250,000 cubic meters and an average natural gas sendout capacity of 750 MMscfd (peak 1.4 Bscfd). The project would also include onshore components. The project would primarily import Australian LNG.	Proposed completion date of 2007-2008. Mexico's Comisión Reguladora de Energía (CRE) application filed on October 7, 2002; accepted in July 2003; approved in January 2005. Secretaria de Medio Ambiente y Recursos Naturales (SEMARNAT) project approval obtained in September 2004. Communication and Transport Secretariat project authorization obtained in January 2005.
Energy Costa Azul LNG (14 miles north of Ensenada)	Sempra Energy LNG and Shell International Gas Ltd.[a]	Onshore LNG import terminal facility and 45-mile-long pipeline. The project would have an LNG storage capacity of 320,000 cubic meters in two tanks and an average natural gas sendout capacity of 1 Bscfd (peak 1.3 Bscfd). The project would primarily import LNG from Indonesia and Russia. Project sponsors indicated that 500 MMscfd would be sent to the Mexican market and 500 MMscfd would be sent to the southern California and southwestern United States markets through the North Baja/GB/TGN pipeline system.	Anticipated completion date of 2007. CRE application filed on September 6, 2002; accepted on November 12, 2002; approved on August 18, 2003. Local Land Use Permit approved on August 18, 2003. SEMARNAT project approval obtained on April 16, 2003.[b] Construction of the LNG terminal began on March 30, 2005. Sempra/Shell expect the facility will be operational and receive its first LNG cargo in 2008. Although it did not halt construction, a September 2005 ruling by a Mexican federal court required the SEMARNAT to complete additional analyses of several environmental issues related to the project.

a Originally, Shell International Gas Ltd. had proposed its own LNG import terminal near Ensenada, Baja California. In December 2003, Shell International Gas Ltd. announced that it would be jointly pursuing the Energy Costa Azul LNG Project with Sempra Energy LNG.

b A temporary federal court injunction was placed on the project's environmental permit in November 2003 due to project opposition. In March 2004, the injunction was lifted and the environmental permit is still in effect.

Sources: Natural Gas Intelligence. North American LNG Import Terminals. December 15, 2004.
http://www.chevrontexaco.com/gnlbaja/default_eng.asp (Accessed April 14, 2005).
http://www.sempra.com/lng_energiaCostaAzul.htm (Accessed April 14, 2005).

Of the two proposed Mexican LNG import projects, the Sempra/Shell project (Terminal GNL Mar Adentro Project) is the furthest along in the permitting process. By March 2005, Sempra/Shell had obtained the necessary permits and begun construction of roads and the terminal facilities. This onshore project would likely deliver a portion (up to half) of its natural gas to markets in the southwestern United States. Although growing, the current demand for natural gas in northern Baja California (Mexico) is about 500 MMscfd.[2] The Sempra/Shell onshore LNG terminal is designed to provide 1 Bscfd of natural gas to the Mexican and United States markets. The project sponsors have indicated that 500 MMscfd

2 Current natural gas demand in northern Baja California includes the CFE 1090 megawatt (MW) Presidente Juarez Power Plant in Rosarito, Mexico; the Sempra 600 MW Thermoelectrica de Mexicali and Intergen 1050 MW Energia Azteca power plants in Mexicali, Mexico; and ECOGAS' natural gas distribution system in Mexicali, Mexico.

would be sent to the Mexican market and 500 MMscfd would be available for export to the United States. Sempra/Shell anticipates completing the project and receiving its first LNG cargo in 2008. ChevronTexaco proposes an offshore LNG project (Energy Costa Azul LNG Project) that is scheduled to be in operation by 2007 or 2008. This offshore project could provide an average of 750 MMscfd of natural gas to regional markets. If both the Sempra/Shell and ChevronTexaco projects are built, they would provide about 1.75 Bscfd of natural gas to markets in Mexico and the United States. However, the specific amount of natural gas that would be available for export over the long term would depend on factors that include actual LNG import volumes and sendout capacities, Mexican power plant electric generation requirements, customer contracts, and the pipeline infrastructure in Mexico and the United States. Based on current demand for natural gas in northern Baja California, it is conceivable that up to 70 percent of the sendout capacity of the natural gas from the Sempra/Shell and ChevronTexaco projects could be available for delivery to markets in other parts of Mexico or the United States.

There are two existing pipeline systems that could be used to deliver natural gas from LNG import terminals in Mexico to markets in southern California. These are the North Baja/Gasoducto Bajanorte (GB)/Transportadora de Gas Natural de Baja California (TGN) system and the SDG&E system (see figure 3.2.1-1).

Sempra/Shell indicated that the Energy Costa Azul LNG Project would deliver about 500 MMscfd of natural gas to the southern California and southwestern United States markets via the North Baja/GB/TGN pipeline system. Currently, the North Baja/GB/TGN system consists of three interconnected pipelines that were recently constructed to deliver natural gas from the United States to Rosarito, Mexico. The United States portion of the system (North Baja pipeline) starts at an interconnection with an El Paso mainline at Ehrenberg, Arizona at the California/Arizona border and runs southward to the Mexican border. In Mexico, the natural gas is transported westward by the GB pipeline to the TGN pipeline near Tijuana/Rosarito. The North Baja/GB/TGN system is currently capable of delivering 500 MMscfd of natural gas to Rosarito. To use this system to transport natural gas to southern California markets, the direction of flow on the system would have to be reversed so that natural gas would flow from an interconnect with the LNG import terminal(s) through the TGN pipeline to the GB pipeline to the North Baja pipeline. Near the northern end of the North Baja pipeline, natural gas could be delivered to the SoCal Gas system through a short lateral[3] or El Paso's existing system.

In early 2005, the FERC received information that plans were underway to expand the North Baja/GB/TGN system. On August 31, 2005, the FERC and the CSLC issued an NOI/NOP to prepare an EIS/EIR for the North Baja Pipeline Expansion Project. This project would involve reversing the flow of the system and constructing up to 80 miles of new large-diameter pipeline loop along the North Baja system. The expansion would allow up to 2 Bscfd of natural gas to be delivered from Mexico to an interconnect with the SoCal Gas system in Blythe, California. With this expansion, natural gas from an LNG terminal located in northern Baja California, approximately 135 to 150 miles south of Los Angeles, would have to be transported a minimum of 400 miles west to east and then east to west to reach the proposed market area. Additionally, some of the volumes of natural gas provided by the Mexican LNG facilities could be provided indirectly to southern California through displacement of existing volumes that are currently provided to the North Baja/GB/TGN system from the El Paso system. That is, 500 MMscfd of natural gas from El Paso that is currently going to northern Mexico could also be diverted directly into the SoCal Gas system. Regardless of whether the natural gas would be transported from an LNG terminal in Mexico or delivered via displacement from the El Paso system, the existing SoCal Gas system could only accommodate about 500 MMscfd of natural gas (half of the proposed project volumes) without upgrades.

[3] A lateral is typically a smaller diameter pipeline that takes gas from the main system to deliver it to a customer, local distribution system, or another interstate transmission system.

The SDG&E pipeline system distributes natural gas in the San Diego area. For this pipeline to be used to transport gas from LNG import terminals in Mexico, a project proponent could utilize a currently inactive pipeline that runs from the TGN system near Tijuana, north into the United States and connects with the SDG&E pipeline. This system alternative would involve construction of a receipt lateral from the LNG terminal(s) to the TGN pipeline, modification of the inactive pipeline and the interconnect with the SDG&E pipeline, upgrading of the SDG&E system in order to reverse the flow (SDG&E currently receives gas from SoCal Gas), and modification and upgrading of the interconnection between the SDG&E and SoCal Gas systems. Depending on the volume imported to the United States, it may also be necessary to loop all or part of the 23-mile-long TGN pipeline. According to a preliminary analysis conducted by SoCal Gas and SDG&E in May 2003, facility improvements would be required on the SDG&E system to accommodate any new natural gas volumes between 300 and 700 MMscfd (Sempra Energy Utilities, 2003). Larger volumes would require looping the existing pipeline from Santee to Escondido, as well as from Escondido to Rainbow, with associated environmental impacts.

The North Baja/GB/TGN and the SDG&E pipeline systems are not currently capable of reliably delivering the natural gas volumes proposed by the Long Beach LNG Import Project to the broader southern California market. Providing significant volumes of natural gas to southern California from Mexico would require a variety of pipeline facility upgrades/expansions and/or an inefficient delivery pathway, both of which would entail associated economic and environmental costs. Serving the LA Basin would require the construction of a new pipeline through densely populated and commercial areas, which would increase environmental and landowner impacts as well as the transportation cost for gas delivery when compared to the much shorter, more direct delivery to the LA Basin through the existing SoCal Gas system from the Long Beach LNG Import Project. While the possible use of the SDG&E system is a much more direct route than the North Baja/GB/TGN system, it is not a reliable, practicable alternative at this time. Furthermore, it is unclear whether contractual arrangements could be made to allow additional deliveries on either of these systems. However, the CPUC has issued a decision that would streamline the contract approval process for receiving LNG imports at several interconnect points in southern California, including one at the border between California and Mexico associated with the SDG&E pipeline system at Otay Mesa (see figure 3.2.1-1). Upgrades/expansion of the existing pipeline systems in the California-Mexico border region would be constrained by existing land uses and could potentially result in a variety of impacts on biological and cultural resources (CEC, 2005a).

Another issue associated with the Mexican-based LNG projects is that to meet the objective of providing a stable source of LNG for vehicle fuel to the southern California market, LNG from a terminal in the Baja California area would have to be trucked between 135 to 150 miles (depending on the location of the LNG terminal) on Mexican and United States highways.[4] Transporting LNG from Baja California to the LA Basin would have the same potential problems as transporting LNG from LNG-producing plants in the United States, including potential increased risks of LNG truck accidents, highway congestion, and air pollution from tanker truck emissions.

The proposed LNG import projects in Mexico would involve a variety of environmental impacts that would differ from the Long Beach LNG Import Project. The Sempra/Shell LNG project is located on a new site with no prior infrastructure development. Construction and operation would include ground disturbance and accompanying environmental impacts that are typical of new development (e.g., land use conversion, vegetation/habitat removal, noise, aesthetic impact). Additionally, the project would require construction of LNG ship docking/berthing facilities that would likely result in impacts on the nearshore marine environment. Finally, there would be environmental impacts associated with construction of the 40-mile-long sendout pipeline needed to connect the new LNG facility with the existing pipeline system infrastructure. Similarly, the ChevronTexaco LNG project would be developed in a previously

[4] It is not economically or technically practical to transport LNG via pipeline for distances greater than about 3 miles.

undeveloped location off the coast of Baja California. In addition to the direct impacts on benthic habitats at the LNG terminal and along the offshore pipeline route, this project would use significant volumes of seawater to vaporize the LNG. Resource agencies and nongovernmental organizations in the United States have expressed serious concerns regarding the impacts a seawater vaporization system could have on fish populations due to the entrainment of large numbers of fish eggs and larvae for proposed projects of similar design in the Gulf of Mexico (LNG Express, 2004). Additionally, concerns have been raised about this project's impacts on seabirds and the potential to introduce invasive species to the nearby Coronado Islands.

Southern California

There are a number of proposals to build LNG facilities in California. These include relatively small facilities capable of liquefying natural gas from pipelines, natural gas from regional reserves, and/or natural gas produced from local sources of decomposing organic materials (e.g., landfills, sewage treatment facilities) for use as vehicle fuel as well as larger facilities that would import and vaporize LNG to supply natural gas to California. Three of the larger proposed facilities that would import and vaporize LNG are offshore facilities. The Long Beach LNG Import Project and the smaller proposed liquefaction facilities are onshore facilities.

<u>Onshore</u>

Currently, at least seven onshore natural gas liquefaction facilities are being planned or proposed in California. Because each of these facilities would be limited by the availability of a consistent and relatively inexpensive source of natural gas that could be converted to LNG as well as by other economic factors, it is difficult to determine which facilities will ultimately be built. However, it seems reasonable to assume that at least some of the natural gas liquefaction facilities will be built. In comparison with the proposed project, these liquefaction facilities are relatively small and limited in the volumes of LNG they could produce and store. Given the proprietary nature of these proposals, information on the specific status and the volumes of LNG that would be provided by these projects is not available. However, Powars and Pope (2002) estimate that all of these projects combined would likely result in providing about 70,000 gpd of LNG to the California market for use as vehicle fuel (as compared to the Long Beach LNG Import Project's 150,000 gpd of LNG).

<u>Offshore</u>

There are three offshore LNG import projects currently under consideration in southern California. These include projects by BHP Billiton (BHP), Crystal Energy LLC (Crystal Energy), and ChevronTexaco (see figure 3.2.2-1).

Offshore LNG import terminals located in federal waters are under the jurisdiction of the DOT and the Coast Guard pursuant to the Deepwater Port Act of 1974 (as amended by the Maritime Transportation Security Act of 2002). Among other things, this legislation requires that the DOT [U.S. Maritime Administration (MARAD)] and the Coast Guard regulate the licensing, siting, construction, and operation of deepwater ports for natural gas. Offshore LNG import terminals located in state waters fall under the jurisdiction of the FERC, pursuant to the NGA.

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DRAFT ENVIRONMENTAL IMPACT
STATEMENT/ENVIRONMENTAL IMPACT REPORT
FOR THE
LONG BEACH LNG IMPORT PROJECT

Docket No. CP04-58-000, et al.

Page 3-12
Figure 3.2.2-1

The operational history of LNG import facilities located entirely offshore is currently limited. Nevertheless, the technology for offshore LNG storage and regasification facilities is being developed and guidance documents have been produced (American Bureau of Shipping, 2002). The DOT and Coast Guard authorized construction of one offshore LNG import terminal that began operating in the Gulf of Mexico in early 2005 (i.e., the Gulf Gateway Project). Additionally, the DOT and Coast Guard are currently reviewing nine other applications to construct and operate offshore LNG import terminals in the United States. Offshore LNG terminals have also been proposed in Australia, West Africa, Taiwan, Mexico, and Italy (LNG Express, 2002). Recently, companies have introduced various strategies for operating LNG import terminals in offshore waters (LNG Express, 2003). All of these approaches would allow offshore docking and unloading of LNG ships as well as offshore regasification of LNG for delivery as natural gas to onshore markets via undersea pipelines. Some of these approaches would allow storage capability. The offshore design strategies that are currently being considered for use in southern California are discussed below.

BHP Billiton – Floating Storage and Regasification Unit

BHP proposes to construct the Cabrillo Port LNG Deepwater Port, which would be a floating storage and regasification unit (FSRU) located about 21 miles offshore of Port Hueneme and Oxnard. As proposed, the project would include a floating vessel that would house three spherical LNG storage tanks mounted within the hull, accommodations for personnel, a ship berthing and mooring system, and eight vaporizers for LNG regasification. The facility would have an LNG storage capacity of about 273,000 cubic meters. The FSRU would be anchored in deep water offshore of the proposed market area where conventional LNG ships could dock next to and unload LNG to the FSRU. After the LNG is unloaded into storage tanks, it would be vaporized and the natural gas transported to onshore markets through an undersea pipeline. The eight vaporizers on the vessel would allow for the vaporization and sendout of about 800 MMscfd of natural gas (peak sendout of up to 1.5 Bscfd). LNG would be used to fuel the vaporization process that would be entirely self contained and would use its own fresh water, thus eliminating the need to intake or discharge sea water. BHP would construct two new 21.5-mile-long, 24-inch-diameter undersea pipelines from the FSRU to a new onshore interconnect that would be owned and operated by SoCal Gas at the Reliant Energy Ormond Beach Generating Station. The project would also include construction of a new 14.3-mile-long, 36-inch-diameter onshore pipeline between the Reliant Energy Ormond Beach Generating Station and an existing SoCal Gas valve station (i.e., the Center Road Station) as well as a new 7.7-mile-long, 30-inch-diameter onshore pipeline loop on the existing SoCal Gas pipeline system.

BHP initially filed its application with the Coast Guard on January 27, 2004 anticipating that the project facilities would be in service some time in 2008. The application was processed and an NOI/NOP was issued on February 24, 2004. The Coast Guard's regulatory review process was suspended on April 16, 2004 due to data gaps but restarted on September 3, 2004. In October 2004, a draft EIS/EIR for the project was released by the Coast Guard, the MARAD, and the CSLC. On January 5, 2005, the CSLC and the Coast Guard again suspended the regulatory review process pending BHP's submittal of additional information needed to address public and agency comments on the draft EIS/EIR.

Crystal Energy – Fixed Platform

Crystal Energy proposes to convert an existing oil platform off of the coast of Ventura County (Platform Grace) into an LNG receiving and regasification terminal. The platform is located in the Santa Barbara Channel about 13 miles offshore and west of Oxnard. Crystal Energy would modify the platform to operate as an LNG receiving and processing facility by installing an LNG transfer system, a cool-down tank, six LNG pumps, and six LNG vaporizers. Reinstallation and upgrade of the platform's power production capability would also be necessary. Once the facility is operational, LNG would be transferred to the platform from a carrier ship where it would be vaporized and sent to the onshore markets as natural gas through a new 32-inch-diameter undersea pipeline. A new docking structure would be installed adjacent to the platform to safely moor LNG vessels during transfer. From depths of about 318 feet at the platform, the pipeline would generally be constructed adjacent to existing undersea pipeline rights-of-way 13 miles to an onshore landing near the Mandalay Power Generating Station. From the landing, a new 12-mile-long, 36-inch-diameter onshore pipeline would be constructed to an interconnect with the existing 30-inch-diameter SoCal Gas pipeline system near Camarillo. The Crystal Energy facility would not store LNG; natural gas sendout capacity would average 800 MMscfd with a peak capacity of 1.2 Bscfd.

Crystal Energy initially filed its application with the Coast Guard on January 28, 2004 and the CSLC on February 10, 2004 anticipating that the project facilities would be in service by early 2007. Crystal Energy's applications were subsequently re-filed with the Coast Guard on July 27, 2004 and the CSLC on July 29, 2004. The applications were found deficient in the scope and depth of the information needed. As of August 2005, the project remained in suspension pending Crystal Energy providing additional project information before the regulatory review will continue (CEC, 2005b).

ChevronTexaco – Gravity-Based Structure

ChevronTexaco publicly discussed plans to construct the Port Penguin LNG Terminal off of the coast of southern California. Reportedly, this terminal would be designed similar to ChevronTexaco's proposed Terminal GNL Mar Adentro Project in Mexico and would include a gravity-based structure (GBS) with an anticipated natural gas sendout of 750 MMscfd. This design involves placing LNG storage tanks and associated facility platforms on new foundations anchored directly on the sea floor. LNG would be offloaded from conventional LNG ships, placed in storage tanks, and then vaporized for delivery to the onshore market via an undersea pipeline. GBS terminals are only feasible in areas of relatively shallow water, where the depths range from between 45 and 100 feet. Based on information provided by the CEC, ChevronTexaco discontinued pursuing this project in June 2005 (CEC, 2005b).

Offshore LNG Import Terminal Technical Issues

To facilitate receiving imported natural gas from the proposed LNG facilities in southern California, the CPUC issued a decision that would streamline the contract approval process for several interconnect points in southern California, including one at SoCal Gas' Center Road Station near Oxnard that would serve the Crystal Energy and BHP projects (see section 1.1). If approved and constructed, both the BHP and Crystal Energy projects would provide a new source of large volumes of natural gas to markets in southern California. Because the Crystal Energy project would not include LNG storage, it would not be able to provide stability to a market with fluctuating energy supply and demand. Although the BHP project would provide offshore storage of LNG, it is only designed to store about 85 percent of the LNG that would be stored by the Long Beach LNG Import Project. Furthermore, neither the Crystal Energy nor BHP projects could provide supplies of LNG for vehicle fuel. As such, neither of these projects would satisfy all of the objectives of the Long Beach LNG Import Project.

A disadvantage of offshore LNG facilities that do not have LNG storage capacity (such as the one proposed by Crystal Energy) is the potential for delays in ship arrivals and the associated delays in the delivery of natural gas to meet the daily demand of customers. Because of the uncertain maritime sailing conditions (e.g., adverse weather), LNG ships can take up to 24 days to get from the export or loading port to the import or unloading location. A facility with fixed LNG storage tanks (either onshore such as proposed by SES or offshore such as proposed by BHP) with standing vaporization capacity compensates for variations in ship arrivals as well as fluctuations in onshore natural gas demand and allows for controlled deliveries of natural gas to onshore customers between LNG deliveries.

Weather not only significantly influences ship travel time between ports, but adverse weather has a higher probability of delaying LNG deliveries to unprotected offshore terminals such as those proposed by Crystal Energy and BHP. Adverse weather (e.g., high seas) could delay the unloading of LNG vessels for several days to a week, depending on the conditions, while the same weather would have little impact on deliveries to onshore facilities located in a protected port. The potential for severe weather delays would equate to a need for increased storage volume at offshore terminals to maintain a predictable, constant flow of natural gas to shore.

As noted above, the offshore terminal designs could not provide LNG for use as a vehicle fuel, which is an objective of the Long Beach LNG Import Project. Once LNG is vaporized, it does not appear practical to reliquefy the product onshore in southern California. This is because the reliquefaction process is energy intensive and is generally only done on a large scale when there is a relatively inexpensive source of natural gas. In addition to the cost and energy expenditure associated with liquefying natural gas, the impact of constructing a liquefaction facility and the air emissions associated with operating such a facility would have to be considered.

Offshore LNG Import Terminal Environmental Issues

Both the BHP and Crystal Energy proposals are undergoing an environmental review by the Coast Guard, the MARAD, and the CSLC. Specific details on environmental impacts will or have been presented in EIS/EIRs for the respective projects. In October 2004, a draft EIS/EIR was issued for BHP's Cabrillo Port LNG Deepwater Port. As of September 2005, a draft EIS/EIR for the Crystal Energy project has not been issued. Because an application to construct ChevronTexaco's Port Penguin LNG Terminal has not been filed, a formal environmental review by the appropriate regulatory agencies has not been initiated for that project.

Table 3.2.2-2 includes a summary of the comparative environmental issues associated with the Long Beach LNG Import Project and the Cabrillo Port LNG Deepwater Port. Much of the information for the comparative analysis presented in table 3.2.2-2 and the discussion presented below was taken from the Cabrillo Port LNG Deepwater Port draft EIS/EIR (CSLC et al., 2004).

It has been suggested that an onshore terminal would present more visual effects, land use conflicts, risks to public safety, biological impacts, and air quality issues when compared to an offshore terminal. However, these generalizations cannot be accurately applied to all LNG projects. The Long Beach LNG Import Project would be located in a previously developed industrial area associated with the POLB where it would not change the existing industrial land use of the site or significantly alter the visual character of the area. In comparison, the Cabrillo Port LNG Deepwater Port would involve permanent facilities that would change the visual character of the offshore view, both during the day and at night. While the evaluation of aesthetics is necessarily subjective, the presence of this deepwater port terminal could have a significant negative impact on the experience of recreational boaters, tourists, and coastal residents who view the offshore environment from land.

TABLE 3.2.2-2

Environmental Comparison of the Long Beach LNG Import Project and the Cabrillo Port LNG Deepwater Port

Resource Issue/Impact	Long Beach LNG Import Project	Cabrillo Port LNG Deepwater Port
Aesthetics/Visual Effects/Recreation	The LNG terminal would have a negligible impact on the visual character of the surrounding Port complex. Construction and operation of the Long Beach LNG Import Project would not threaten the viability of a recreational resource, prohibit access to recreational resources, or cause termination of a recreational use.	The FSRU would significantly change the visual character of the ocean view for recreational boaters that travel near the facility. Safety zones around the FSRU would restrict sportfishing activities in the project area.
Land Use	The LNG terminal and pipelines would be constructed in an area dominated by industrial land use.	The FSRU and offshore pipelines would be constructed in areas of soft bottom marine sediments. The onshore pipelines would be constructed in an area that includes a mix of agricultural, industrial, commercial, open space, and residential land uses.
Construction Disturbance		
Terminal	57 acres	147 acres
Offshore pipeline	Not Applicable	511 acres
Onshore pipeline [a]	30 acres	225 acres
Operational Disturbance		
Terminal	32 acres	147 acres
Offshore pipeline	Not Applicable	511 acres
Onshore pipeline [a]	4 acres	144 acres
Public Safety	The risks of a safety incident are considered manageable.	The risks of a safety incident are considered manageable. The consequences of an incident at the proposed facility are potentially less than at an onshore terminal due to the site's more remote location.
Water Quality and Biological Resources	Dredging and the temporary resuspension of sediments during construction would disrupt benthic communities in the dredged area and subject organisms in adjacent areas to increased sedimentation. Recovery of the benthic community would take up to 3 years.	Installation of the FSRU and the offshore pipeline would result in the temporary resuspension of sediments, destroying benthic communities at the anchor points and along the pipeline route in previously undisturbed natural habitats. The benthic community would recover, but an exposed pipeline would introduce a permanent new habitat type to the area. Construction and operation of the onshore pipeline would result in temporary, short-term, and long-term impacts on terrestrial species and habitats.
Transportation	Construction of the project would result in impacts on vehicle traffic at one intersection near the proposed LNG terminal. Operation of the project would increase ship traffic into the POLB, potentially affecting other industrial marine traffic.	Construction of the onshore pipeline could temporarily impact vehicle traffic at some locations in the Cities of Oxnard and Santa Clarita. Construction and operation of the FSRU could impact some commercial, recreational, and industrial marine traffic in the area.
Air Quality	Given the project location within the Port, air pollutants resulting from the project would likely contribute to cumulative air quality impacts in the area. Because the project would provide LNG vehicle fuel that could be used as an alternative to diesel-fueled trucks, some overall reductions in regional air emissions might be achieved.	Given the location of the FSRU 21 miles offshore of Port Hueneme and Oxnard, air pollutants resulting from operation of the project would disperse and would not likely contribute to cumulative air quality impacts at onshore areas.
Operational Emissions		
NO_X	63 tons/year	187 tons/year
SO_X/SO_2	111 tons/year	<1 ton/year
CO	37 tons/year	162 tons/year
PM_{10}	15 tons/year	15 tons/year
ROC	22 tons/year	50 tons/year

[a] The acreage of construction and operation disturbance for the onshore pipelines includes associated aboveground facilities.

Offshore LNG import terminals have been represented as being safer and more easily secured compared to LNG facilities located onshore. Any assessment of risk to human health and safety must consider both the potential for an incident and the consequences of an incident. For either an onshore or offshore facility, the risks of an accidental release of LNG are small and can be managed with current safety policies and practices (Sandia National Laboratories, 2004). Additionally, the risk from intentional incidents (such as a terrorist act) at either an offshore or onshore facility could be significantly reduced with appropriate security, planning, prevention, and mitigation. A recent congressional report suggested that offshore LNG facilities may be more vulnerable to terrorist attack because of their remote locations compared to an onshore facility (Parfomak, 2003). Also, workers' health and safety may be more at risk at an offshore facility because of the distance to emergency response and health care services compared to an onshore facility. The risks and safety issues associated with operation of SES' proposed onshore facility are discussed in detail in section 4.11.

The construction of an offshore LNG terminal and pipeline has the potential to disturb a number of marine resources that would not be affected by the Long Beach LNG Import Project. For example, offshore pipeline construction typically involves excavating a shallow trench or laying the pipeline directly on the sea floor in areas of benthic marine habitats, frequently in areas that have not previously been extensively disturbed. Excavating a shallow trench to bury the pipeline would affect bottom substrates and habitats due to excavation and redeposition of sediments and the associated organisms. Laying the pipeline directly on the sea floor could disturb and/or replace existing substrates and destroy individual benthic organisms. Although these impacts have not been specifically identified for the Cabrillo Port LNG Deepwater Port, laying a pipeline directly on the seafloor has been shown to create a potential barrier to invertebrate movements (Glaholt et al., 2000). Additionally, operation of an offshore terminal might disrupt the behavior of marine birds and mammals.

Both the Long Beach LNG Import Project and the Cabrillo Port LNG Deepwater Port would be located in air quality management districts that do not meet federal air quality standards for certain air contaminants. Construction and operation of both projects would result in the emission of regulated pollutants above applicable regulatory thresholds. As such, both projects would be required to apply for and obtain permits to construct and operate the facilities, conditions of which would require the installation of appropriate emission controls and/or the acquisition of emission offsets. It is likely, given the location of SES' project within the Port, that toxic air pollutants resulting from the Long Beach LNG Import Project would have a direct impact on the existing air quality in the area. Because BHP's FSRU would be located about 21 miles offshore, air emissions from its operation would disperse and be less likely to noticeably impact air quality in onshore areas. However, an onshore LNG import terminal could indirectly improve air quality by providing another source of alternative fuel for heavy-duty vehicles, most of which currently run on diesel fuel. While emissions resulting from the combustion of diesel fuel are improving due to more stringent emission and fuel formulation standards, a switch to LNG-fueled vehicles could serve to further reduce the emissions of regulated criteria and toxic air pollutants (e.g., NO_x).

3.2.3 System Alternatives Conclusions

As shown in table 3.2.3-1, none of the existing or proposed systems could (individually or in combination) meet all of the stated objectives of the Long Beach LNG Import Project. Several of the proposed LNG import systems (either offshore California or in Mexico) could meet the project objective of providing a new source of natural gas to southern California markets. Trucking LNG from existing liquefaction facilities and/or construction of the proposed liquefaction facilities could not meet the project objective of providing a source of up to 150,000 gpd of LNG for vehicle fuel to southern California. Only the Mexican LNG projects could potentially accommodate fluctuating energy supply and demand in southern California by storing up to 320,000 cubic meters of LNG in the region. However, the reliability of a foreign source of LNG satisfying this project objective is questionable. The offshore BHP project could partially satisfy the project objective of reducing fluctuations in the local supply by storing up to 273,000 cubic meters of LNG (about 85 percent of the storage volume proposed by SES).

TABLE 3.2.3-1

Existing and Proposed System Alternatives Compared to the Long Beach LNG Import Project

SES Project Objectives	Pipeline System Alternatives	Existing or Proposed Liquefaction Facilities	Mexican LNG Import Terminals	California Offshore LNG Import Terminals
Providing markets in southern California, particularly the LA Basin with:				
• a new source of natural gas (up to 1 Bscfd)	No	No	Yes [a] ChevronTexaco - 1.4 Bscfd Sempra/Shell - 1.3 Bscfd	Yes Crystal Energy - 1.2 Bscfd BHP - 1.5 Bscfd
• a stable source of LNG for vehicle fuel (up to 150,000 gpd)	No	No [b]	No	No
• a facility that can reduce fluctuations in the local supply by storing LNG (up to 320,000 cubic meters)	No	No	Yes ChevronTexaco - 250, 000 cubic meters Sempra/Shell - 320,000 cubic meters	Partially BHP - 273,000 cubic meters

[a] Assuming expansion of existing pipeline infrastructure and significant volumes are available to the markets in southern California.

[b] Even assuming access to LNG from existing and proposed LNG liquefaction facilities considered in combination [e.g., 70,000 gpd from new liquefaction facilities in California as well as 30,000 gpd from the existing facility in Topock, Arizona (one-third of this facility's capacity)].

In conclusion, construction of one or more of the California or Mexican LNG import terminals would partially satisfy the objectives of the Long Beach LNG Import Project. If these system alternatives were constructed in place of the Long Beach LNG Import Project, some of the significant environmental effects of the proposed project might be avoided or substantially lessened. For example, construction of an offshore LNG import terminal would not result in local air emissions and the release of toxic air pollutants in Long Beach as would the Long Beach LNG Import Project. However, each of the system alternatives could result in its own set of significant environmental impacts that could be far greater than those associated with the proposed project (e.g., alteration of natural habitats and/or offshore viewshed and recreational experience).

3.3 LNG TERMINAL ALTERNATIVE LOCATIONS

Alternative sites were also evaluated for the proposed project. The examination of alternative sites for an LNG import terminal involved a comprehensive, step-wise process that considered environmental, engineering, economic, safety, and regulatory factors. In the first step, the most suitable geographic area for an LNG terminal was determined based on the stated purposes of the project to provide a new source of natural gas and LNG vehicle fuel as well as to ensure stability of natural gas supply to southern California markets, particularly the LA Basin. The second step included identification of specific ports within the area that are capable of accommodating ships that are able to transport up to 145,000 cubic meters of LNG. The third step in the identification and evaluation of sites included comparatively evaluating specific sites within suitable ports that are capable of providing or supporting the necessary docking, storage, and vaporization facilities, as well as access to pipeline infrastructure.

3.3.1 Regional Review

As discussed previously, there is a current and growing demand for natural gas and LNG in southern California, particularly the LA Basin. Due to the limitations in the existing natural gas pipeline infrastructure serving the region as well as the disadvantages associated with trucking large quantities of LNG long distances (see section 3.2.2.1), an LNG import facility located north of Ventura County or south of San Diego County would have difficulty serving southern California markets (see figure 3.2.1-1).

3.3.2 Preferred Port Identification

Ships that are presently used to transport LNG typically have capacities ranging between 125,000 and 165,000 cubic meters. Ships of this size are 950 to 1,000 feet long with typical fully loaded drafts of about 40 feet. To ensure that the LNG ships do not easily or frequently run aground, an additional 2 feet of water is required under the keel. It is predicted that most LNG ships built in the future will have larger capacities and deeper drafts than those currently in operation. Ports with water depths 50 feet or greater could accommodate these newer ships with deeper drafts. Although dredging in shallow water areas could provide access for LNG ships, the costs and environmental impacts of significant dredging requirements in undeveloped ports could be prohibitive. Consequently, the analysis of alternative LNG terminal sites was primarily limited to offshore (deepwater) or shoreline ports that could readily accommodate LNG ships.

3.3.2.1 Offshore Deepwater Ports

An offshore LNG import terminal would not be capable of delivering LNG vehicle fuel to markets in southern California. Consequently, offshore site alternatives were not considered in this aspect of the analysis. However, there are several proposals to build offshore LNG import terminals in southern California. The potential for one or more of these proposed offshore terminals to satisfy some of the other objectives of the Long Beach LNG Import Project and the environmental issues associated with offshore LNG terminals are discussed in section 3.2.2.2.

3.3.2.2 Coastline Ports and Harbors

Based on the review to identify the most suitable regional setting for an LNG terminal, 12 existing ports or harbors in Ventura, Los Angeles, Orange, and San Diego Counties that are close to the natural gas markets in southern California were identified. These ports/harbors included Ventura Harbor, Channel Island Harbor, Port Hueneme, Marina Del Rey, Redondo Beach-King Harbor, San Pedro Bay (including the ports of Los Angeles and Long Beach), Newport Beach Harbor, Dana Point Harbor, Oceanside Harbor, Mission Bay, and San Diego Harbor. These ports are shown on figure 3.2.1-1.

Of the 12 existing harbors along the southern California coast, 8 have water depths that average about 20 feet and primarily support recreation and sport/commercial fishing. These harbors include Ventura Harbor, Channel Island Harbor, Marina del Rey, Redondo Beach-King Harbor, Newport Beach Harbor, Dana Point Harbor, Oceanside Harbor, and Mission Bay. Given the current depths of these harbors, substantial dredging would be necessary to accommodate LNG ships. Also the recreational nature of these harbors would likely make it difficult to locate an appropriate site for the LNG terminal and could potentially lead to conflicts with current users of these harbors. Consequently, these harbors were considered inappropriate for development of an LNG import terminal and were eliminated from further consideration.

Port Hueneme is a relatively small deepwater port located about 60 miles northwest of Los Angeles in the cities of Port Hueneme and Oxnard in Ventura County. It is roughly divided into two jurisdictions: the Port Hueneme U.S. Naval Construction Battalion and the Oxnard Harbor District. Commercial and industrial use of Port Hueneme primarily involves the import and export of cars, fresh fruit and produce, and forest products. Port Hueneme is the top seaport in the United States for citrus export and ranks among the top 10 ports in the country for automobile and banana imports; however, there are few heavy industrial uses in the port. To accommodate the proposed project, the current harbor would need to be dredged to 50 feet (from its current depth of about 35 feet) and an area to dispose of the dredged materials would have to be located. About 10 miles of pipeline would need to be constructed to interconnect with the existing SoCal Gas system. Given the land use in the area, this pipeline would likely traverse industrial, residential, commercial, and agricultural lands before interconnecting with the SoCal Gas system. Also, SoCal Gas estimates that it could only accept up to 400 MMscfd in this area without extensive system upgrades. Given the additional environmental disturbance compared to the proposed project, limitations in natural gas sendout capacity of the nearby SoCal Gas system, and the inability of an LNG terminal within this port to avoid or substantially lessen any significant environmental effects of the proposed project, Port Hueneme was eliminated from further consideration in this EIS/ER.

San Diego Harbor is a major naval, commercial, and recreational harbor that is approximately 110 miles south of Los Angeles and several miles north of the Mexican border. This crescent-shaped 18-mile-long harbor and bay is separated from the ocean by a low peninsula that has been extensively developed for residential and recreational purposes. To enter the harbor, ships must travel north 4 miles to enter the channel at the north end of the Silver Strand, and then several miles east between the Naval Air Station and Harbor Island (located immediately south of the San Diego International Airport), then south by the municipal yacht basin and commercial fish harbor to the harbor entrance and central and southern harbor areas. The entrance channel depth is 53 feet and the main channel depths are 42 feet from the entrance to the turning basin. The harbor is home to a major U.S. Naval fleet, the Naval Communications Station, a Naval Air Station, and a Naval supply center. It is a major shipping point for agricultural goods from southern California, as well as a major recreational harbor that has over 4,000 boat slips for recreational craft, a sport-fishing fleet, and cruise ships. It is also the center of the west coast commercial tuna fishing industry. The marine terminals within San Diego Harbor accommodate container, dry bulk, liquid bulk, refrigerated, vehicle, and break bulk cargoes.

Although an LNG terminal in San Diego Harbor could be linked to the SDG&E pipeline system, this distribution system includes relatively small (6- to 12-inch) diameter pipelines in the vicinity of the harbor. Significant additional upgrades to the SDG&E system would be required to accommodate natural gas deliveries of 1 Bscfd as proposed by the Long Beach LNG Import Project (e.g., construction or expansion of large-diameter pipeline(s) to accommodate the proposed natural gas sendout volumes). The specifics are unavailable without a detailed engineering analysis, but it is assumed that upgrades of the SDG&E pipeline system would result in substantial environmental impacts given the residential and commercial developments in the area surrounding San Diego Harbor. Because of the distances ships would have to travel in confined waters to access the harbor; the potential for incompatibility of an LNG terminal with current naval, recreational, and port uses; the potential environmental impacts associated with upgrades of the SDG&E system; and the inability of an LNG terminal within this port to avoid or substantially lessen any significant environmental effects of the proposed project, San Diego Harbor was eliminated from further consideration in this EIS/EIR.

The ports of Los Angeles and Long Beach, although politically divided into two jurisdictions, are adjacent to each other and together form the fifth busiest port complex in the world after Hong Kong, Singapore, Shanghai, and Kaohsiung. The combined port complex comprises over 7,500 acres of land and is dominated by container cargo terminals, bulk terminals for the import/export of other products including automobiles, and oil and gas production facilities. Because of the size and industrial nature of these ports, there are established areas for the import of hazardous cargo. Although there are some recreational boating and fishing fleets within the complex, the ports are primarily used for industrial purposes. Access to the ocean is through “gates” in the stone breakwaters that extend along the 50-foot bottom contour and that mark the seaward limit of the harbors. Channels are dredged to at least 50 feet and major entrances are dredged to over 65 feet. Access to the existing SoCal Gas system is within 2 to 4 miles of the port complex. At this location, the SoCal Gas system could accommodate the proposed natural gas volumes from the LNG terminal without the need for upgrades.

The ports of Los Angeles and Long Beach offer the most compatible harbors for developing an LNG import terminal to serve the markets of southern California, particularly the LA Basin. First, the ports maintain sufficient channel depth to accommodate even the largest LNG ships. Second, these are highly industrialized ports with limited recreational boating facilities or nearby residential areas. Third, both ports already import and store hazardous materials, including petroleum products, and LNG would represent a similar class of import. Fourth, both the ports and the nearby cities could benefit from an ample and readily available supply of LNG vehicle-quality fuel. Fifth, the existing SoCal Gas system, which is within 2 to 4 miles of the ports, can accommodate the volumes without the need for upgrades. For these reasons and because sites in other ports in the region would not avoid or substantially lessen any significant environmental effects of the proposed project, the ports of Los Angeles and Long Beach were determined to be preferable for the proposed project and other ports were eliminated from further consideration in this EIS/EIR.

3.3.3 Preferred Site Identification

After identifying the ports of Los Angeles and Long Beach as areas that would provide reasonable access to southern California markets, specific alternative sites suitable for developing an LNG terminal were evaluated. Regulations specific to siting an LNG terminal that are relevant to the alternatives analysis are listed in table 3.3.3-1.

Within the ports of Los Angeles and Long Beach, three sites were identified and evaluated as alternatives to the proposed site because they are potentially available and meet the regulatory siting criteria listed in table 3.3.3-1. These sites are the Los Angeles Export Terminal (LAXT) Site, the Pier A West Site, and the Navy Mole Site. Figure 3.3.3-1 shows the location of these alternative terminal sites and associated sendout pipelines. Similar to the proposed site, all of the alternatives are located within an industrialized port complex that currently imports and provides storage for petroleum products. Consequently, construction of an LNG terminal at any of these sites would be consistent with surrounding land uses. Given the lack of habitats for protected species and absence of historic properties, impacts related to these resources would be insignificant and similar to those discussed for the proposed terminal site (see sections 4.4.4 and 4.8). An environmental comparison of the alternative LNG terminal sites in the ports of Los Angeles and Long Beach with the proposed LNG terminal site is provided in table 3.3.3-2. A discussion of each of these sites is included below.

TABLE 3.3.3-1

Select Regulations Related to the Siting of an LNG Terminal

Regulations	Description
U.S. Department of Transportation - LNG Federal Safety Standards	
Thermal Exclusion/Vapor Dispersion (Title 49 CFR Parts 193.2057 and 193.2059)	Safety requirements pertaining to thermal exclusion and vapor dispersion zones must be identified in accordance with National Fire Protection Association (NFPA) 59A *Standards for the Production, Storage, and Handling of Liquefied Natural Gas* (2001 edition). These federal guidelines are established to minimize the potential damaging effects of an LNG release reaching beyond the property line that can be built upon and/or that, at the time of terminal siting, is used for outdoor assembly by groups of 50 or more persons (see section 4.11.5).
Airports [Title 49 CFR Part 193.2155(b)]	LNG storage tanks must not be located within a horizontal distance of 1 mile from the ends, or 0.25 mile from the nearest point of a runway, whichever is longer. The height of LNG structures in the vicinity of an airport must also comply with Federal Aviation Administration requirements.
U.S. Coast Guard - LNG Waterfront Handling Requirements (Title 33 CFR Part 127.105)	Waterfront facilities where LNG is handled must comply with U.S. Coast Guard regulations pertaining to layout and spacing of the marine transfer area. These regulations require that each LNG loading flange be located at least 985 feet from general public or railway bridges crossing navigable waterways or entrances to any tunnel under navigable waterways.

3.3.3.1 Los Angeles Export Terminal Site

Mitsubishi Corporation, the parent company of SES, is currently part owner of properties within the POLA that are referred to as the LAXT Site. These properties consist of a remote terminal facility that is currently configured for the receipt, storage, blending, and reclaiming of bulk coal and petroleum coke; a ship loading facility on Pier 301; and a 5,200-foot-long conveyor corridor that connects the remote terminal and ship loading facilities. Because global market conditions have made export of coal and coke from the United States uneconomical, the owners of the LAXT Site (including Mitsubishi Corporation) were considering the conversion of this facility to accommodate imported LNG.

Conversion of this site to an LNG import terminal would require modification of the existing ship berth; the demolition of the existing remote terminal facilities and replacement with the LNG storage tanks, vaporizers, and associated structures; and removal of the conveyor corridor and replacement with a 5,200-foot-long cryogenic pipeline to carry the LNG from the ship berth to storage tanks at the remote terminal facility. The cryogenic pipeline would cross the site in a northeast-southwest line, then follow the current conveyor corridor from the remote terminal facility to the ship loading area. The berth at Pier 301 is already over 50 feet deep and could accommodate current and future LNG ships. The location of the LAXT Site at the western tip of Terminal Island in the POLA and the new Terminal 300 container dock would also accommodate LNG tankers with a minimum of navigational challenges. The pipeline that would deliver natural gas from a facility at the LAXT Site to the SoCal Gas system would be 3.9 miles in length, which is about 1.6 miles longer than the sendout pipeline from the proposed site. Trucking distances between the LAXT Site and the Terminal Island Freeway are essentially the same as those between the proposed site and the Terminal Island Freeway. There are 180 housing units within 1.0 mile of the LAXT Site compared to 0 housing units within 1.0 mile of the proposed site.

Non-Internet Public

DRAFT ENVIRONMENTAL IMPACT
STATEMENT/ENVIRONMENTAL IMPACT REPORT
FOR THE
LONG BEACH LNG IMPORT PROJECT

Docket No. CP04-58-000, et al.

Page 3-23
Figure 3.3.3-1

TABLE 3.3.3-2

Comparison of Alternative LNG Terminal Sites

Feature	Proposed Site (Pier T East)	LAXT Site	Pier A West Site	Navy Mole Site
General Site Characteristics				
Adequate land available	Yes	Yes	Yes	Only if fill is added
Present land use	Vacant	Abandoned coal export	Oil extraction	Vacant
Adjacent land use	Other vacant areas, container terminal, scrap metal facility, lumber storage facility	Rail yard, container terminal, parking for fish pier adjacent to conveyor corridor	Recreational boat docking on three sides, other oil field work, POLB main access highway (Terminal Island Freeway)	Naval fuel pier, U.S. Maritime Administration pier, and Sea Launch facility
Recreational boat traffic	None	Offload site and conveyor corridor adjacent to fish harbor entry (within 500 feet)	Significant recreational boat traffic adjacent to any offload site	Within 1,000 feet of entry to POLB Middle Harbor
Potential for interruptions to ship/boat traffic	Low-Medium	Low-Medium	High	Low-Medium
LNG ship access	Clear	Clear	No access to wharf	Clear
Zoning	Port Industrial (PI)	PI	PI	PI
LNG trailer truck access to the Terminal Island Freeway	1.2 miles	1.1 miles	0.3 mile	2.4 miles
Nearby housing units (based on LandView Census 2000 Population Estimator)	0 within 0.25 mile 0 within 0.5 mile 0 within 1.0 mile	2 within 0.25 mile 12 within 0.5 mile 180 within 1.0 mile	0 within 0.25 mile 42 within 0.5 mile 465 within 1.0 mile	0 within 0.25 mile 0 within 0.5 mile 0 within 1.0 mile
Environmental Site Characteristics				
Impact on essential fish habitat	Minor, short-term impacts on water quality from dredging	Minimal, temporary, no long-term net loss	None known	Minor, short-term impacts on water quality from dredging; potential loss/alteration of about 16 acres of soft bottom habitat due to filling necessary to develop the site
Construction Considerations				
Construction access	Good	Good for terminal, poor (multiple conflict) for cryogenic pipeline	Poor, high traffic crossing with railroad crossing	Good
Preconstruction remediation/demolition required	The POLB would demolish two remaining buildings	Significant demolition of existing coal export terminal required	Significant remediation of oil field, removal of existing oil wells and pipelines	None
Feet of cryogenic pipeline needed	None	5,200	Unknown - No access to wharf	None

TABLE 3.3.3-2 (cont'd)

Comparison of Alternative LNG Terminal Sites

Feature	Proposed Site (Pier T East)	LAXT Site	Pier A West Site	Navy Mole Site
Amount of dredging needed for ship berth and/or to reinforce shoreline structures	275,000 to 475,000 cubic yards	None	Unknown - No access to wharf	Unknown - minor dredging may be required for new wharf and pier construction
Amount of fill needed to create site and/or to reinforce shoreline structures	6.6 acres (below 0 feet MLLW)	None	Unknown	16 acres (above 0 feet MLLW)
Wharf and pier construction needs	Berth modifications, the POLB would modify wharf, add pilings, dolphins	Wharf and pier modifications needed to accommodate LNG ships	Unknown - No access to wharf	New wharf and pier construction needed
Length of sendout pipeline	2.3 miles	3.9 miles	1.7 miles	4.8 miles

The existence of a ship berth at Pier 301 that could accommodate LNG ships without the need for additional dredging is a slight advantage over the proposed site. Development of the proposed site at Pier T would involve dredging of approximately 175,000 cubic yards of sediments for the ship berth. An additional 100,000 to 300,000 cubic yards of sediments would also have to be dredged to accommodate an underwater rock buttress necessary to reinforce the shoreline structures. Because this dredging and fill would be limited to a localized area that has been dredged in the past and an appropriate spoil disposal location is available, the environmental benefit of the reduced dredging at the LAXT site compared to the proposed site is minimal. Refer to sections 4.3.3.2 and 4.4.3 for a detailed discussion of impacts associated with dredging and filling at the proposed site and effects on biological communities. On the other hand, the extensive building demolition, the cryogenic pipeline, and the longer sendout pipeline are disadvantages of the LAXT Site. Based on the 1.6 miles of additional pipeline, the extensive building demolition, and the negligible environmental benefits of reduced dredging and filling compared to the proposed project, the LAXT Site was eliminated from further consideration in this EIS/EIR.

3.3.3.2 Pier A West Site

There is currently property on the western portion of Pier A within the POLB that is large enough to accommodate an LNG terminal and is available for lease. Because there is an active oil field on a portion of the Pier A West Site, development of the remaining property for an LNG terminal would potentially require significant remediation of contaminated soils. Pier A is also relatively close to residential areas. Based on a review of U.S. Census Bureau data, there are 0 housing units within 0.25 mile of the alternative site; however, there are 42 housing units between 0.25 mile and 0.5 mile of the site and 465 housing units between 0.5 and 1.0 mile of the site. In total, there are about 1,476 people living within 1.0 mile of the Pier A West Site (U.S. Census Bureau, 2001). This compares to 0 housing units within 1.0 mile of the proposed site.

Another drawback of the Pier A West Site is that there is no area to construct a wharf, thus the site would have no access to water. Therefore, space would have to be found at another berth and a cryogenic pipeline would need to be run from that berth to the regasification facility and storage tanks on Pier A West. Depending on where berth space were found, the cryogenic pipeline could be anywhere from 0.5 mile to 3.0 miles in length, with the most likely distance being approximately 2.5 miles. Once the LNG is on Pier A West, the sendout pipeline to deliver natural gas to the SoCal Gas system would be 1.7 miles in length, which is 0.6 mile shorter than the sendout pipeline from the proposed site.

Because of the necessary site remediation, proximity to neighborhoods, and LNG ship berth constraints, the Pier A West Site was determined not to be a reasonable alternative to the proposed site. Furthermore, because the Pier A West Site would not avoid or substantially lessen any significant environmental effects of the proposed project, it was eliminated from further consideration in this EIS/EIR.

3.3.3.3 Navy Mole Site

The Navy Mole Site is part of the former naval complex, part of which is now owned by the POLB and part of which is leased to the POLB by the Navy. It was installed as a breakwater for the naval shipyard harbor and currently houses facilities operated by Sea Launch (a commercial operator that provides services related to marine-based satellite launches). In addition to Sea Launch, there is an existing pier for a Navy fuel depot (Pier 12) and berth space for two DOT (MARAD) ships. Given the availability of property at this site, it is possible that the LNG terminal could be placed on fill at the northern side of the Navy Mole.

Development of the Navy Mole Site for an LNG terminal would require filling about 16 acres on the north side of the existing mole. This would result in a permanent loss of soft bottom marine habitats that would require mitigation. Despite the existence of contaminated sediments that will require remediation, this area of soft bottom is considered essential fish habitat (EFH) for a number of managed species and the fill would be a permanent impact on waters of the United States. Development of the Navy Mole Site for an LNG terminal would also require construction of a new wharf and pier structures, with associated dredging. The U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) generally recommends avoidance of impacts on EFH as its first preference (NOAA Fisheries, 1991).

Another drawback of the Navy Mole Site is the length of sendout pipeline that would be needed to connect the terminal to the SoCal Gas system. This pipeline would be 4.8 miles long, which is 2.5 miles longer than the sendout pipeline from the proposed site. LNG trucks accessing the site would also have to travel about twice the distance from the Terminal Island Freeway compared to the proposed site (2.4 miles for the Navy Mole Site compared to 1.2 miles for the proposed site). There are no housing units within 1.0 mile of either the Navy Mole Site or the proposed site.

Development of the proposed site at Pier T would involve dredging approximately 175,000 cubic yards of sediments for the ship berth. An additional 100,000 to 300,000 cubic yards of sediments would also have to be dredged to accommodate an underwater rock buttress necessary to reinforce the shoreline structures. Nevertheless, the resulting impacts on aquatic resources at the proposed site would be outweighed by the impacts on aquatic resources resulting from the permanent fill of 16 acres of open waters and the dredging required for construction of a new wharf and pier at the Navy Mole Site. Considering the greater impacts on aquatic resources, the greater length of the sendout pipeline, and the increased trucking distance, the Navy Mole Site would potentially result in more environmental impacts than the proposed site. Because use of the Navy Mole Site would not avoid or substantially lessen any significant environmental effects of the proposed project, it was eliminated from further consideration in this EIS/EIR.

3.3.4 Point Conception Site

Some commentors have asked why SES does not locate its facilities at a site near Point Conception, California, where the CPUC authorized another LNG import terminal project in 1978 (see figure 3.2.1-1). This earlier project, proposed by the Western LNG Terminal Company (Western Terminal), was designed to store and vaporize LNG shipped from Alaska and Indonesia.

Western Terminals’ proposed Point Conception LNG terminal facility was the culmination of several years of effort to bring LNG to the California coast. As part of that effort, environmental impact studies were prepared for applications to construct LNG terminals at Los Angeles, Oxnard, and Point Conception. These proposals were designed so that each site would receive LNG produced at a different location. After these proposals failed to develop, Western Terminal proposed the project that was authorized by the CPUC for Point Conception.

The Point Conception Site is about 120 miles northwest of Los Angeles and is situated on a coastal cliff about 80 feet above the water level near the northern end of the Santa Barbara Channel. The project included a 6,000-foot-long LNG transfer line to connect the ships to the storage tanks and a 112-mile-long pipeline to deliver the natural gas to the Pacific Gas and Electric system. The FERC analyzed the project in a final EIS that was issued in October 1978.

The final EIS identified severe concerns with the Point Conception Site and recommended that LNG facilities not be constructed there. The basis for the recommendation to reject the Point Conception location was primarily the presence of an active fault on the site, the extraordinary amount of land work required to develop the site (such as filling in ravines), and a significant cultural resources impact on the Chumash Nation.

Although the final EIS determined that other locations were environmentally superior to the Point Conception Site, those locations were eliminated from consideration due to the California LNG Terminal Act of 1977, which set limits of population density within 4 miles of an LNG terminal. Consequently, the CPUC issued its decision (in 1978) authorizing a conditional permit for the Point of Conception LNG facilities and the FERC approved the site in 1979. However, project opponents appealed the FERC's approval to the United States Court of Appeals for the District of Columbia, and the Court remanded the case back to the FERC for reconsideration.

During the ensuing years of hearings and legal proceedings, increasing domestic natural gas supplies rendered the project uneconomical. The project was never constructed and the agencies' approvals are no longer valid. Subsequently, the LNG Terminal Act of 1977 was repealed in 1987.

The current owner of the Point Conception property objects to the site being used for an LNG import terminal and is considering putting a conservation easement on the property to protect it from future industrial development (Allen & Kimbell, 2004). Given this and based on the adverse environmental impacts of constructing an LNG facility at Point Conception that were identified in the previous EIS, the additional impacts of constructing more than 100 miles of interconnecting pipeline, and the fact that the site is located outside of the geographic area that could efficiently serve the southern California LNG and natural gas markets, the Point Conception Site is not considered a practicable or environmentally preferable alternative to the proposed site.

3.4 PIPELINE ALTERNATIVES

To meet the project objectives, an alternative to the natural gas pipeline must be able to transport up to 1 Bscfd of natural gas from the LNG terminal to the SoCal Gas system; an alternative to the C_2 pipeline must be able to transport up to 10,000 MMBtu per day of vaporized C_2 from the LNG terminal to the ConocoPhillips LARC. Currently, the existing pipeline systems do not have the available capacity to transport these volumes of natural gas or vaporized C_2 to the delivery points.

The heavily industrialized nature of the project area limits the range of potential alternatives to the proposed route alignments. Nevertheless, the evaluation of variations to the proposed routes includes those that might avoid or minimize environmental impacts. Typically route variations would be identified and evaluated that have the potential to reduce overall environmental impacts associated with the proposed pipeline alignment by avoiding environmentally or otherwise sensitive resources such as residences, cultural resources sites, special-use areas, steep terrain, major waterbodies, and extensive wetlands. Due to the lack of environmentally sensitive areas crossed by the proposed pipeline routes, route variations were examined that might:

- maximize collocation with existing utility corridors;
- reduce the overall length of pipeline (in order to minimize construction impacts);
- minimize the need for construction workspace;
- avoid potential problems associated with crossing the Cerritos and Dominguez Channels; and
- minimize disturbance to other POLB activities including crane, truck, and rail traffic.

Additionally, the analysis of route variations is limited to those that are technically and economically reasonable. Based on the above criteria, two variations to the proposed pipeline routes were evaluated between the LNG terminal and the SoCal Gas system interconnect (i.e., Oil Field Variation and Carrack Avenue Variation). Because the proposed natural gas and C_2 pipeline routes follow the same alignment between the LNG terminal and the SoCal Gas system interconnect, the route variations considered for this segment apply to both the natural gas and C_2 pipelines. The analysis also includes three variations to the C_2 pipeline route between the end of the natural gas pipeline and the LARC (i.e., Edison Variation and Dominguez Channel Variations 1 and 2). All of these route variations are shown on figure 3.4-1.

3.4.1 Oil Field Variation

The Oil Field Variation would replace the corresponding segment of the proposed pipeline routes between mileposts (MPs) 0.40 and 1.61. Instead of crossing Ocean Boulevard at MP 0.40, the Oil Field Variation turns west and generally follows the south side of Ocean Boulevard for about 4,400 feet through the "W Strip" oil wells to the Terminal Island Freeway. On the north side of Ocean Boulevard, the route variation continues north for about 2,900 feet across Henry Ford Avenue and Dock Street to a location where the Cerritos Channel could be crossed using the HDD technique. After the channel crossing, the route variation continues north and the pipelines would be installed aboveground on precast pipe supports through an oil field. At the north end of the oil field, the route variation turns east and the pipelines would be bored under several railroad lines, the Terminal Island Freeway, and Hanjin Way. After crossing Hanjin Way, the pipelines would again be laid on precast concrete supports, adjacent to other existing steam and oil pipelines along Pier A Way. The route variation follows Pier A Way to Pier B Street where it rejoins the proposed route at MP 1.61.

The variation would be about 1.7 miles longer than the corresponding segment of the proposed routes and would require about 1 mile of the natural gas and C_2 pipelines to be located aboveground. Generally, pipelines that are placed aboveground are not as preferable as underground pipelines because they are more exposed to accidental or intentional damage. Because the Oil Field Variation does not avoid or substantially lessen impacts associated with the corresponding segment of the proposed pipeline routes, this variation was eliminated from further consideration in this EIS/EIR.

3.4.2 Carrack Avenue Variation

The Carrack Avenue Variation would replace the corresponding segment of the proposed pipeline routes between MPs 1.31 and 2.08. Instead of turning west at the intersection of Carrack Avenue and Pier A Way at MP 1.31, the Carrack Avenue Variation continues along and adjacent to Carrack Street until its end where it rejoins the proposed routes at MP 2.08. This variation is 0.3 mile shorter than the corresponding segment of the proposed routes and would require two less horizontal or slick bore crossings[5] compared to the proposed routes (seven rather than eight crossings for each of the pipelines). However, construction along the Carrack Avenue Variation would involve crossing 17 pipelines that connect to the pipelines that currently run parallel to Carrack Avenue. Crossing this many pipelines would complicate and slow construction. Additional workspace would also likely be necessary to accommodate construction activities in these areas. Although somewhat shorter, the Carrack Avenue Variation does not avoid or substantially lessen impacts associated with the corresponding segment of the proposed routes; therefore, this variation was eliminated from further consideration in this EIS/EIR.

[5] In order to avoid interrupting vehicle or rail traffic, pipelines are frequently installed at road or railroad crossings by boring beneath the feature and pulling a section of pipe through the bore hole (see section 2.3.2). This technique generally requires additional extra workspace on each side of the road or railroad and is more expensive than conventional open-cut crossings.

Non-Internet Public

DRAFT ENVIRONMENTAL IMPACT
STATEMENT/ENVIRONMENTAL IMPACT REPORT
FOR THE
LONG BEACH LNG IMPORT PROJECT

Docket No. CP04-58-000, et al.

Page 3-30
Figure 3.4-1

3.4.3 Edison Variation

The Edison Variation would replace the corresponding segment of the proposed C_2 pipeline route between MPs 2.25 and 3.65. This variation begins near the point where the natural gas pipeline ends at the interconnection with the SoCal Gas system at about MP 2.25. From there, the Edison Variation continues north on the west side of the Edison powerline right-of-way for 1.14 miles. The variation then turns west for approximately 0.2 mile to rejoin the proposed route at about MP 3.65, just before the Dominguez Channel crossing. The Edison Variation would not be appreciably longer than the proposed route, would cross similar industrial land uses, and would offer no apparent environmental advantages. Furthermore, it is unlikely that a right-of-way for the C_2 pipeline could be obtained because of the existing utilities already in place. Because the Edison Variation does not avoid or substantially lessen impacts associated with the corresponding segment of the proposed C_2 pipeline route, this variation was eliminated from further consideration in this EIS/EIR.

3.4.4 Dominguez Channel Variations 1 and 2

The Dominguez Channel Variations 1 and 2 were identified as potential options for routing the C_2 pipeline along the Dominguez Channel. The Dominguez Channel Variation 1 turns west from the proposed route near MP 2.45 and continues west for about 0.28 mile to the Dominguez Channel. At that point, this variation turns north and continues for 0.47 mile along the east side of the Dominguez Channel to rejoin the proposed route at MP 3.08. The Dominguez Channel Variation 2 turns west from the proposed route near MP 2.72, continues west for about 0.17 mile to the Dominguez Channel, and then turns north to rejoin the proposed route at MP 3.08. Both of the Dominguez Channel route variations were eliminated from further consideration in this EIS/EIR because the number of existing utilities already in place along these alignments and the lack of adequate space to install the C_2 pipeline make these variations infeasible.

3.5 DREDGE AND FILL ALTERNATIVES

As described in sections 2.1.1.1 and 2.3.1.3, the Long Beach LNG Import Project would require the modification of Berth T-126 to accommodate LNG ships. The proposed project would involve dredging of approximately 175,000 cubic yards of sediments at Berth T-126 to achieve a uniform water depth of -55 feet MLLW. The area affected by the dredging of the ship berth would be about 200 feet by 1,150 feet (5.3 acres) and currently ranges in depths from -46 to -53 feet MLLW. The LNG ship berth and unloading facility would require the construction of an unloading platform and multiple mooring and breasting dolphins that would be supported by concrete and/or steel piles or jacketed structures.

As described in section 2.3.1.2, it would be necessary to reinforce the existing shoreline structures to support the upland loads generated by the LNG storage tanks and other heavy load structures. Three strengthening options being considered for the wharf at Berth T-126 include rehabilitation of the existing structure, demolition of the entire deck structure, or demolition of half of the deck structure and retrofitting of the remaining portion. All three options would require installation of an underwater rock buttress. Depending on the final wharf improvement option selected, construction of the Berth T-126 rock buttress would require between 900,000 to 1.2 million tons of rock. An underwater rock buttress would also be necessary along the westerly portion of Berth T-124. This rock buttress would require between 100,000 and 500,000 tons of rock. Installation of the rock buttresses at Berth T-126 and Berth T-124 would require the dredging of between 100,000 and 300,000 cubic yards of sediments depending on the west wharf improvement and rock buttress configuration option chosen. This dredging would disturb an area up to 6.6 acres along the edge of the existing pier.

Dredging and placement of structures within waters of the United States fall under the jurisdiction of the ACOE and require a CWA section 404 permit from the ACOE (see section 1.2.3). As an element of its review, the ACOE is required to consider whether a proposed project represents the least environmentally damaging practicable alternative pursuant to the CWA section 404(b)(1) guidelines (see Title 40 CFR Part 230). The term practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. As a cooperating agency, the ACOE has recommended that the alternatives analysis in this EIS/EIR consider project design, configuration, and construction alternatives that avoid or minimize effects on the aquatic environment. In this way, this EIS/EIR could be used to identify the ACOE's least environmentally damaging practicable alternative.

Ultimately, activities associated with dredging, construction of the LNG ship berth and unloading facility, and strengthening the shoreline structures would be conducted in accordance with ACOE permit stipulations as well as the requirements of state and local permits (see sections 1.5, 4.3.3.1, and 4.3.3.2). To avoid or minimize impacts on water quality or biological resources associated with these activities (see sections 4.3.3 and 4.4.3), reduced dredge/fill alternatives, alternative ship birth configurations, dredge disposal alternatives, and alternative dredging methods were considered.

3.5.1 Reduced Dredge/Fill Alternatives and Alternative Ship Berth Configurations

The extent of dredging that would be necessary for the proposed project for the ship berth was established based on the minimum volumes needed to safely accommodate the largest LNG ships expected to be operating in the future during all periods of the tidal cycle. The proposed berth on the west side of Pier T would be dredged to a depth of approximately -55 feet MLLW at the breasting dolphins. This would provide at least 7 feet of depth under the deepest draft ships. Alternatives requiring less dredging may not be able to fully accommodate all LNG ships. Similarly, any in-water pilings, structures, or rocks would result in the least fill necessary while still providing for a sound LNG ship berth and shoreline structures that would adequately support the heavy upland loads generated by the LNG terminal facilities. As such, it was not considered practicable or feasible to reduce dredging or the use of in-water piles/structures/rocks and still satisfy the stated objectives of the project.

As an alternative to dredging, an evaluation was conducted to determine whether it would be possible to locate the ship berth in deeper water by increasing the distance between the face of the pier and the dolphins/platform. The water depths extending for at least 800 feet from the west side of Pier T are similar to the depth adjacent to the pier; therefore, increasing the distance between the face of the pier and the dolphins/platform to the west would not reduce the amount of dredging. Similar water depths occur for at least 500 feet to the south side of Pier T; consequently, this increase in distance would not reduce dredging. However, beginning 500 feet to the south side of Pier T, the water depths increase to approximately -55 feet MLLW. Therefore, to eliminate dredging in waters of the United States would require using additional and/or larger pilings to support a larger platform or a trestle between a platform located more than 500 feet to the south of the pier. A platform in this location would be within the shipping channel of the Middle Harbor and would impact other vessel movements and use of the West Basin (see figure 3.5.1-1). Additionally, it would increase the distance required to transport the LNG from the ship to shore, requiring a greater length of cryogenic transfer pipeline, which could result in lowered transfer efficiencies and increased safety considerations. Given the temporary, minor direct impacts of construction-related dredging on aquatic resources (see sections 4.3.3.2 and 4.4.3), the fact that the area in question has been dredged in the past and is part of an active commercial port, and the fact that the benthic community would be expected to recover rapidly after dredging, the alternative of extending the ship berth further from the pier was not considered a practical alternative when compared to the reduction in safety that could result from the required design modifications associated with this alternative. Because an alternative design of the ship berth would not avoid or substantially lessen any significant environmental effects of the proposed project, this alternative was eliminated from further consideration in this EIS/EIR.

Non-Internet Public

DRAFT ENVIRONMENTAL IMPACT
STATEMENT/ENVIRONMENTAL IMPACT REPORT
FOR THE
LONG BEACH LNG IMPORT PROJECT

Docket No. CP04-58-000, et al.

Page 3-33
Figure 3.5.1-1

An alternative location for the LNG terminal that would reduce the amount of dredge and fill associated with the project was previously discussed in section 3.3.3.1.

3.5.2 Dredge Disposal Alternatives

Disposal of dredged materials within waters of the United States requires a permit from the ACOE. As discussed in section 2.1.1.1, a portion of IR Site 7 is adjacent to Berth T-124, at the southern end of the project site, and at Berth T-126, which is the berth proposed for the Long Beach LNG Import Project. Past sampling has indicated that there are chemically impacted sediments present. The POLB has recently negotiated a consent agreement with the DTSC for its concurrence with the IR Site 7 sediment remediation. Accordingly, the dredging associated with the proposed project would be done only with the concurrence of the DTSC and in accordance with permits issued by the ACOE and the RWQCB (see section 4.2.3). The POLB currently plans to dispose of the sediments at a confined disposal site previously approved for contaminated materials within Long Beach Harbor (e.g., ITS Slip fill, East Basin Slip 1 fill, or upland site). The POLB could propose to dispose of uncontaminated dredged materials at an unconfined aquatic location (i.e., Western Anchorage Temporary Sediment Storage Site) if the sediments were determined by the ACOE to be suitable for unconfined aquatic disposal. In order to determine disposal site suitability, the POLB would prepare and implement a Sampling and Analysis Plan in accordance with the three-tiered testing protocols in the EPA/ACOE Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual (Inland Testing Manual). Based on the results of the tiered testing protocols, the ACOE would review and approve or deny the use of an unconfined aquatic location, or alternately a request to take the materials to a confined or upland site. Because there are approved disposal sites for contaminated and uncontaminated sediments available in the area, no other alternatives were evaluated for disposal of the dredged materials.

3.5.3 Alternative Dredging Methods

The POLB typically uses mechanical dredging equipment for maintenance and improvement dredging of the harbors and channels. Mechanical dredging involves equipment such as clamshell dredges, dipper dredges, draglines, grab buckets, and barge-mounted excavators for the removal of bottom sediments and other materials. The dredged material removed by mechanical methods is typically high in solids content and lower in mixed waters than are sediments removed by hydraulic dredge methods. Mechanical dredging equipment involves the use of a bucket to place dredged materials in scows or on barges for transport to a disposal area. Various bucket designs are available that are able to reduce the amount of solids suspended in the water column.

Alternatively, hydraulic dredging equipment could be used for this project. Hydraulic dredges operate using a centrifugal pump capable of handling solids to transport a slurry of dredged sediments and water through a pipeline. The slurry containing the dredged materials is hydraulically transported through the pipeline from the dredged area to a disposal site. For long distance transport, the slurry can also be placed in barges for removal to the disposal site. Although hydraulic dredging typically generates somewhat lower levels of turbidity throughout the water column at the dredge site compared to mechanical dredging methods, the environmental advantages of hydraulic dredging equipment are not compelling given the setting and the disadvantages associated with disposing of the higher volume of dredge slurry. However, there are several disadvantages associated with the use of this equipment. First, the hydraulic dredge would typically require a long, temporary pipeline system, which could potentially become an obstruction to navigation and/or vessel movement with the harbor. Hydraulic dredging also entrains significant amounts of water during the dredging process, requiring a much larger disposal area and longer drying times. If barges are used to transport dredged materials, it requires more barge movements between the dredge site and the disposal area than would be necessary if mechanical dredging were used. There are sometimes water quality issues associated with overflow off of the barge. Given the limited extent of the dredging necessary for this project and the relatively minor associated environmental impacts, hydraulic dredging methods are not believed to be a practical alternative to mechanical dredging equipment for this project. Because hydraulic dredging would not avoid or substantially lessen any significant environmental effects of the proposed project, this alternative dredging method was eliminated from further consideration in this EIS/EIR.

3.6 VAPORIZER ALTERNATIVES

There are various designs of equipment that are used to warm LNG to the point it returns to a gaseous state. SES considered operational advantages and stability, space requirements, environmental controls, and costs in selecting the vaporization equipment for the Long Beach LNG Import Project. Because SES selected a vaporizer design that utilizes the combustion of natural gas for heating, and air emissions would be generated, other designs were evaluated to determine if an alternative design could result in reduced impacts. For purposes of an environmental comparison, vaporizers can be broadly categorized into two groups depending on whether or not they require onsite combustion of a fuel to warm the LNG.

Vaporizers Not Requiring Combustion

LNG vaporizers generally utilize a warm water bath to provide the heat exchange required to increase the temperature of the LNG and cause it to vaporize. Generally, the LNG is pumped through a closed system of stainless steel pipes that are immersed in the warm water bath. As the LNG is vaporized, the warm water in the bath is cooled and needs to be continually rewarmed. Generally the heat used to rewarm the water bath is provided by the combustion of natural gas. However, at some locations with warm climates, it is possible to use ambient warm air to rewarm the water bath or ambient warm water as a source of the heat needed to vaporize the LNG. The advantage of vaporizers that utilize ambient air or water vaporization systems is that air emissions tend to be lower than for a system that involves combustion of a hydrocarbon fuel (Coast Guard and MARAD, 2003). Although air or water vaporizers can result in very small quantities of air emissions associated with electrical generation required to power fans or pumps, the power is generally produced offsite and the amount needed for the vaporizers is relatively minor.

Ambient air-heated vaporizers utilize air warming structures as heat exchangers to recirculate the cooled water from the water bath and warm it through exposure to the air. Because the surface area of the water–air interface needs to be large for efficient heat transfer, the structures are generally large and require significant space for construction and operation. Ambient air-heated vaporizers were not considered practical for the Long Beach LNG Import Project because of the comparatively large footprint necessary to operate this system and the limitations associated with periods of cool weather in the Long Beach area along the coast.

Circulating warm sea water through the warm bath and over heat exchangers (i.e., once-through heating) is sometimes used as a method for vaporizing LNG. For the Long Beach LNG Import Project, a sea water vaporization system would require withdrawing (and discharging) water from Long Beach Harbor at the rate of about 78,000 gallons per minute (gpm) (40 billion gallons per year). Representatives of NOAA Fisheries and the CDFG indicated that significant numbers of fish and/or fish larvae could be entrained during the withdrawal of sea water. Additionally, the Los Angeles RWQCB noted concern about the thermal plume associated with discharging cold water back into the harbor. Based on these environmental concerns, SES eliminated the use of sea water as a method of vaporizing the LNG from further consideration.

Vaporizers Requiring Combustion

Two vaporizers that require the combustion of fuel were considered for the Long Beach LNG Import Project, the submerged combustion vaporizer and the shell and tube vaporizer.

Submerged combustion vaporizers are generally based around a concrete structure containing a water bath with submerged stainless steel pipe coils. LNG enters the coils and, as it is warmed by the water bath, the vaporized LNG (natural gas) exits the coils. The water bath is warmed by burning natural gas. Blowers provide combustion air at a pressure sufficient to force the combustion emissions up through the water bath where they heat the water. This type of submerged combustion vaporizer system is very efficient and is able to accommodate wide fluctuations in the amount of LNG vaporized. It tends to have higher air emissions than other combustion units because the use of selective catalytic methods to control emissions has not proven reliable.

The shell and tube vaporizer is based on a simple heat transfer between the LNG on the tube side and the source of heat on the shell side of the exchanger. The source of heat may vary depending on the particular design. A vertical shell and tube design with a closed-loop hot water system that provides heat to the vaporizers was considered. The water is heated using direct-fired heaters run on natural gas. About 100,000 gallons of fresh water would be necessary to operate this closed-loop system. An advantage of the shell and tube vaporizer is that selective catalytic reduction (SRC) systems and oxidation catalysts can be used on the heaters to reduce NO_x and CO emissions.

Typical air emissions associated with submerged combustion vaporizers and shell and tube vaporizers are presented in table 3.6-1. The proposed vaporizer for the Long Beach LNG Import Project is the shell and tube vaporizer. In addition to having lower air emissions, this type of vaporizer is efficient, can be readily integrated with the NGL extraction system, and utilizes proven vaporizer technology. Shell and tube vaporizers are also the most compact LNG vaporizers available, an important consideration given the size of the LNG terminal site.

TABLE 3.6-1

Typical Air Emissions Associated with Vaporizer Combustion

	Air Emissions (tons per year)		
Vaporizer Design	NO_x	CO	PM_{10}
Submerged Combustion Vaporizer [a]	110	94	19
Shell and Tube Vaporizer [b]	14	25	27

[a] Emissions are based on a vendor quote for a system utilizing water injection as a control method for NO_x.

[b] The shell and tube vaporizer used in this estimate is of the vertical shell and tube design. This design uses water as an intermediate heat transfer fluid in a closed-loop system, whereby the water is warmed using direct-fired heaters. Emissions are based on utilizing selective catalytic reduction and oxidation catalysts on the fired heaters to control both NO_x and CO emissions.

NO_X = nitrogen oxides
CO = carbon monoxide
PM_{10} = particulate matter having an aerodynamic diameter of 10 microns or less

Recently, new vaporization processes have been developed that primarily utilize air exchangers as a heat source. Standard fin-fan type air exchangers are used to warm an intermediate fluid loop (consisting of propane, water/glycol, potassium formate/water, or other liquid solutions) that circulate through the LNG vaporizers. These systems, particularly in areas where ambient conditions drop below 50 ºF, require a secondary backup whereby heat can be added to the circulating intermediate fluid from natural gas-fired heaters or where the LNG can be vaporized by a parallel system (e.g., submerged combustion vaporizers). These new vaporization processes would have lower fuel gas requirements than conventional combustion vaporizers. For example, it is estimated that a vaporization process utilizing air exchangers could reduce fuel use by about 90 percent compared to conventional combustion vaporizers in an area like Long Beach where the average air temperature is about 64 ºF. Reduced fuel use would lead to a corresponding reduction in air emissions and operating costs. While air exchange systems have been successfully demonstrated and operated at other facilities (e.g., Dahej LNG terminal in India), the space requirements of air exchangers and back-up heaters/vaporizers appear to make this approach technically infeasible at the site proposed for the Long Beach LNG Import Project. Therefore, this alternative was eliminated from further consideration in this EIS/EIR.