Chevron U.S.A. Inc.
April 22,1982

Platform Edith

OCS Lease P 0296

Supplement to Environmental Report and Development and Production Plan

Chevron

Supplement to the Environmental Report and Development and Production Plan

for

Proposed Platform Edith

San Pedro Bay
Offshore Southern California
Federal OCS Lease P 0296
Chevron U.S.A. Inc.
April 22, 1982

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1.0 INTRODUCTION

This supplement to the Environmental Report for proposed Platform Edith concerns the construction and operation of a subsea natural gas pipeline from Chevron U.S.A. Inc's proposed Platform Edith, located on Federal OCS Lease P 0296, to Union Oil Company of California's Platform Eva which is located on State Lease PRC 3033.

In order to provide a thorough analysis of the proposed activities and surrounding environment, this supplemental report is to be read in conjunction with the Environmental Report (ER) for Chevron's proposed Platform Edith (Ref. 1) and the Development and Production Pan for Federal OCS Lease P 0296. (Ref. 2)

This document fulfills the requirements of Section 250.34-3 of CFR Title 30, Part 250, as published in the Federal Register, Volume 44, Number 180-Friday, September 14, 1979.

This supplemental report identifies the following:

1. Activities proposed for the construction and operation of the proposed subsea natural gas pipeline from OCS Lease P 0296 by Chevron U.S.A. Inc. as Operator.

2. The environmental and safety features required by law and those voluntarily employed by Chevron U.S.A. Inc.

3. The environmental impacts and their mitigation of the proposed

subsea natural gas pipeline on the Outer Continental Shelf (OCS) and tidelands of the State of California.

4. The rationale supporting Chevron U.S.A. Inc.'s claim for coastal zone consistancy.

The format of this report conforms to the guidelines set forth in NTL (Notice to Lessees) 80-2 "Minimum Requirements for Environmental Reports," dated March 20, 1980. As stipulated, information contained in Chevron U.S.A. Inc.'s Environmental Report for proposed Platform Edith and other reports or surveys, has not been duplicated but is referenced extensively and summarized in this report. Information applying specifically to this project has been furnished by the professional staff of Chevron U.S.A. Inc. or affiliated companies. Information in referenced material is available at many universities or college libraries in California, at the Minerals Management Service (formally the U.S. Geological Survey, U.S.G.S.) Files in Los Angeles, or in the library of the Standard Oil Company of California in San Francisco. In the event any reviewing agency has difficulty in obtaining a copy of a particular reference, one of the parties listed on the title page of this report should be contacted.

Working within the guidelines for environmental reports, this supplement to proposed Platform Edith's Environmental Report, provides the information required by the Minerals Management Service (M.M.S.) and Bureau of Land Management (BLM) for preparation of an Environmental Assessment, and by the issuance of Pipeline Right of Way.

2.0 DESCRIPTION OF PROPOSED ACTION

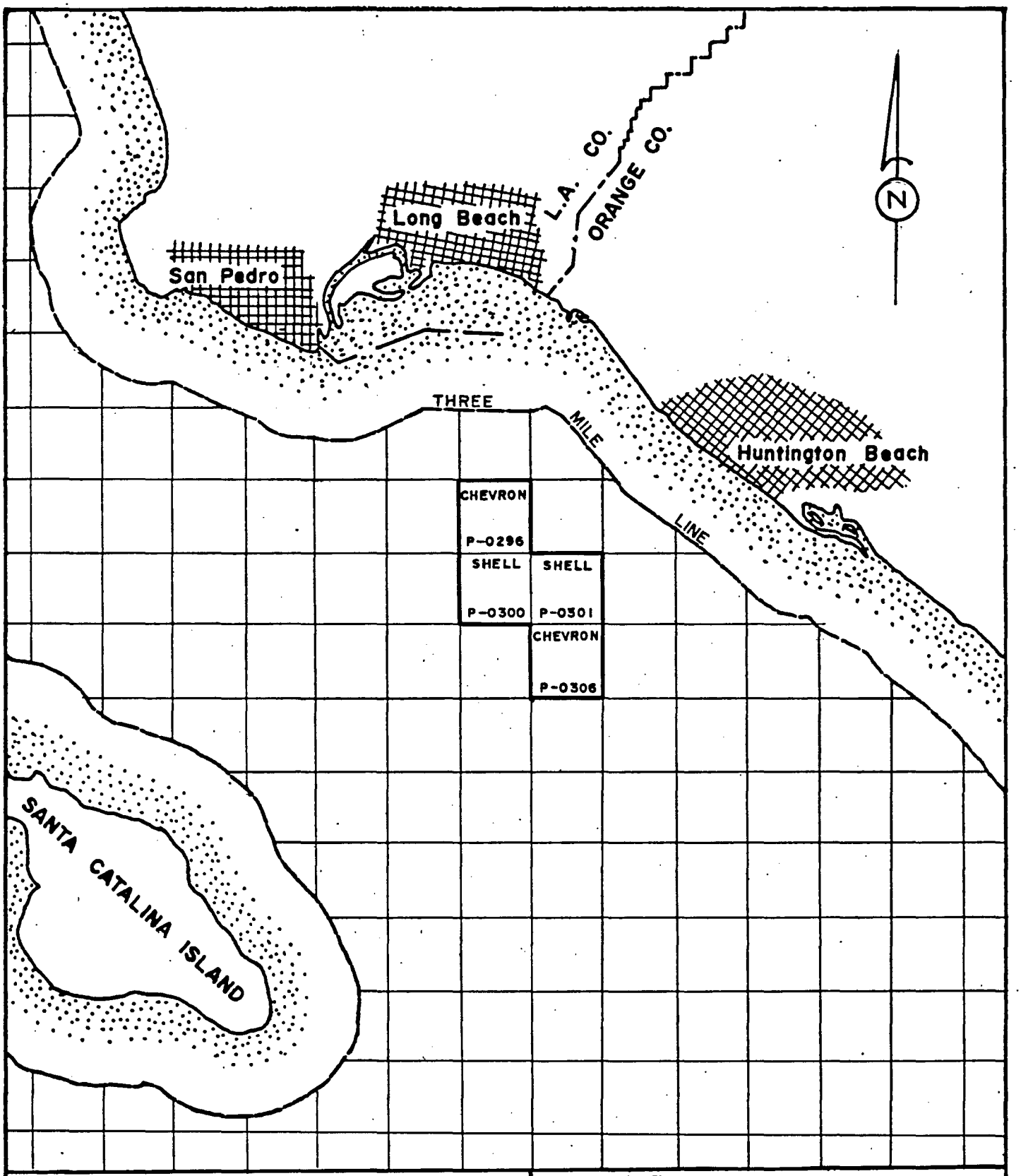
2.1 Operator

Chevron U.S.A. Inc. (hereinafter referred to as "Chevron") is the operator of OCS Lease P 0296 and of the proposed platform to be called "Edith". Union Oil Company of California, Aminoil U.S.A. Inc., and Champlin Petroleum Company are also participants in the proposed gas pipeline project.

2.2 Lease Number and Location

The northern boundary of OCS Lease P 0296, formerly Tract 254, is located approximately 6.6 statute miles (10.4 km) southwest of Huntington Beach, and the southern boundary is located approximately 19.7 statute miles (31.7 km) northeast of Catalina Island (see index map, Figure 2-1). OCS Lease P 0296 was part of OCS Lease Sale No. 35 which covered approximately 1.5 million acres. The Shell OCS Beta Unit Development EIR/EA and the Environmental Impact Statement for Lease Sale No. 35 gives a concise history with respect to OCS Lease P 0296. Chevron obtained the lease in December 1975.

This lease, as well as OCS Leases P 0300, P 0301 and P 0306 constitute the proposed Beta unit. The participants in the proposed unit include Shell Oil Company, Aminoil U.S.A. Inc., Hamilton Brothers Oil Company and Occidental Petroleuma Company,



Chevron U.S.A. Inc.
Western Region, Production Department

REGIONAL MAP
SAN PEDRO BAY DEVELOPMENT

FIGURE 2-1

Union Oil Company of California, Champlin Petroleum Company and Chevron U.S.A. Inc.

2.3 Objectives

The objective of the installation of the gas pipeline from Chevron's proposed Platform Edith to Union's Platform Eva is to transport produced natural gas from Edith for ultimate use in Chevron's Huntington Beach facilities. Using Edith's produced gas in Chevron's Huntington Beach facilities will replace sales gas presently used there. That sales gas will then be available for use at other sources. With the given requirements for fossil fuels in the L.A. Basin; this additional natural gas, which is clean burning and a highly desirable replacement for fuel oil, will result in noteworthy air quality benefits to the Huntington Beach area.

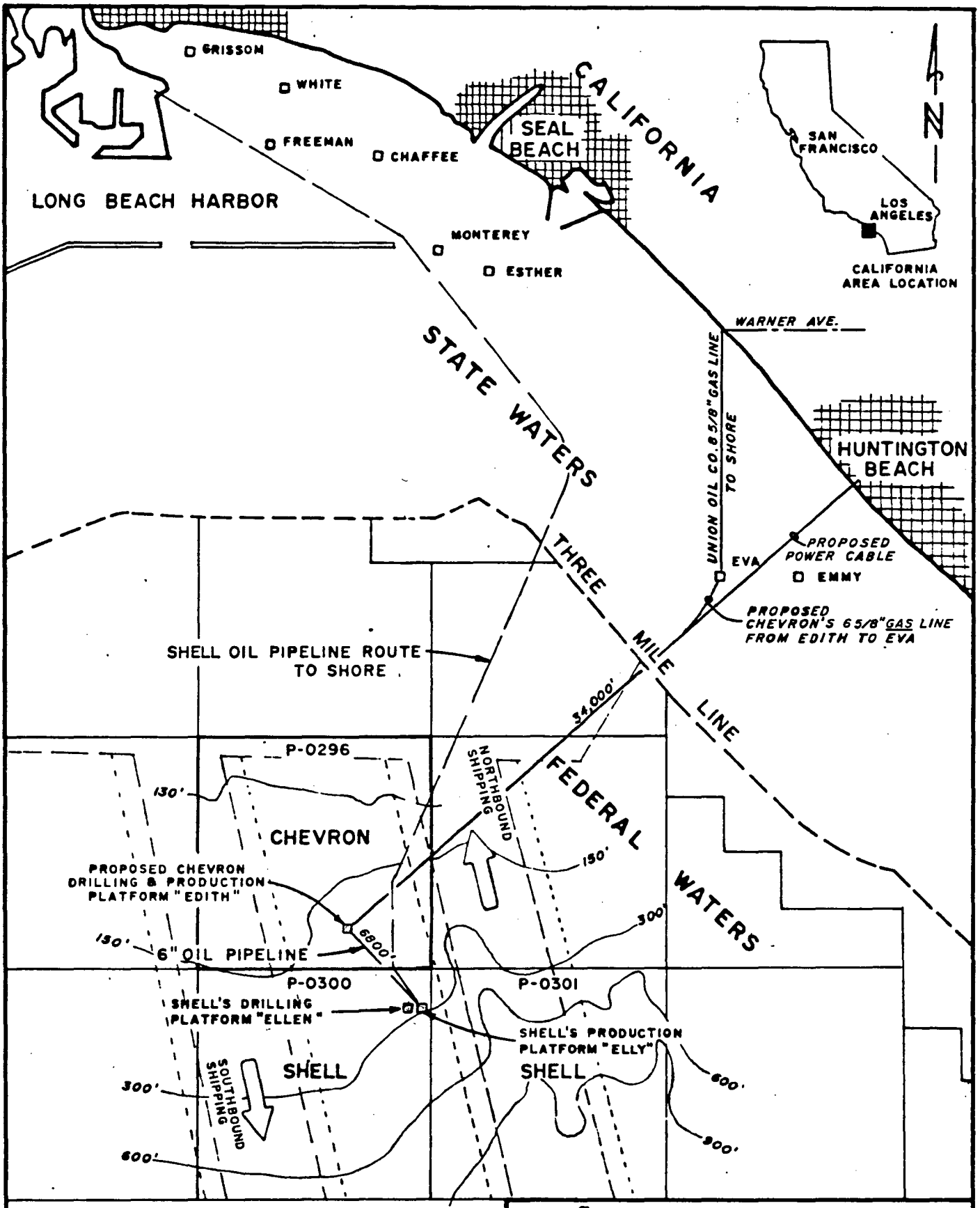
The utilization of Unions' and Aminoil's existing pipelines, as described in Section 2.5, consolidates the proposed project with existing facilities to the maximum extent possible. This consolidation will minimize the resultant environmental impacts in bringing this clean fuel ashore. It is also in compliance with the California Coastal Commissions' Policy 30261(b) which states that consolidation with existing facilities is highly encouraged and desirable in the coastal zone.

2.4 Project Location

The proposed gas pipeline will originate at Chevron's proposed Platform Edith, which will be located on OCS Lease P 0296 in the San Pedro channel, at the intersection of California Lambert Coordinates X = 1,424,260 and Y = 525,220 in System Zone 6 (see Figure 2-2). Platform Edith will be erected on federal land in 161 feet (49.1m) of water approximately 10 statute miles (16.1 km) due south of Long Beach. The city of Huntington Beach is the nearest coastal community, at a distance of 8.5 statute miles (13.7 km) to the northeast.

The gas pipeline connecting proposed Platform Edith with Union's Platform Eva will be approximately 34,200 ft. (6.5 statute miles, 10.4 km) in length. The pipeline will be laid in a straight southwest course, towards Platform Edith from Union's Platform Eva. Platform Eva is located on California state land on state Lease PRC 3033 in 58 ft (17.7m) of water. Platform Eva is approximately 2.1 statute miles (3.4 km) southwest of the city of Huntington Beach.

The proposed gas pipeline will cross the northbound shipping lane of the Maritime Traffic Separation Scheme (TSS). The affected section of the TSS is located from the Gulf of Catalina through the San Pedro Bay (See Figure 2-2).



CHEVRON PLATFORM "EDITH" LOCATION

X=1,424,260 Y=525,220

CALIFORNIA (LAMBERT) COORDINATE SYSTEM ZONE 6

Chevron U.S.A. Inc

Western Region Production Department

CHEVRON'S PLATFORM "EDITH"
SAN PEDRO BAY DEVELOPMENT

DATE 3-22-82

FIGURE 2-2

A-H-2335

2.5 Project Description

Proposed Platform Edith entails a 70 slot platform installed at a water depth of 161 ft (49.1 m). Of the 70 slots, 47 will be for producing wells,18 for water injection wells, and 5 spare conductors for exploration and/or service wells. In addition to the platform, Chevron has proposed a 6 5/8-inch (16.8 cm) O.D. subsea oil pipeline, 6,800 ft (2073 m) in length that will span the distance between Platform Edith and Shells' Platform Elly. The crude produced and processed on Platform Edith will be transported via this subsea pipeline to Platform Elly where it will commingle with Shell's Beta production. From there the crude will travel to shore through Shell's existing 16-inch (40.6 cm) O.D. pipeline for distribution to refineries.

As proposed in the Development and Production Plan - Platform Edith (D and PP, Ref. 2), a portion of the gas produced daily from the reservoir underlying OCS-P 0296 will be used as fuel in the process heater onboard Platform Edith. The remainder of the produced gas was to be reinjected into the producing formation.

Subsequent analyses have shown the alternative of piping the produced gas to shore for use in Chevron's Huntington Beach facilities to be very favorable from both an economic and environmental standpoint.

The proposed method for transporting produced gas from Edith for ultimate use at Chevron's Huntington Beach facilities is as follows:

a) Lay a 34,200 Ft. (10,424m) 6-5/8 inch (16.8 cm) O.D. subsea gas pipeline from Platform Edith to Union's Platform Eva.

b) Commingle with Eva gas and utilize Union's existing 8 5/8-inch (22.0 cm) O.D. subsea pipeline to shore.

c) Enter Aminoil's existing 12 3/4-inch (32.4 cm) O.D. gas gathering line near the intersection of Warner Avenue and Algonquin Street for ultimate delivery to Chevron's Huntington Beach facilities (See Figure 2-2).

The estimated gas production will peak at a rate of 6.5 million standard cubic feet per day (mm SCFD) in 1985. The gas flow rate will be metered on board Platform Edith. (See Figure 2-3 for the production forecast.)

The proposed subsea gas pipeline will be equipped with a high-low pressure sensor to shut-in wells on Platform Edith. It shall also be equipped with an automatic shut-in device located on Union's Platform Eva. In general, the pipeline design, inspection, and operation will comply with OCS Order #9, applicable Bureau of Land Management (BLM) policies and State Lands Regulations for Oil and Gas Production, Section 2132.

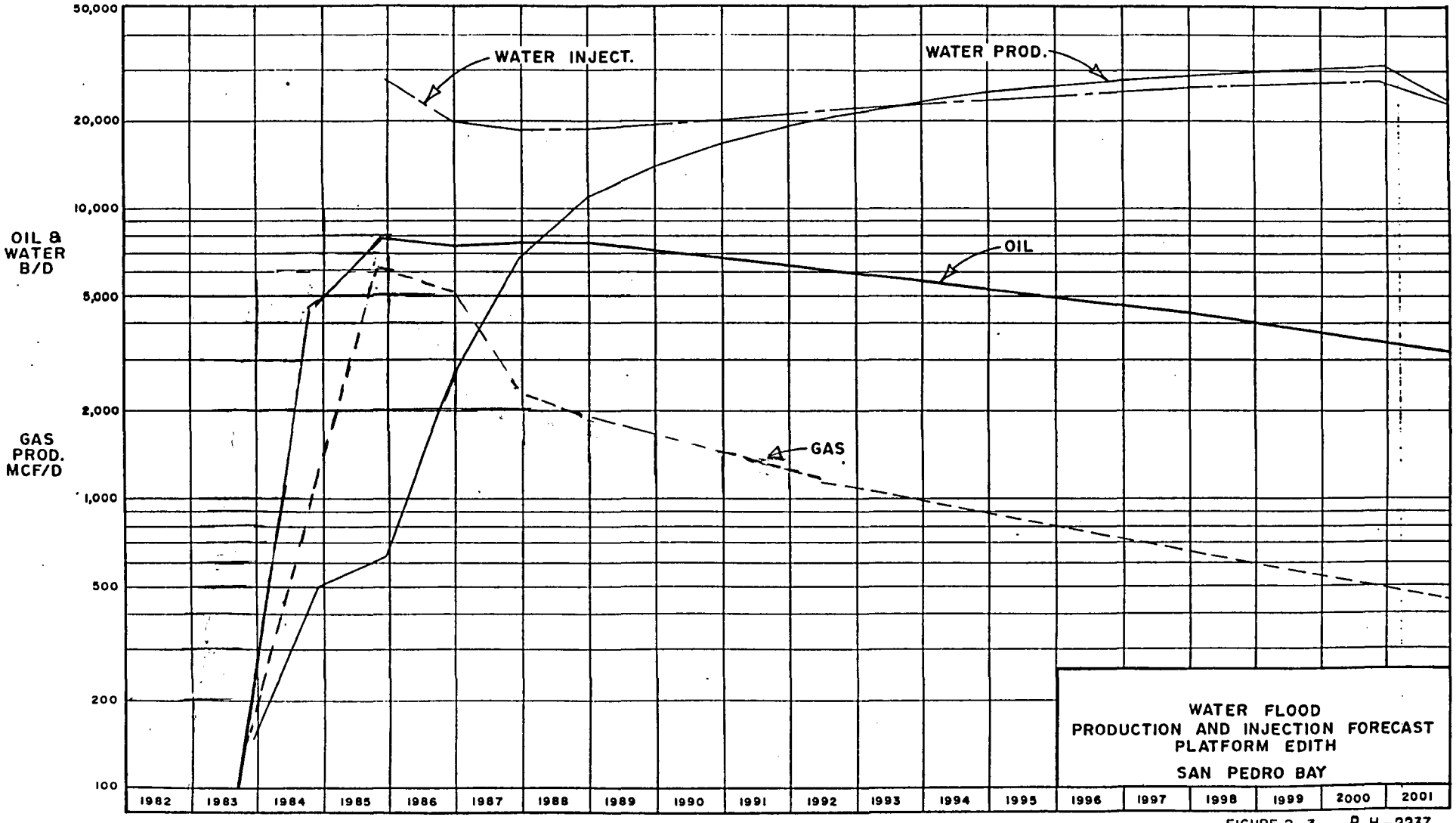


FIGURE 2-3 B-H-2237

A shallow geologic hazards and two cultural surveys was executed along the proposed route for the subsea gas pipeline during January, 1981 and 1982. These surveys found no significant geologic hazards or cultural resources along the proposed route (See Appendix 2).

The proposed pipeline installation technique to be utilized will be the bottom pull method. A fabrication barge will be anchored near Platform Eva, upon which pipeline sections are joined. A pull barge, anchored at progressive 5,000 foot (1524 m) intervals, will pull the fabricated pipeline to Platform Edith by means of a pull winch and a wire line attached to the pipeline (Refer to section 2.5.1.9).

2.5.1 Pipeline Design

2.5.1.1 Basis For Design

The proposed subsea gas pipeline from Platform Edith to Platform Eva will be 6-5/8 inches (16.8 cm) O.D. and designed for a throughput of approximately 6.75 mm SCFD at a discharge pressure, from Platform Edith, of 150 pounds per square inch, gas (psig). It is expected that this line will be utilized for a period of ten to eleven years. (See Production Forecast; Figure 2-3) At that time it

is anticipated that gas production will be depleted to the extent that all produced gas will be required for the platform process heater fuel and miscellaneous platform usage such as blanket gas. (Example of blanket gas: for filling vapor space in waste water separators to prevent oxygen from dissolving into the water.)

The proposed subsea pipeline will operate at a low pressure of approximately 150 psig to minimize constructing additional facilities at Union's Platform Eva. Current production through Union's existing pipeline is 0.45 mm SCFD at a line pressure between 7 psig and 9 psig. Depending on the volume of Edith's gas the electric motor driven compressor on Eva will probably require some modification, (i.e., recylindering, changing of clearance pockets, etc.). Chevron does not anticipate any additional facilities for Aminoil as a result of Edith's gas being added to their system.

API 5L Grade B seamless pipe will be used for the proposed subsea pipeline and risers. This material has specified minimum yield strength of 35,000 psi. Based on a design factor of 0.72 SMYS for the

pipeline and 0.5 SMYS for the risers, a wall thickness of 0.344 inches (0.84 cm) is provided. Pipe weight will be 23.08 lbs. per foot (10.5 kg), which includes a thickness with a minimum of 1/16 inch corrosion allowance. Flanges shall be in accordance with ASA 1316.5-1953, material specification ASTM A-105 Grade 11. Flange pressure ratings are equivalent to ANSI 300 (720 psig at 100° F.)

2.5.1.2 Applicable Regulations and Codes

The proposed subsea gas pipeline will be designed in compliance with the Minerals Management Service (MMS), Conservation Division, Pacific Region, OCS Order No. 9, dated June 1, 1971, ANSI B31.8-1975, "Gas Transmission and Distribution Piping Systems," and Code of Federal Regulations Title 49, Part 192, "Transportation of Natural and Other Gas by Pipeline Minimum Federal Standards." Also, the pipeline design and operating procedures will follow API Recommended Practice RP 1111, Design, Construction, Operation and Maintenance of Offshore Hydrocarbon Pipelines, March 1976. State Lands Commission "Regulations for Oil and Gas Drilling and Production Operations on State Tide and

Submerged Lands" Section 2132(h)(8) will be complied with, as a portion of pipeline will traverse state lands.

2.5.1.3 Stability

The pipeline will be designed to resist movement under action of on bottom currents of 2.6 ft. (0.79 m) per second based on the significant wave for a 100-year storm. On-bottom currents are calculated perpendicular to the pipeline and include both steady - state currents and wave orbital velocity currents due to a storm. Maximum currents occur at the 100 ft. (30.5 m) water depth. The bulk specific gravity of the empty line is 1.46. Stability for this pipeline will be achieved by sufficient wall thickness for weight.

2.5.1.4 Maximum Operating Pressure

The proposed gas pipeline will be designed to ANSI 300 (720 psi at 100°F) under applicable codes and regulations. The maximum anticipated discharge pressure from Platform Edith, of 150 psig, will be less than ANSI 300 (720 psi at 100°F).

2.5.1.5 External Pressure

The proposed subsea gas pipeline will be designed to withstand external loads, including hydrostatic pressures with the pipeline void and with absolute internal pressure equal to one atmosphere. Such design limitations are determined by utilizing Timoshenko's "Theory of Elastic Stability," McGraw Hill, pp. 216-225. Allowances will be made for mill tolerances of 1% in out-of-roundness and 12.5% in wall thickness.

2.5.1.6 Other Stresses

The proposed subsea gas pipeline will be designed under applicable codes and regulations to withstand stresses which result from installation, dead loads, and surges. Thermal and fluid expansion is of minor concern in the design of the pipeline, since the difference between operating temperature vs. installation temperature is of minor consequence. The pipeline will not be subject to over pressuring from ambient heating of the static contents. Piping at the compressors will be designed, anchored, and supported so that dynamic effects such as vibration will be negligible.

For design of offshore pipelines, installed by the bottom pull method, bending moment is considered the only source of pipe injury. Excess bending movement can result in buckling of the pipe. Since steel assumes the shape of an elastic curve, analysis can be made by ordinary beam theory methods. A simple but useful way to measure bending stress is in terms of pipe curvature. For elastic members in bending, the radius of curvature is selected which will hold the static strain within a certain value. For marine pipelines this is usually held to a value represented at 80% to 85% of the yield stress. These relationships are established by the equation $S = EC/R$; where S = maximum fiber stress, R = radius of curvature, E = modulus of elasticity, C = distance from neutral axis to the most remote fiber.

2.5.1.7 External Corrosion Protection

The pipeline will be protected against external corrosion by means of a pipe coating and cathodic protection. A minimum 75 mil (0.19 cm) polyethylene over butyl adhesive coating system will be utilized for external corrosion protection. Field joints will be protected with the same material.

Aluminum alloy sacrificial anodes will be used for the cathodic protection system. The sacrificial anode system is conservatively designed to maintain a protective potential (-0.85V to a copper sulfate reference electrode) with the absence of 2% coating over the length of the pipeline. An anode weighing approximately 32 lb. (14.5 kg) will be placed every 1,000 ft. (304.8 m) to provide this protection. The riser at Platform Edith will be protected by the platform cathodic protection system. The pipeline will be cathodically isolated from Platforms Eva and Edith. Platform Eva's riser will be protected by Eva's cathodic protection system.

2.5.1.8 Internal Corrosion Protection

Internal corrosion in this dry gas subsea pipeline is not expected. However, the design of the pipeline includes an allowance of 1/16 inch for internal corrosion. Additional corrosion protection will be provided by use of inhibitors if inspection or product analysis indicates the need. The pipeline is designed so that internal inspection tools such as the AMF/Tuboscope "Linalog" can be run to detect corrosion.

2.5.1.9 Construction Method

The proposed construction method, of the subsea gas pipeline, will be the bottom pull method. The equipment to be utilized is described as follows:

a) Fabrication barge Dimensions : 200 ft. (60.6 m) x 60 ft. (18.3 m) x 14 ft. (4.3 m). This barge will have three deck winches at 185 brake horsepower (bhp) each, one pipe line-up powerpack at 175 bhp, one crane (to handle pipe) at 175 bhp, six welding engines at 102 bhp each, two generators at 102 bhp each, and two compressors at 102 bhp each.

b) Pull barge Dimensions: 160 ft. (48.8 m) x 50 ft. (15.2 m) x 14 ft. (4.3 m). This barge will have three deck winches at 102 bhp each, two generators at 143 bhp each, one generator at 102 bhp, one crane (used only for risers) at 525 bhp, one pull winch at 462 bhp, and one compressor at 102 bhp.

c) Support tugboat - two engines at 450 shaft horsepower (shp) each.

d) Crew boat - two engines at 174 shp each.

The following describes the procedure for construction and installation of the proposed gas pipeline utilizing the bottom pull method:

The first phase of construction of the proposed gas pipeline will be the welding of pipeline sections at the Healy Tibbitts Construction Company's yard on Terminal Island in Los Angeles Harbor. This will involve welding two 40 ft. (12.2m) joints of pipe into an 80 ft. (24.4 m) pipeline section. The time required to weld 34,200 ft. (10,424 m) of 40 ft. (12.2 m) pipe joints into 80 ft. (24.4m) pipeline sections is approximately eight weeks, or 320 hours. The pipeline sections will then be loaded on board the fabrication barge.

The fabrication barge will be towed out, positioned near Platform Eva, and secured by four anchors; two seaward and two shoreward. Positioning of the anchors will be accomplished by the supply tugboat.

Initially the pull barge will be positioned approximately 5,000 ft. (1,524 m) seaward of the

fabrication barge and on a straight, southwest course to Platform Edith.

The six anchors used to position the pull barge will be set by the supply tugboat in a pattern as follows:

- Two seaward anchors, one from each side of the bow, will be set approximately 1,500 ft. (457 m) directly ahead of the pull barge.

- Two other seaward anchors will be set from the same points on the bow as the first set of seaward anchors. These anchors will be positioned approximately 1,500 feet (457 m) ahead and at an angle of less than 45° to either side of the bow to provide lateral stability.

- The final two anchors will be set shoreward, from either side of the stern, approximately 1,000 feet (305 m) directly behind the pull barge.

Once the anchors are positioned and tension is taken up, the pull barge will be locked in

position. The pull winch, with a wire line attached to the subsea pipeline, will then provide a pulling force of approximately 100 tons.

After the subsea pipeline has been pulled 5,000 feet (1,524 m) seaward to a position near the stern of the pull barge, progress will then halt. The supply tugboat will then return, tow the pull barge approximately 5,000 feet (1,524 m) closer to Platform Edith, and the six anchors will be reset. The barge is then again locked in position. Tension will be taken up on the wire line attached to the subsea pipeline, which was let out during the previous tow. The pull winch will then again provide pulling force to the subsea gas pipeline. It is anticipated that the pull barge will be repositioned seven times, at approximately 5,000 feet intervals, during the construction of the proposed subsea gas pipeline between Platforms Eva and Edith.

In order to reduce pulling friction resistance, temporary buoys will be attached to the subsea pipeline as it is launched from the fabrication barge. This will result in an average net submerged weight of 4 lbs. (1.8 kg) per foot.

After the pipeline is in position and has been flooded, the buoys will be released by pulling a previously installed stripping line.

Pipe tension stresses will be monitored by measuring the wire rope tension at the pull winch with a tension meter.

After the proposed subsea pipeline has been pulled to Platform Edith, the fabrication barge will be moved towards Platform Eva, laying pipe in a horizontal curve for the short distance required.

Emission calculations associated with this proposed construction method are in Appendix 4.

2.5.1.10 Pipeline Operation

The proposed subsea gas pipeline will be operated and regularly inspected in compliance with OCS Order No. 9, applicable Bureau of Land Management (BLM) policies and State Lands Regulations For Oil and Gas Production, Section 2132.

At proposed Platform Edith, the pipeline will be equipped with high-low pressure shut-in sensors and

with an automatic shut-in valve. The pressure sensors will be connected so as to actuate the automatic shut-in valves on the pipelines. The pressure settings will be determined by pipeline operating characteristics, and will be set as close as practical to the normal operating pressure of the pipeline. The automatic shut-in valves also will be actuated by the integrated safety-control system of the production facility.

The pipeline will be delivering produced gas to Union's Platform Eva, which will be equipped with an automatic shut-in valve. This automatic shut-in valve will be controllable by the integrated safety-control system of the platform.

All gas compressors will be equipped with high-low-pressure shut-in devices.

All pressure sensors, pressure shut-in devices, and automatic shut-in valves will be tested monthly, and will be witnessed and approved by the appropriate agency. Records shall be maintained on the production facility showing the present status and past history of each device, including dates and details of inspection, testing, repairing, adjustment, and reinstallation or replacement.

At proposed Platform Edith, the pipeline will be protected from over/under pressure by means of an automatic shutdown valve. The shutdown valve is actuated (closed) by a signal from a Pressure Sensor High (PSH), a Pressure Sensor Low (PSL), the Fire Detection System, Emergency Shutdown System or a shutdown signal from Platform Eva.

2.5.1.11 Crossing Existing Pipelines

The proposed subsea gas pipeline will cross over an existing 16-inch (40.6 cm) Shell oil pipeline in approximately 155 ft. (47.2 m) of water.

Temporary rollers will be positioned on both sides of the 16-inch (40.6 cm) oil pipeline to support the subsea gas pipeline during installation. The temporary rollers will be placed, using diver assistance, before the pulling head reaches the crossing area. The pull wire line position will be used to confirm the crossing location.

After the proposed subsea gas pipeline has been pulled into position, a sand-cement sack barrier will be installed which will maintain approximately a 12-inch (30.5 cm) vertical separation between the

two pipelines. After the barrier is constructed, the temporary rollers will be removed.

Details of the barrier construction are shown in Figure 2-4.

2.6 Time Frames

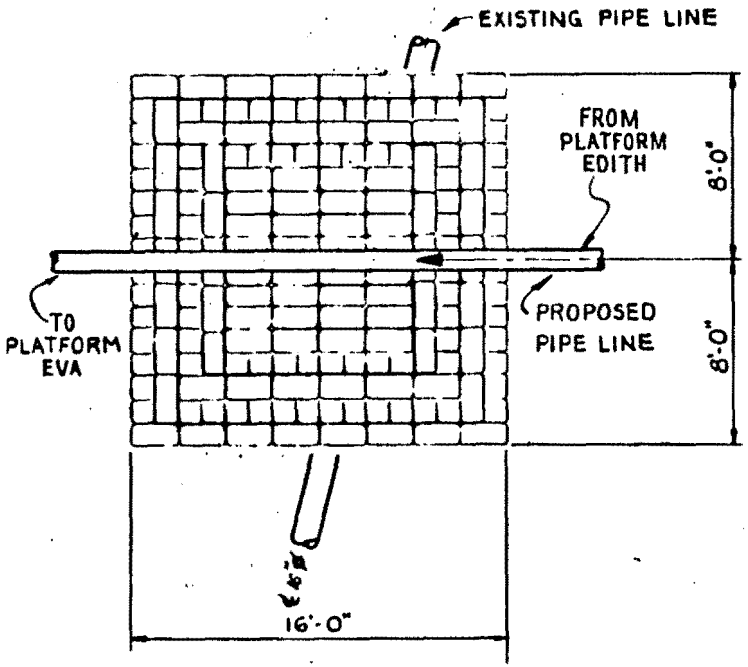
The construction phase of OCS Lease P 0296 of the Beta Development, Platform Edith, will encompass five general phases.

1. Final engineering design of platform, pipelines, and cable facilities.

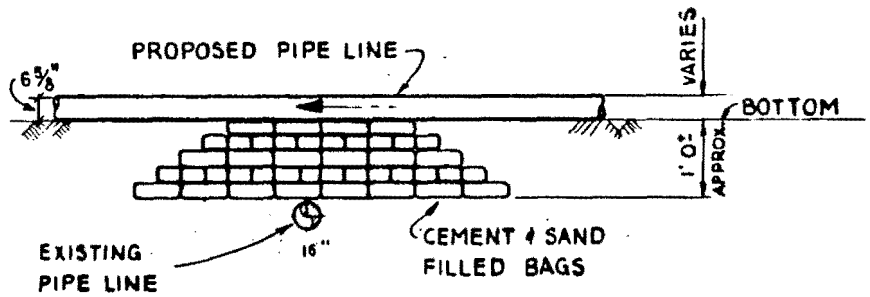
2. Fabrication of the platform jacket and process facilities as described in Sections 5 and 6 in the Development and Production Plan (D and PP) for proposed Platform Edith, dated December 1, 1980 (Ref. 2).

3. Jacket and module installation (including drilling rigs.).

4. a) Installation of the 6,800 foot (2,073 m) subsea oil pipeline to Shell's Platform Elly.
   b) Installation of the 34,200 foot (10,424 m) subsea gas pipeline to Platform Eva.



PLAN



ELEVATION

(WATER DEPTH APPROX. 155 FT.)

NOTES:

1. CEMENT & SAND MIXTURE SHALL BE 1 TO 3 PARTS BY WEIGHT
2. BAGS SHALL BE MADE OF CLOSELY WOVEN MATERIAL WITH WICKING ACTION
3. AFTER FILLING THE BAG IT SHALL BE CLOSED BY SEWING OR THE EQUIVALENT BUT NOT BY BUNCHING AND TYING THE ENDS

REVISION	DATE	APPVD	DESCRIPTION	BY

Chevron U.S.A. Inc.
Western Region, Production Department

BETA UNIT PIPELINES

Dr. _____ Ck. _____
Date 3-22-82 Proj. Eng. _____
Submitted _____
Signed _____

SEPARATION BARRIER CROSSING
OF SHELL OIL COMPANY PIPELINE

DRAWING NO.

FIGURE 2-4 B-H-2336

5.. Installation of the subsea power cable from Chevron's Huntington Beach facilities to proposed Platform Edith (refer Appendix 6 of the Envirnomental Report, Platform Edith, dated December 1, 1980).

The overall schedule for Chevron Beta development is shown in Figure 2-5. Preliminary estimates indicate the start of drilling is April 1983 with the first crude oil production to shore two months later.

2.7 Personnel Requirements

2.7.1 Installation Phase

Approximately 50 persons will be involved with the construction-installation phase of the proposed subsea gas pipeline. This will involve working 12-hour shifts, 24 hours a day, for a period of two weeks. Riser installation, at each platform, will require fewer barge personnel, as the primary rigging operations will be done from the platforms using portable winches and air tuggers.

The riser installations will take approximately one month, as a large amount of time will be required by divers to clean the platform legs for clamp installation, run surveys, and install the clamps. Weather conditions may also impede

Platform Edith Project
P-0296
San Pedro Bay Development
Chevron U.S.A. Operator

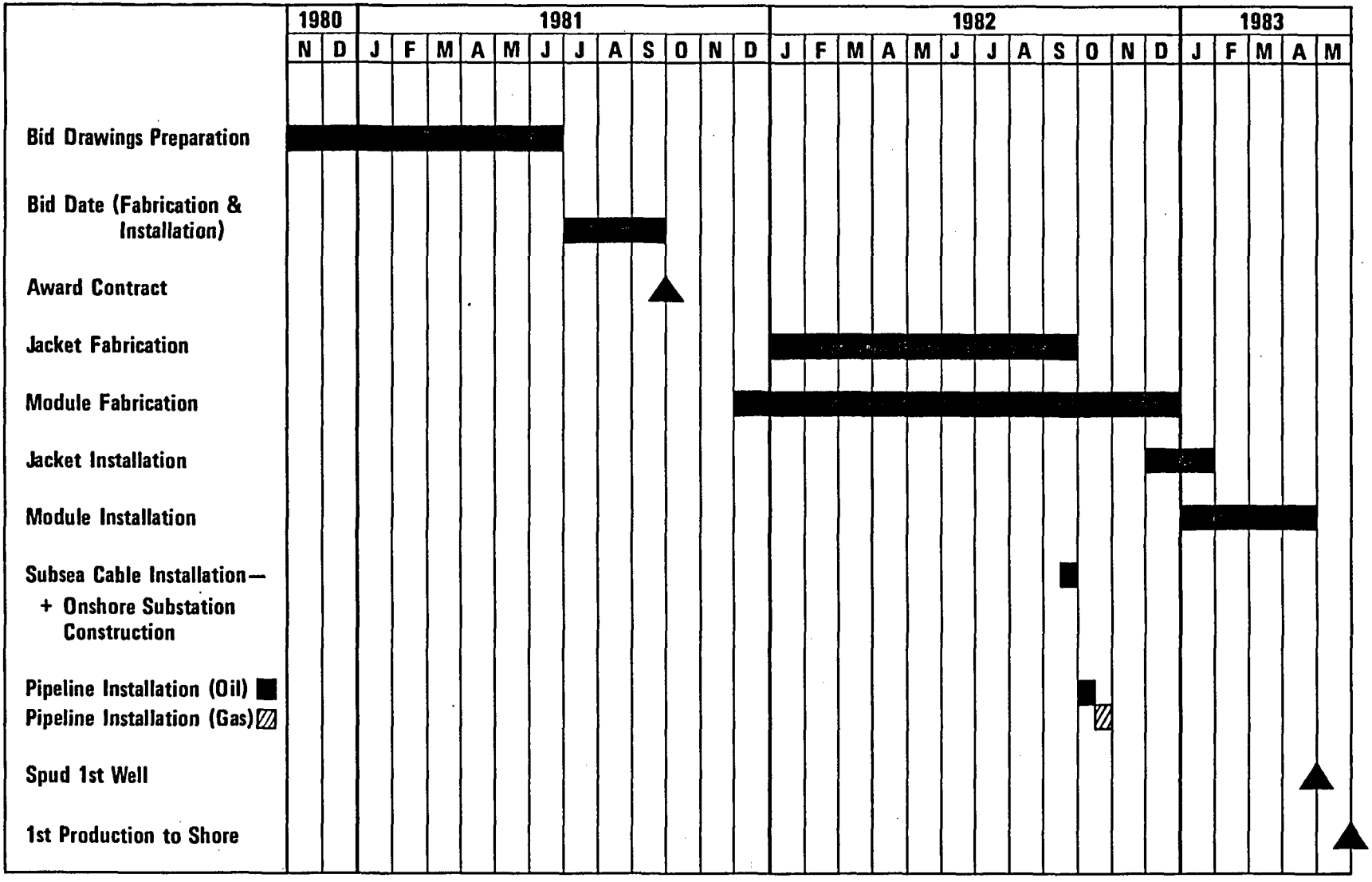


Figure 2-5

the progress of this construction phase of the subsea gas pipeline.

2.7.2 Operation Phase

No additional personnel will be required other than those outlined in Platform Edith's Environmental Report, Section 2.8, dated December 1, 1980 (Ref. 1).

2.8 Monitoring Systems

The proposed subsea gas pipeline from Platform Edith to Platform Eva will be monitored by high and low pressure sensors. When a predetermined high output pressure is exceeded the pipeline will be shut in at Platform Edith. In the event of a large leak, pipeline rupture, or abnormally low pressure is detected at either platform, all gas shipping pumps will be automatically stopped and the pipeline will be shut in.

2.9 On Shore Support Systems

Supplies and personnel during the construction phase will come from Healy-Tibbitts Construction Company located on Terminal Island, Los Angeles. During the production phase, pipeline personnel will be recruited from the platform staff to monitor the gas pipeline.

2.10 New or Unusual Technology

No new or unusual technology is anticipated for this project.

2.11 Solid and Liquid Wastes

Solid wastes (excess asphalt sealant, scrap metal, etc.) generated during the construction of the proposed subsea gas pipeline will be approximately 200 lbs. (90.9 kg) per day during the fabrication and installation period of the pipeline. Riser installations will produce substantially less solid wastes. All solid wastes will be containerized and disposed of properly onshore.

Liquid wastes generated during the fabrication and installation phase of the pipeline would be sanitary sewage and hydrostatic test water. Sanitary sewage will be contained in chemical toilets and then disposed of onshore. The pipeline will be hydrostatically tested after installation with sea water of a pressure at least 50 percent higher than the maximum operating pressure. This will involve approximately 65,000 gallons of sea water. Disposal of used test water would be in compliance with the conditions of a NPDES permit issued by either the Environmental Protection Agency (EPA) (for discharge into federal waters) or the California Regional Water Quality Control Board (CRWQCB) (for discharge into state waters).

2.12 Gaseous Emissions

Gaseous emissions associated with the construction and installation of the proposed subsea gas pipeline will consist of carbon monoxide (CO), volatile organic compounds (VOC), nitrous oxides (NOx), sulphur compounds treated as sulphur dioxide (SO_2), and total suspended particulates (TSP). The equipment involved in this project which are sources of the above-mentioned contaminants are listed in Section 2.5.1.9. Calculated emissions for the equipment listed in Section 2.5.1.9, and private vehicles involved, can be found in Appendices 3 and 4. It should be noted that emissions for private vehicles and the crewboat are not included in total facility emissions as they are temporary, mobile sources. (Refer Appendix 3.) All other emissions from the fabrication barge and pull barge, which are also temporary, appear in Appendix 4. Total pipeline facility emissions will be increased by 0.98 lbs/day VOC from compressor seals and is considered negligible.

2.12.1 Installation Phase - All Sources.

The total offshore mobile source emissions from the crewboat and supply tugboat for construction and installation of the proposed subsea gas pipeline, for a duration of 14 days, are the following: NOx - 350.7 lbs. (25.1 lb/day), VOC - 153.2 lbs. (10.9 lb/day), CO - 116.2 lbs. (8.3 lb/day), and SO_2 - 26.7 lbs (1.9 lb/day). (Refer to Table 1, Appendix 3.)

The total offshore mobile source emissions from worker transporation, approximately 50 persons, for the 14 day duration of the construction and installation of the gas pipeline are the following: NOx - 225.4 lbs. (16.1 lb/day), VOC - 120.4 lbs (8.6 lbs/day), CO - 1134.0 lbs (81.0 lbs/day), SO_2 - 12.6 lbs. (0.9 lb/day), and TSP -32.2 lbs. (2.3 lbs/day) (Refer to Table 1, Appendix 3).

The total onshore mobile source emissions from worker transportation, approximately 25 persons, and supply truck transportation for the 40 day duration (8 weeks at a 5 day work week, 40 hours per week) of the construction of the welded pipeline sections to be prepared prior to offshore installation are the following: NOx - 372 lbs. (9.3 lb/day), VOC - 176 lbs. (4.4 lbs./day), CO - 1,652 lbs. (41.3 lbs./day), SO_2 - 24 lbs. (0.6 lbs./day), and TSP - 52 lbs. (1.3 lbs./day) (refer to Table 2, Appendix 3).

The total offshore temporary source emissions for construction and installation of the gas pipeline involve the fabrication barge equipment, pull barge equipment, and the supply tugboat. The total emissions are the following: NOx - 19,896.8 lbs. (1,421.2 lbs./day), VOC -1,633.8 lbs. (116.7 lbs/day), CO -4,390.4 lbs (313.6 lbs/day), SO_2 - 1,338.4 lbs. (95.6 lbs/day), and TSP - 1,365 lbs (97.5 lbs/day). (Refer Table 1, Appendix 4.)

The total onshore temporary source emissions fro the 40 day duratin (8 weeks at a 5 day work week, 40 hours a week) necessary for the construction of the welded pipeline sections, and their subsequent loading to the fabrication barge prior to offshore installation, are the following: NOx - 3,764.0 lbs. (94.1 lb./day), VOC - 300.0 lbs. (7.5 lb./day), CO - 820.0 lbs. (20.5 lb./day), SO_2 - 252.0 lbs. (6.3 lb./day), and TSP -268.0 lbs. (6.7 lb./day).

2.12.2 Operational Phase - all Sources

The only operational phase emission source will be fugitive emissions (VOC) from the gas compressor on Platform Eva. The total emissions will be 0.98 lbs/day and are considered negligible (Refer to fugitive emission calculations in Appendix 4).

2.13 Maps and Diagrams of Projected Layout

Regional and detailed location maps of the gas pipeline are included as figures in this supplement.

2.14 Certificate of Coastal Zone Consistency

The proposed activities which are described in detail in this supplement to the Environmental Report and the D&PP (Platform Edith) for the installation of the gas pipeline from Platform Edith

to Union's Platform Eva are consistent with the policies of the California Coastal Management Program and these activities will be conducted in a manner to ensure conformity with that program.

Each of the applicable California Coastal Zone Management Plan policies are hereinafter evaluated relative to such activities.

1. POLICY: Water and Marine Resources

30230. Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.

30231. The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface water flow,

encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.

Assessment:

The bottom pull method of pipeline laying will increase suspended solids in the pipeline route and surrounding area. This condition is temporary and will occur during a two-week period due to the construction and anchoring activities.

The suspended solids generated from installation activities will have a minor effect upon localized flora, fauna and bottom dwelling biota. The water depth and currents in the project area ensure maximum dilution and rapid settling of the suspended plume.

The pipeline will not adversely affect fish, marine mammals, or other marine organisms. This structure will, however, contribute additional habitat for fish and other marine organisms as a man-made reef.

Both epifaunal and infaunal benthic communities will be locally affected to some degree including common species of polychaetes, Prionspio pinnata, Pholoe glabra, and Pectinaria californienses, the crustaceans, Ampelisca brevisimulata and

Heterophoxus oculatus, and the echinoderm Amphiodia urtica. The normal functions and interactions of local benthic communities will be upset by the disturbance of sediments from pipeline installation/construction. However, the disturbance of the sediments will be short term and will have no significant impact on pelagic organisms (see Section 4.5).

As a necessary protective measure, at Platform Edith the pipeline will be equipped with high-low-pressure shut-in sensors and with an automatic shut-in valve. The pressure sensors will be connected so as to actuate the automatic shut-in valves on the pipeline as well as all shut-in devices on input sources to the pipeline. The pressure settings shall be determined by pipeline operating characteristics, and will be set as close as practical to the normal operating pressure of the pipeline. The automatic shut-in valves also shall be actuated by the integrated safety-control system of Platform Edith.

The pipeline will be delivering gas to Union's Platform Eva and will be equipped with an automatic shut-in valve. This automatic shut-in valve shall be controllable by the integrated safety-control system of the platform.

All gas compressors shall be equipped with high-low-pressure shut-in devices.

All pressure sensors, pressure shut-in devices, and automatic shut-in valves, including those on Platform Edith, shall be tested monthly and shall be witnessed and approved by the appropriate agency. Records shall be maintained on Platform Edith showing the present status and past history of each device, including dates and details of inspection, testing and repairing, adjustment, and reinstallation or replacement.

Finding:

The proposed activities are consistent with the enumerated policies for the following reasons:

a. Such activities will be conducted in compliance with Minerals Management Service (MMS) regulations (OCS Orders No. 9 and No. 5), applicable Bureau of Land Management (BLM) policies and State Lands Regulations for Oil and Gas Production, Section 2132.

b. Construction of the pipeline will have a short-term, insignificant impact upon localized flora, fauna, and bottom dwelling biota, thereby preserving the overall marine resources in the project area.

c. The pipeline will provide additional habitat for fish and other marine organisms, thereby enhancing the marine environment.

d. Fuel transportation and fuel transfer operations are controlled by the U.S. Coast Guard anti-pollution regulations (CFR Title 33, Parts 154 and 156) and the contractor supplying diesel fuel for the pipeline project will be in compliance with these regulations.

2. POLICY: Environmentally Sensitive Habitat Areas

30240. (a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on such resources shall be allowed within such areas.

(b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade such areas, and shall be compatible with the continuance of such habitat areas.

Assessment:

The closest environmentally sensitive areas to the proposed pipeline route are the Bolsa Chica Ecological Reserve 8 nau. miles (15 km) northeast and Niguel Marine Life Refuge 7.5 nau. miles (14 km) south, 21 nau. miles (39 km) east. The proposed activities will have no forseeable impact on any environmental-

ly sensitive habitat areas. A highly improbable pipeline rupture would result in the emittance of hydrocarbons to the atmosphere which would not affect any environmentally sensitive areas in the surrounding vicinity.

Finding:

The proposed activities are consistent with the enumerated policy for the following reason:

The installation and subsequent operation of the pipeline will not have a significant impact on any environmentally sensitive habitat areas as such areas are not located near the project location.

3. POLICY: Hazard Areas

30253. New development shall:

1) Minimize risks to life and property in areas of high geologic, flood and fire hazard.

2) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective

devices that would substantially alter natural landforms along bluffs and cliffs.

3) Be consistent with requirements imposed by an air pollution control district or the State Air Resources Control Board as to each particular development.

4) Minimize energy consumption and vehicle miles traveled.

5) Where appropriate, protect special communities and neighborhoods which, because of their unique characteristics, are popular visitor destination points for recreational uses.

Assessment:

The pipeline is situated in an area which may be subject to ground motions generated by large magnitude earthquakes during the operational life. The pipeline will not cross any known active faults. Its route is located between the active Palos Verdes fault zone and the Newport-Inglewood fault zone.

Due to the nearly flat surface of the San Pedro Shelf and the demonstrated resistance of the foundation soils to liquefaction, the foundation soils in the pipeline area will remain stable even under extreme earthquake conditions.

The proposed subsea gas pipeline construction, installation and production phases will generate air emissions containing VOC, CO, COx, NOx and particulates. These emissions are generated by mobile sources such as crew boats, private vehicles, etc., and by facility construction involved with the fabrication and pull barges. With the exception of fugitive emissions from the production phase, which will be negligible, all other emissions will be of temporary duration.

The gas pipeline will be installed by the bottom pull method (See Section 2.5.1.9) and will take approximately two weeks to complete.

Travel by employees in private vehicles and truck traffic will occur during the construction of the gas pipeline.

The closest recreational areas to the proposed platform site are Newport Beach and Long Beach. The proposed activities will have no forseeable impact on these beaches located approximately 10 statute miles away.

Findings:

The proposed activities are consistent with the enumerated policy for the following reasons:

a. Based on the known submarine geology, earthquake recurrence intervals, and best available safety technology, the pipeline will be designed in accordance with the latest edition of OCS Order No. 9. Complete details on site conditions, design criteria, pipeline analyses, and installation will be provided as part of the requirements for OCS Order No. 9 (Refer to Section 2.5).

b. The proposed subsea gas pipeline construction, installation and production activities will generate air emissions containing VOC, SOx, CO, NOx, and particulates. These emissions, which will be of a temporary duration, are generated by mobile sources such as crew boats, private vehicles, etc. and facility construction activities associated with the fabrication and pull barges (Refer to Section 2.12.1 for total emission figures and Appendices 3 and 4 for emission calculations).

The only operational production emissions will be fugitive emissions from the gas compressor on Platform Eva and at 0.98 lbs./day, which is considered negligible (refer to fugitive emission calculations in Appendix 4). A discussion of the South Coast Air Quality Management District's regulations, which are applicable to the production phase emissions, appears in Section 3.3.1.

The installation of the gas pipeline will be done in the most efficient manner possible to minimize energy consumption and vehicle miles travelled. It should be noted that this project will be of short duration (approximately two weeks).

The installation and subsequent operation of the pipeline will not have a significant impact on any recreation areas as such areas are not located near the project location.

4. POLICY: Locating and Planning New Development

30244. Where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required.

Assessment:

The pipeline would be located in shallow coastal waters on a gently sloping ocean floor which was exposed, during the last ice age, for over 15,000 years. During the past 5,000 years this exposed surface was flooded by rising sea levels and subject to the deposition of fine grained sediments. To date, no significant cultural resources have been discovered on this surface or within the recently deposed sediments that make up the San Pedro shelf.

Finding:

The proposed activities are consistent with the enumerated policy for the following reasons:

a. The results of the cultural resource investigation by Scientific Resource Surveys Inc. (Ref. 3) indicated no observable and/or detectable prehistoric archaelogical resources within the platform project area. In regards to historic resources, two anomalies were observed, but these were thought to be insignificant. These were located at the edge of the 2,000 foot (610 m) radius of impact. The location of these anomalies will be avoided during construction activities.

b. Woodward-Clyde Consultants (Ref. 4 and Appendix 2) have conducted for Chevron a cultural resource survey along the proposed gas pipeline route from proposed Platform Edith to Union's Platform Eva. This survey was conducted pursuant to the "Minimum Cultural Survey Requirements, OCS Pipeline Right of Way" promulgated by the BLM Pacific OCS office.

5. POLICY: Industrial Development and Energy Facilities Coastal Act Policies

30260. Coastal-dependent industrial facilities shall be encouraged to locate or expand within existing sites and shall be permitted reasonable long-term growth where consistent with this division. However, where new or expanded coastal-dependent industrial facilities cannot feasibly be accomodated consistent with other policies of this division, they may nonetheless be permitted in accordance with this section and Section 30261 and 30262 if (1) alternative locations are infeasible or more environmentally damaging: (2) to do otherwise would adversely affect the public welfare; and (3) adverse environmental effects are mitigated to the maximum extent feasible.

Assessment:

The proposed pipeline will be located in the most suitable site in terms of least impact on the environment and most advantageous for natural gas transport. It is proposed to lay a 6-5/8-inch (16.5 cm) gas line to Union's Platform Eva. Gas flowing to Platform Eva will then commingle with Eva gas and utilize Union's existing 8-inch (20.3 cm) line to shore. Once onshore, the gas will enter Aminoil's existing 12-5/8 inch (32.0) gas gathering line for ultimate delivery to our

Huntington Beach Field. Potential environmental impacts (i.e. construction to shore and beach construction) will be eliminated by pipeline consolidation. At Platform Edith the pipeline will be equipped with high-low-pressure shut-in sensors and with an automatic shut-in valve located at the platform. The pressure sensors will be connected so as to actuate the automatic shut-in valves on the pipeline. The pressure settings will be determined by pipeline operating characteristics, and will be set as close as practical to the normal operating pressure of the pipeline. The automatic shut-in valves also will be actuated by the integrated safety-control system of Platform Edith.

The pipeline will be delivering gas to Union's Platform Eva and will be equipped with an automatic shut-in valve. This automatic shut-in valve shall be controllable by the integrated safety-control system of Platform Eva.

All gas compressors shall be equipped with high-low-pressure shut-in devices.

All pressure sensors, pressure shut-in devices, and automatic shut-in valves will be tested monthly and shall be witnessed and approved by the appropriate agency. Records will be maintained on the production facility showing the present status and past history of each device, including dates and

details of inspection, testing and repairing, adjustment, and reinstallation or replacement.

Finding:

The proposed activities are consistent with the enumerated policies for the following reasons:

a. All of the geological data available from former studies and the geophysical surveys on the Beta prospect have been extensively evaluated by Chevron in order to determine the safest, most effective pipeline route and method of installation. Design, fabrication, and installation will all be performed in accordance with the latest edition of OCS Order 9.

b. The subsea gas pipeline is proposed to run from Platform Edith to Union's Platform Eva. From Platform Eva the transportation of gas will be further consolidated with Aminoil's existing gas gathering pipeline onshore with ultimate delivery to the Chevron's Huntington Beach Field. The utilization of Union's and Aminoil's existing pipelines consolidates the proposed project with existing facilities to the maximum extent possible. This consolidation will occur rather than the building of a separate pipeline from Platform Edith to shore.

2.15 Compliance with OCS Orders and Regulations

The natural gas line will be designed in compliance with Minerals Management Service (MMS), Conservation Division, Branch of Oil and Gas Operations, Pacific Region, OCS Order No. 9, dated June 1, 1975, ANSI B31. 8-197S., "Gas Transmission and Distribution Piping Systems," and Code of Federal Regulation Title 49 Part 192, "Transportation of Natural and other Gas by Pipeline: Minimum Federal Safety Standards."

The design of the pipeline will include approved leak detection devices, high-low pressure monitoring and shut-in equipment in accordance with the provisions of OCS Order No. 9.

2.16 Interrelated Pending Action

Directly related pending action is the construction and installation of Platform Edith on OCS P 0296 which will precede or will be ongoing during the installation of the proposed gas pipeline between Platform Edith and Union's existing Platform Eva.

Presently, two other platforms exist in the Beta Field. Shell's Platforms Elly and Ellen on OCS Lease P-300 were installed in early 1980. Shell may also construct a third platform, Eureka, on OCS Lease P-0301. This development, if warranted, would occur sometime in the mid-1980s (Ref. 5, p. 23).

Thirty tracts in the area of the proposed project are expected to be included in Lease Sale 68 scheduled for June 1982. Approximately 221 tracts stretching from Point Conception to Laguna Beach are expected to be made available in Lease Sale 68.

No other leasing actions or planned developments are pending for the near future.

2.17 Monitoring Systems in Surrounding Areas

The monitoring systems to be placed on Platform Edith are described in Section 2.11 in the Environmental Report for Platform Edith (Ref. 1). The air quality monitoring device is discussed in Section 2.22 of the Environmental Report.

2.18 Other Planned Environmental Protection Measures

In addition to the specific protective and mitigating measures described in this supplement, the Environmental Report, and Development and Production Plan for Platform Edith, the preeminent mitigating measure will be the utilization of safe and proper operating procedures in all phases of the development and production program.

3.0 DESCRIPTION OF AFFECTED ENVIRONMENT

3.1 Geology

The area of Chevron's planned gas pipeline, geographically, lies in the San Pedro Channel, approximately 10 miles (16.1 Km) south and southwest of the City of Long Beach. This 6-5/8 inch (16.8cm) O.D. gas pipeline will run from Platform Edith, on Federal Lease OCS P-0296 to Union Oil Company's Platform Eva in California State Lease PRC 3033 (Figure 2-2). The San Pedro Channel is defined as an offshore basin (Ref. 1) that lies between Santa Catalina Island and the Southern California coastline. As part of the California Continental Borderland, within the Penninsula Range Province, it is typified by elongated northwest and west-trending seafloor ridges, shelves and basins. Along the northeast side of this basin, between the Palos Verdes Hills and Newport Beach area, there is a shelf area of shallower water, which is considered to be a southerly seaward extension of the onshore Los Angeles Basin. Chevron's pipeline project will take place on this shelf in water depths that range from 55 feet (16.8 m) to 161 feet (49.0 m).

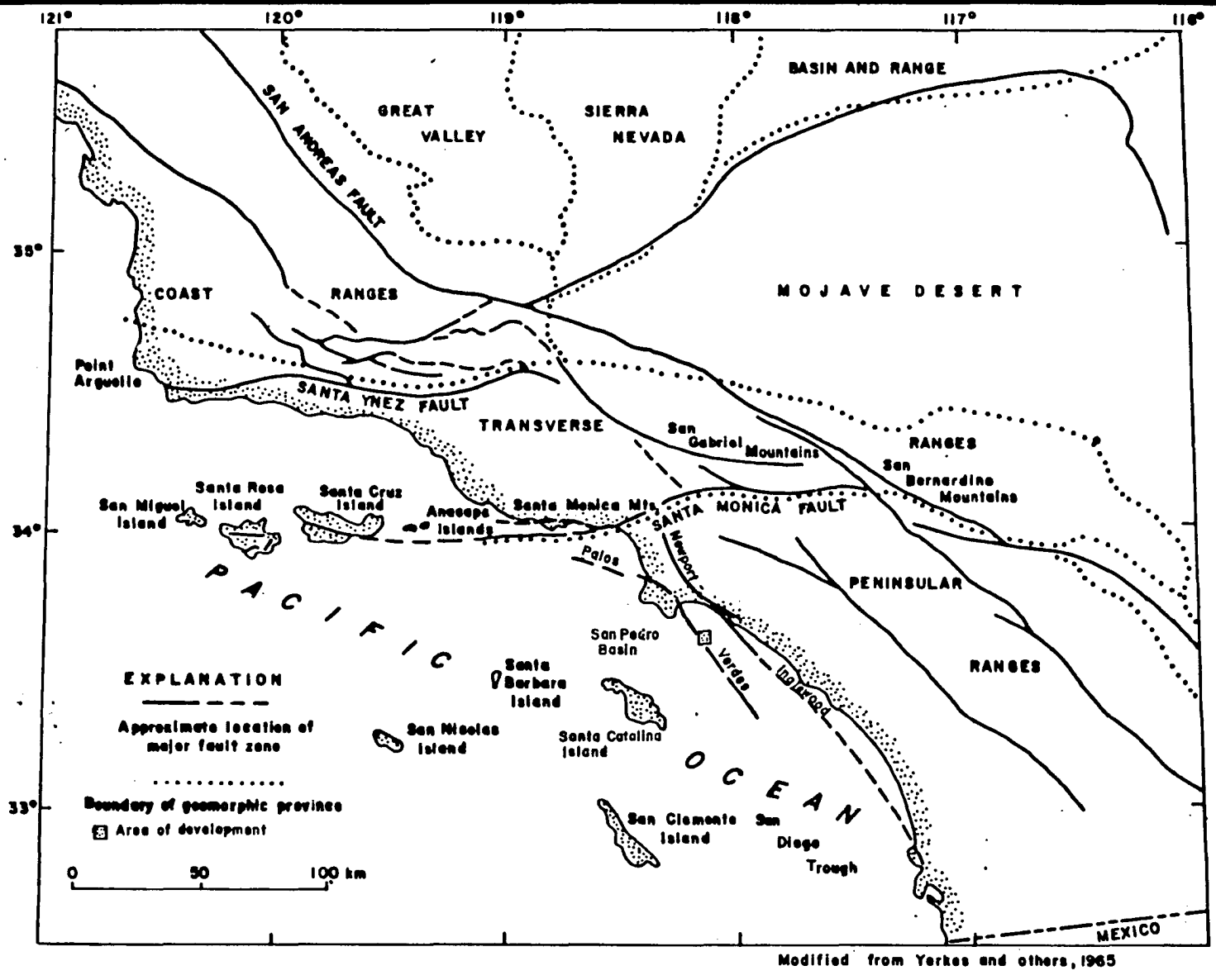
3.1.1 History of Lease P 0296 Drilling

Following the December 1975 acquisition of Lease OCS-P 0296, Chevron et al drilled and abandoned thirteen evaluation wells on this lease. A detailed listing of this drilling is contained in The Development & Production Plan for Platform

Edith (Ref. 2). The Beta field exploratory discovery wells were drilled by Chevron (OCS-P 0296 #1) and Shell (OCS-P 0301 #1) during the period July to October 1976. Thereafter Chevron drilled wells #2 through #13 during the period between November 1976 through March 1978. In the Chevron et al's OCS-P 0296 #1 well, hydrocarbons were encountered in Miocene sands between the drilled depths of 2904' (885m) and 3520' (1073m). Formation tests of these sands yielded 17.7 degrees oil at a maximum rate of 70 barrels/day. This well was subsequently drilled to a total depth of 10,895 feet (3321m) where it bottomed in basement rock consisting of schist breccia. As a result of all the drilling on this lease, three more or less separate accumulations of 17 degrees API oil have been delineated. These are described in greater detail in the Development & Production Plan (Ref. 2).

3.1.2 Regional Geology

The 6-5/8" pipeline (16.8 cm) O.D., from Platform Edith to Platform Eva is located in the Southern California Offshore area (Figure 3-1) which is a submerged portion of the Peninsular Ranges. As shown on Figure 3-1, the Peninsular Range province is comprised of numerous major northwest trending faults, with associated ridges and basins. These terminate at their northerly end against the east-west trending Transverse Range. The submerged portion of the



Modified from Yerkes and others, 1965

Index Map of Southern California Showing Development Area, Fault Zones and Boundaries of Major Geomorphic Provinces.

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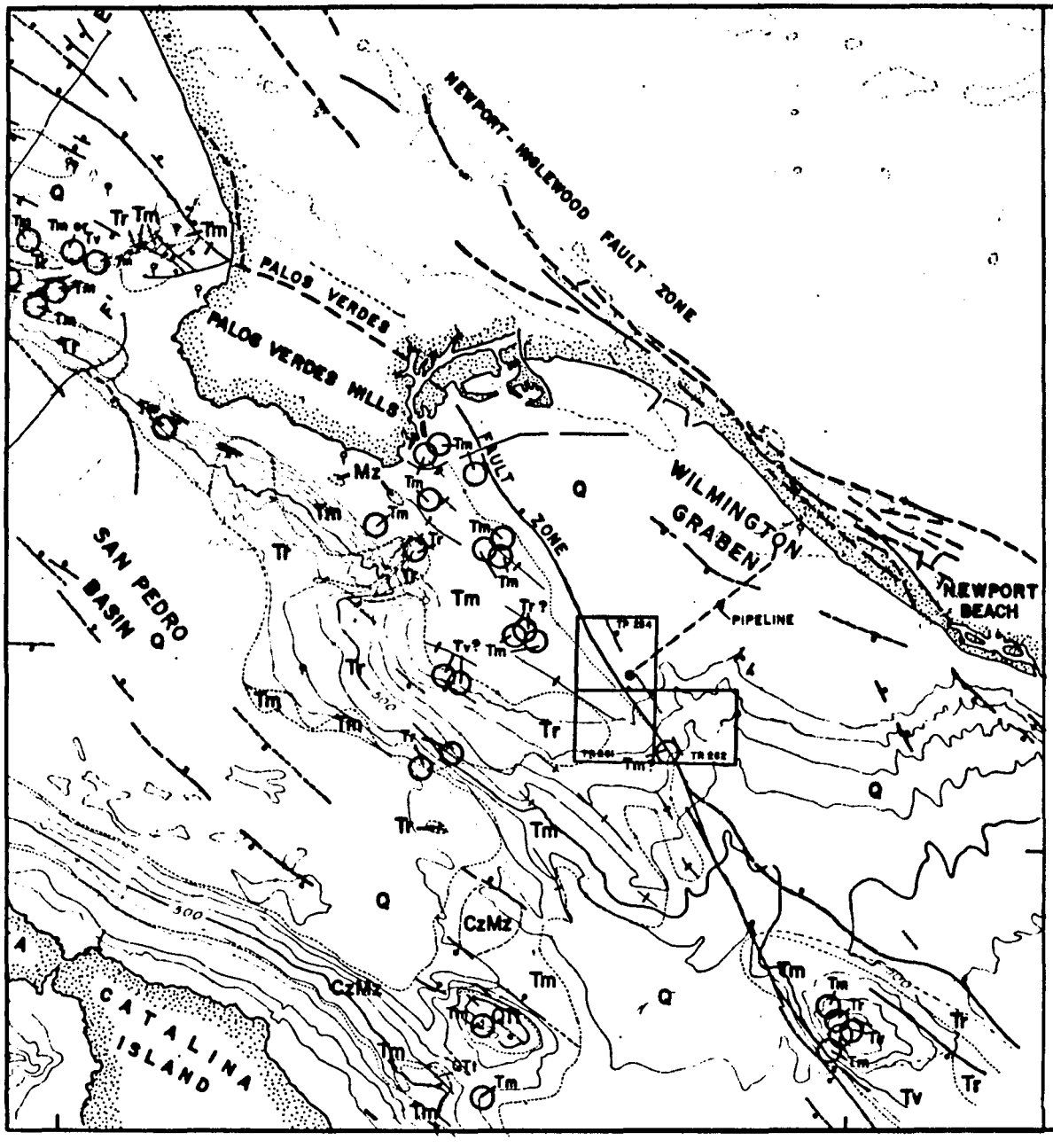
FIGURE 3-1

A-H-2338

province, termed the "Continental Borderland", is in turn characterized by a complex of basins, banks, shelves, islands and canyons. The Beta field and gas pipeline are located in one of these basins, the San Pedro Basin (Figures 3-1 and 3-2). This basin also consists of certain major structural features. These features are the northwest trending Palos Verdes and the Newport-Englewood fault zones, which are separated by the Wilmington Graben (Figure 3-2). These fault zones consist of throughgoing strike-slip faults with components of vertical offset. The numerous associated secondary faults and folds are typical of the structural style of the region. Lease OCS-P 0296 at the southwest end of the pipeline lies astride one of these major structural trends, the Palos Verdes anticlinorium and fault zone. At the northeast end of the pipeline, Platform Eva and the Huntington Beach offshore oilfield lie astride major anticlines associated with the Newport-Inglewood fault zone.

The history of tectonic activity along these trends as well as within the San Pablo Channel area has been discussed in reports by Junger et al (Ref. 6), Dames and Moore (Ref. 7) and Yerkes et al (Ref. 8).

Within the Wilmington Graben and along the pipeline route a relatively thick sequence of nearly flat lying sediments has been deposited on basement rocks comprised of schist. All



LEGEND

- PLATFORM EDITH SITE
- ----------?--? CONTACT BETWEEN ROCK UNITS ? DENOTES POSITION UNKNOWN
- SOLID WHERE CUTTING HOLOCENE BEDS OR TO SEAFLOOR IN OLDER ROCKS; LONG DASHED WHERE CUTTING PLEISTOCENE BEDS; SHORT DASHED WHERE CUTTING PLIOCENE BEDS; DOTTED WHERE CUTTING MIOCENE AND OLDER ROCKS. BAR AND BALL ON DOWNTHROWN SIDE.
- ANTICLINE
- OUTLINE OF OIL OR GAS FIELD
- OIL OR GAS SEEP
- Tm BEDROCK SAMPLE

- Q = QUATERNARY SEDIMENTS
- QTf = TERRACE DEPOSITS. (QUATERNARY / TERTIARY)
- Tr = REPETTO Fm (PLIOCENE)
- Tm = MONTEREY SHALE (MIOCENE)
- TV = VOLCANICS (MIOCENE)
- CzMz = ACOUSTIC BASEMENT ROCKS (CENOZOIC / MESOZONE UNDIFF.)
- Mz = BASEMENT ROCKS
- PIPELINE ROUTE

MODIFIED FROM JUNGER & WAGNER, 1977

Chevron U.S.A. Inc.
Western Region, Production Department

SURFACE GEOLOGIC MAP
BETA UNIT
SAN PEDRO BAY DEVELOPMENT

SCALE 1:250,000 FIGURE 3-2

8-H-2340

of the significant folding and faulting of these sediments has been restricted to the area immediately adjacent to the major bounding fault systems (i.e. Palos Verdes and Newport-Inglewood). At the Huntington Beach offshore end of the line, Platform Eva is located near the axis of a large east-west trending asymmetrical fold. There is a deeply buried thrust fault associated with the steeply dipping south flank of this fold. However, this fault appears to die out before reaching those sediments above 5000 feet in depth. The folding and faulting conditions in the immediate vicinity of Platform Edith has been described in Section 2.3, Area Geology, of Reference 1.

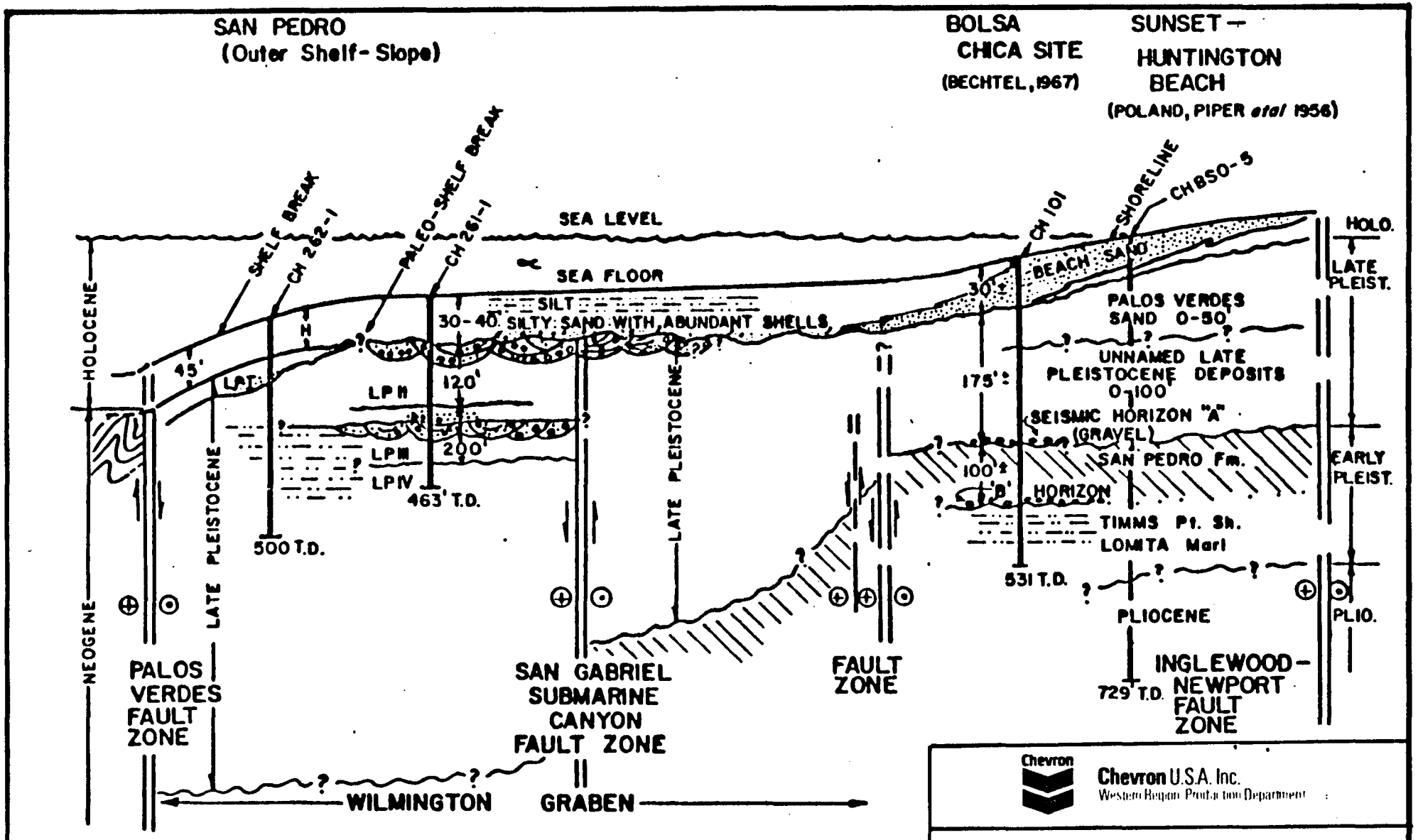
The sedimentary section, deposited in the Wilmington Graben, consists of interbedded sand and shales, varying in thickness from over 12,500 feet at Huntington Beach to 9500 feet at the Beta field. The older sedimentary section, Miocene and Pliocene in age, is thickest in the Huntington Beach area and thins southwesterly toward the Beta field. The shallow Pleistocene age sediments thicken southwesterly. They reach their maximum thickness in an elongated northwest-southeast trending basin which lies parallel to the Palos Verdes fault system and immedately northeast of it. Further southwest over the Beta field, these young sediments again thin very rapidly. Capping this sequence of older sediments is a relatively thin section of Holocene age sediments composed of silts, fine sands and clayey sands.

fine grained sands and silts. An idealized diagram showing this Quaternary stratigraphy is shown in figure 3-3.

A detailed discussion of the stratigraphic section underlying the pipeline route is contained in section 2.2 of Chevron's Development and Production Plan (Ref. 2). Only the near surface sediments are discussed in any detail in this document (Section 3.1.3.4) because they have a more significant bearing on the construction and future operation of the pipeline.

3.1.3 Geotechnical Considerations

The route for the gas pipeline was initially selected on the basis of the shortest route between Platform Edith and Huntington Beach where the gas will be used. A geological hazards survey and an archaeological and cultural survey were then made along the proposed route during the summer of 1981 and winter of 1982 by Woodward-Clyde Consultants (Ref. 4). During June 1980, McClelland Engineers under contract to Chevron made a geotechnical and geophysical site investigation for Platform Edith and a pipeline route survey to Shell's Platform Elly (Ref. 3). Both of these investigations and reports found conditions at the platform site and along the pipeline routes to be favorable for the proposed construction.



SOURCE: JUNGER AND WAGNER, 1977

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DIAGRAM OF QUATERNARY STATIGRAPY

SAN PEDRO BAY SHELF AREA

NO SCALE

FIGURE 3-3

A-H-2339

3.1.3.1 Bathymetry

Ocean floor water depths and the sea floor topography along the pipeline route are shown on Plates II and IV of the Woodward-Clyde Consultants report (Ref. 4). These plates show the water depth to vary from 55 feet (16.8m) at Platform Eva to 161 feet (49.0m) at Platform Edith. Along the pipeline route, the sea floor slopes gently toward the southwest from the shore line at Huntington Beach to Platform Edith. There appears to be no significant topographic irregularities along the entire route. The route does pass to the north of the headward end of a submarine canyon that lies adjacent to the eastern boundary of Chevron's Lease P 0296. This canyon, however, ends before it reaches the pipeline route. In this particular area, Woodward-Clyde's Plate IV, geologic cross section, (Ref. 4), shows a broad gentle sag in the ocean floor. The slope along the route has an average ratio of 1 ft. of vertical drop for each 320 ft. of horizontal distance (i.e. .003% gradient or .2 degrees).

3.1.3.2 Ocean Bottom Conditions

Ocean floor samples, taken along the pipeline route, during Woodward-Clyde Consultants' survey, showed that a nearly uniform fine silty sand condition exists between Platforms Edith and Eva. (Ref. 4). McClelland Engineers reported (Ref. 3) similar ocean bottom conditions in the immediate vicinity of Platform Edith. These findings are also in close agreement with those published by Allan Hancock Foundation (Ref. 9, pg. 130) following their 1961 oceanographic investigation.

3.1.3.3 Shallow Gas and Hydrocarbon Seeps

Only minor occurrences of shallow gas were reported by Woodward-Clyde (Ref. 4) and McClelland Engineers (Ref. 3). These observations were based on their reviews of all of the high resolution geophysical surveys that have been run.

3.1.3.4 Shallow Overburden Sediments

Based on the shallow high resolution geophysical surveys run by Woodward-Clyde. There is a shallow overburden section along the pipeline route which

ranges in thickness from 10 ft. (3.0 m) to 20 ft. (6.1 m). To the northeast of Platform Edith where the line passes over a major buried channel, this section thickens to 90 ft. (27.4 m). Woodward-Clyde has mapped this interval and presented its distribution and thickness on their Plate III (Ref. 4). The composition of these sediments varies from a gray fine sand to silty fine sand. This is based on the bottom samples recovered along the pipeline route by Woodward-Clyde (Ref. 4) and cored by McClelland Engineers (Ref. 3) at the platform site. The age of these sediments is probably Holocene. This opinion is based on their stratigraphic relationship to the underlying sediments.

The deeper sediments along the pipeline route show a similar uniform bedding along most of the route, except in an area of older stream channel. In these channel areas unconformable relationships exist, (Figure 3-3). These ancient stream channels appear to have to be refilled with fine to coarse grained sands of Holocene and Pleistocene age.

3.1.3.5 Shallow Structural Geology

Woodward-Clyde Consultants report (Ref. 5) should be referred to for a detailed description of the shallow geologic structure along the route of the pipeline. Generally, both the Holocene and Pleistocene sediments are nearly flat lying. Within the Pleistocene section there are ancient stream channels, which have been refilled with younger sediments. Also, because of the seaward thickening of the Pleistocene section, the southwesterly bedding dip increases toward the base of this section. No major faults cut these shallow sediments anywhere along the pipeline route.

3.1.3.6 Earthquake Activity

The San Pedro Bay area is in a structurally complex and seismotectonically active region. Earthquake activity that might impact the platform and pipeline was investigated by Dames & Moore (Ref. 7). Their report identifies the significant active faults (Table 3-1), assigns upper level earthquake magnitudes to each fault and assesses their basic input on a probabilistic and deterministic basis at the platform site. In a

TABLE 3-1

SIGNIFICANT ACTIVE FAULTS
SOUTHERN CALIFORNIA

Fault	Length (km)	Length (mi)	Fault Type	Distance To Site (km)	Distance To Site (mi)	Estimated Upper Level Magnitude
Palos Verdes	65	40	Rt. Lat./Rev. Obl.	1	1	6
Newport-Inglewood	80	50	Rt. Lat.	15	9	6¼
San Andreas	1,100	700	Rt. Lat.	95	59	8+
San Jacinto	240	150	Rt. Lat	92	57	7½
Whittier-Elsinore	225	140	Rt. Lat.	44	27	7¼
Sierra Madre	130	80	Rev. Obl.	64	40	7
Santa Monica	80	50	Rev. Obl.	58	36	7
San Clemente	130	82	Rt. Lat.?	68	42	7¼
Norwalk	27	17	?	34	21	6
E. Catalina Basin	32	20	?	41	45	6

After: Dames & Moore Job No. 00216-197-02 (1978) (Ref. 7)

follow-up report dated 1980, Dames and Moore (Ref. 10) updated and reevaluated their 1978 response spectrum (Ref. 7). They concluded that the proposed platform should be designed to withstand ground motions expected from a Magnitude 6 earthquake on the Palos Verdes fault, about 1400 feet (427m) from the platform, or a Magnitude 6¼ event on the Newport-Inglewood fault at a 10 mile (16.1 km) epicenter distance.

Southern California has had a long history of earthquake activity. The significant active faults are listed on Table 3-1 and their approximate locations are shown on Figure 3-2. During the past 50 years, for which instrumented recordings of earthquake magnitudes are available, the largest nearby event was a Magnitude 6.3 earthquake. This event occurred in 1933, possibly along the Newport-Inglewood fault. The epicentral location lies about 10 miles (16.1 km) north of the proposed platform site. Larger earthquakes have occurred historically at greater distances, but the ground shaking that they imposed on the proposed site and along the pipeline route will be less than that expected from an upper level earthquake on the Palos Verdes or Newport-Inglewood faults.

There is little likelihood that the gas pipeline will rupture as a result of ground shaking from a nearby earthquake. This conclusion is based on an analysis of the various possible failure modes that might occur within the near surface sediments during earthquake ground shaking.

1. Ground Rupture

   A study of the published literature and an analysis of the test borings and high resolution surveys indicates that there are no active fault traces beneath the proposed pipeline route. Therefore, ground rupturing from fault movement is not anticipated during any nearby earthquakes.

2. Ground Failure

   (a) Liquefaction

   The subsurface soils along the proposed pipeline route can safely support the proposed pipeline. They appear to be generally uniform from platform to platform. The studies which evaluated soil properties and liquefaction potential indicate that the potential for liquefaction of these sediments is extremely low (Ref. 3).

(b) Slumping

The ocean bottom along the pipeline is nearly flat with a very gentle bottom slope, and there are no indications of any slumping along the route. Potential slumping is unlikely.

3.1.3.7 Tsunami Hazards

Based on published records and the location of the pipeline in open water, tsunami damage will not be a factor to be considered. Tsunamis, or seismic waves, are large oceanic waves that are generated by earthquakes, submarine volcanic eruptions or large submarine landslides. The waves are formed in groups having a great wave length and a long period. In deep water, wave heights (crest to trough) may be a few meters or less, wave lengths may be a hundred miles or more and velocities have been reported at greater than 400 knots (460 mph). However, as a tsunami enters shallower waters, wave velocity diminishes and height increases. Waves can crest at heights of more than 100 feet (30m) and strike with devastating force. Tsunami waves do not impact vessels or structures in open water because of their low amplitude and great breadth.

The largest tsunami ever reported in California followed the 1812 earthquake in the Santa Barbara Channel. The wave may have reached land elevations of 50 feet (15.2m) at Gaviota and 30-35 feet (9.1-10.7m) at Santa Barbara. The most recent tsunami to impact the California coast line occurred following the 1964 Alaskan earthquake. Only minor damage was sustained by small craft in the coastal harbors.

3.1.3.8 Subsidence

There is a potential for surface subsidence due to reservoir fluid withdrawal from the Beta field. However, it is expected to be negligible because a pressure maintenance program using water injection will begin a short time after the start of production. This injection will be continued throughout the life of the field. By maintaining this injection, little reduction in reservoir pore pressure is anticipated; thus, no compensating compaction is expected. Along the pipeline route, there are no other known areas where subsidence could occur.

3.1.3.9 Hydrology

From the Beta Field to the Huntington Beach Field, along the pipeline route, there are no known fresh water bearing formations.

3.1.3.10 Other Mineral Deposits

There appear to be no other known mineral deposits of either commercial or noncommercial value along the pipeline route.

3.1.4 Cultural Resources

The area around proposed Platform Edith and along the route of the proposed pipeline from Platform Edith to Platform Eva was evaluated for cultural and archaeological resources. Woodward-Clyde Consultants (Ref. 4) made this evaluation and their report with conclusions has been included as Appendix 2. They concluded from their review of the geophysical records and spot underwater dives that there are no identifiable prehistoric cultural resources along the route of the pipeline. The only significant cultural development noted crossing the pipeline route is the Shell Oil Company ocean floor pipeline which runs from their Platform Elly to Long Beach.

3.2 Meteorology

Please refer to Section 3.2, Environmental Report for Platform Edith (Ref. 1) for an extensive description of the Southern California coastal and offshore meteorological conditions.

3.3 Air Quality

The South Coast Air Basin (SCAB) has areas with air quality ranging from good to poor. Air quality generally improves as one approaches the coast. Improvement in air quality is determined by comparing the number of days inland air quality data exceeded state standards vs. the frequency (if any) the state standards are exceeded in the coastal areas. Appendix 5, of Platform Edith's ER, is the 1979 Summary of Air Quality in the South Coast Air Basin published and written by the South Coast Air Quality Management District. Appendix 5, of the Platform Edith's ER, should be referred to for in-depth discussion of the present air quality in SCAB.

The coastal air quality is most applicable to the proposed offshore subsea gas pipeline project. The Costa Mesa monitor is the only station that can be considered representative of the coastal air quality.

Costa Mesa air quality is generally good. The state ozone standard was exceeded at Costa Mesa 26 days in 1979. This compares favorably with inland areas within the SCAB. Inland areas typically exceeded the state ozone standard over 100 days in 1979 (refer to Table 4, Appendix 5 of Ref. 1).

The station at Costa Mesa also monitors SO_2, NOx, TSP, sulfate and lead. The number of days Costa Mesa exceeded the state standard in 1979 is shown in Table 3-2.

High concentrations and excesses of the state air quality standards can generally be related to moderate Santa Anas with high ozone concentrations originating in the inland areas generating offshore air flow, or stagnant meteorological conditions.

3.3.1 Rules and Regulations

The proposed subsea pipeline construction air emissions will come under the jurisdiction of the Department of the Interior (DOI) (refer to Section 3.3.5) and the South Coast Air Quality Management District (hereinafter referred to as the District).

The District's present New Source Review Rule (Rule 13) was adopted on October 5, 1979 and amended March 7, 1980. The regulation sets forth requirements for the preconstruction

TABLE 3-2

NUMBER OF DAYS COSTA MESA AIR QUALITY
EXCEEDED STATE AIR QUALITY STANDARD IN 1979

Air Contaminant	State Air Quality Standard	Number of Days Exceeding Standard in 1979
Carbon Monoxide, ppm	10.0	5
Ozone, ppm	0.10	26
Sulphur Dioxide, ppm	.05	0
Nitrogen Dioxide, ppm	0.25	4
TSP, mg/m3	100	26

review of new stationary sources and modifications to existing stationary sources within the District's jurisdiction. This rule was developed to insure that new construction or modification and subsequent operation of stationary sources within the District does not interfere with the progress toward attainment of the National Ambient Air Quality Standards. Rule 13 supersedes Rules 213, 213.1, 213.2, 213.3, 203.1 and 203.2 of the former rules and regulations pertaining to New Source Review.

The provisions of Rule 13 must be met by any new stationary source or modification to an existing stationary source that results in net emission increases of 150 pounds (68 kg) per day of the pollutants for which the District is non-attainment (NOx, TSP, VOC), except for CO. Rule 13 is applied to new or modified sources which exceed 750 pounds (340 kg) in net emission increases of carbon monoxide (CO).

The proposed subsea gas pipeline construction air emissions, though not directly affected by the District's Rule 13, will comply with and will abide with this rule as this project is temporary, and also involves mobile sources (Refer to Section 4.22.1). The only increase in emissions, due to modification of a stationary source, will be 0.98 lbs/day VOC fugitive emissions from the compressor on Platform Eva. Emissions, generated during construction, for the barges and

supply tugboat have, however, been calculated and appear in Appendix 4.

3.3.2 Offshore

There is presently no offshore air quality monitoring or data for the San Pedro Channel. However, the offshore air quality is considered very good as there are few major emission sources in this area. Degradation in offshore air quality may occur during Santa Ana winds, but this degradation is temporary and minimal.

The effects of the proposed subsea gas pipeline project on nearby Huntington Beach will be a direct benefit to the area as the produced gas from Platform Edith will supplement sales gas presently being used at Chevron's Huntington Beach facilities. This additional sales gas could then be made available to other companies which are presently using fuel oil (a greater pollutant source); an example of which would be local power generating utilities.

3.3.3 Federal Standards and Regulations

The Outer Continental Shelf Lands Act Amendments of 1978 give the Department of the Interior (DOI) sole responsibility for regulation of OCS air pollutant emissions (Section 5(a)(8)). Pursuant to this mandate, DOI published

the final rule providing for compliance with national ambient air quality standards to the extent the OCS activities affect the air quality of any State on June 2, 1980 (30 CFR Part 250). The rule applies to new stationary sources, temporary stationary sources and, to some extent, existing stationary sources in the Outer Continental Shelf (OCS).

The following explanation of the DOI rule pertaining to the OCS is extracted, in part, from the revised Air Quality Impact Assessment for OCS Lease Sale No. 53 prepared by Environmental Resources Group for the Bureau of Land Management.

The regulation established a three-step review process for air pollutant emissions arising from OCS oil and gas development and production activities. The first step is a determination of whether the projected emissions of a facility exceed the applicable regulatory threshold, termed "emission exemption level." Facilities whose emissions are below the levels are exempt from further review. The second step of the regulatory review requires air quality modeling to determine whether a proposed facility would have a "significant" onshore impact (i.e., produce maximum onshore pollutant concentrations in excess of DOI's significance levels). Facilities which do not produce significant onshore impacts are exempt from further review. Finally,

facilities with significant onshore impacts must mitigate their impacts through emission controls and/or offsets depending upon whether they affect attainment or nonattainment areas, and the magnitude of the projected impact.

For a discussion of how the proposed subsea gas pipeline project is affected by the DOI final rule, refer to Section 4.2.2.2 of this document.

3.4 Oceanography

A general discussion concerning the oceanography of the San Pedro Channel can be found in Section 3.4, Page 114, Environmental Report for Platform Edith. (Ref. 1)

3.4.1 Sea Temperature and Salinity

The variation and description of sea temperature off the San Pedro Channel is discussed in Section 3.4.1, Page 115, Environmental Report for Edith. (Ref. 1)

3.4.2 Currents

The flow within the California current is summarized as being "extremely irregular." Between Santa Catalina Island and the coast (state waters), the current can be moving in

any direction at any time (Ref. 1, Page 116). For an overall thorough description of the currents in the San Pedro Channel, please see Pages 115 - 117, Section 3.4.2, Environmental Report-Platform Edith (Ref. 1).

3.4.3 Tides

Southern California coast tides are discussed in corresponding Section 3.4.3, Page 117, of the Environmental Report for Platform Edith (Ref. 1).

3.4.4 Sea State

This section in the Environmental Report for Platform Edith describes deep water and sea swell conditions in the Southern San Pedro Channel as observed by ships passing through the area. For a detailed discussion, please refer to Pages 117 -119 in the Environmental Report for Platform Edith (Ref. 1).

3.4.5 Existing Water Quality

The existing water quality is described in corresponding Section 3.4.5 of the Environmental Report for Platform Edith, Pages 119-121 (Ref. 1).

3.5 Other Uses

3.5.1 Fishing

Stephen (Ref. 11) conducted trawl surveys throughout San Pedro Bay between 1971 and 1973. Several of these trawls were done off Huntington Beach. A complete list of the species taken in those surveys is shown in Table 5, Appendix 6, Ref. 1. From Stephen's data the most characteristic species of the shallow water of San Pedro Bay were the speckled sand dab (Citharichthys stigmaeus), the California tonguefish (Symphurus atricauda), the hornyhead turbot (Pleuronichthys verticalis), the white surf perch (Cymatogaster aggregata), and the white croaker (Genyonemus lineatus) (Ref. 11).

The Southern California Coastal Water Research Project (Ref. 12) have also trawled extensively in San Pedro Bay. They found the dover sole (Microsomnus pacificus) to be the most abundant species. Other common fishes were the California tonguefish (Symphurus atricauda), the English sole (Parophys vetulis), and the speckled sand dab.

Environmental Quality Analysts and Marine Biological Consultants (Ref. 13) sampled the shallow water fish fauna offshore of the Huntington Beach Generating Station. The most abundant species in their samples were the queenfish

(Seriphus politus), the white croaker, the northern anchovy (Engraulis mordax), the shiner surf perch, and the speckled sand dab.

The proposed pipeline route lies primarily in Fish Block 739. The commercial catch for this block is given in Table 3-3. The kind of fish most frequently taken by commercial fishermen in this area is anchovy.

The sports catch for Block 739 was dominated by rockfish (Sebastes spp.), kelp bass (Paralabrax clathautus), Pacific bonito (Sardo chiliensis). barracuda (Sphyraema asgentea), and sand bass (Paralabrax nebuiler) (Table 3-4). The California chart guide reports fishing rate on Huntington Flats, the area of the proposed pipeline route (Table 3-5). The most heavily fished species in this localized area were sand bass and halibut (Paralichthys californicus).

3.5.2 Shipping

The proposed gas pipeline route from Platform Edith to Union's Platform Eva will be laid northeast passing through the northbound shipping lane. See Fig. 2-2.

Upon approval of the proposed pipeline route the U.S. Coast Guard will issue a "Notice to Mariners" regarding installation of the pipeline and temporary disturbance of ship traffic.

TABLE 3-3 COMMERCIAL CATCH FISH BLOCK 739 (1964-1975)

Year		Pounds Landed
1964		6,595,292
1965		2,667,124
1966		12,744,386
1967		5,224,562
1968		720,410
1969		13,760,795
1970		35,713,603
1971		10,657,642
1972		15,650,120
1973		35,682,996
1974		23,615,954
1975		18,248,044
	Total	181,580,928
	Mean	15,131,744
Five Most Abundant Taxa		
Anchovy		109,691,488
Jack mackerel		2,701,557
Rock crab		1,550,289
Pacific bonito		1,408,070
Pacific mackerel		579,533
Total		116,119,401

Source: Dames and Moore, 1978. (Ref. 14)

Table 3-4 SPORT CATCH FISH BLOCK 739 (1964-1975)

Year	Number of Individuals	Anglers	Angler Hours
1964	167,582	29,641	1,062,349
1965	131,789	25,791	1,067,838
1966	98,998	19,267	731,436
1967	65,207	12,027	527,687
1968	85,801	12,502	48,614
1969	106,397	15,503	67,306
1970	119,288	18,517	73,033
1971	81,777	11,046	46,129
1972	159,071	16,541	66,767
1973	186,357	26,336	99,667
1974	149,670	19,203	62,394
1975	87,765	8,642	30,743
TOTAL	1,439,702	215,016	3,883,963
MEAN		17,918	323,663

Five Most Abundant Taxa

Rockfish	501,315
Rock bass	323,426
Pacific bonito	184,777
California barracuda	137,390
Sandbass	97,713
TOTAL	1,244,621

Source: Dames and Moore, 1978 (Ref. 14)

Table 3-5 FISHING RATE ON HUNTINGTON FLATS
(In Reported Weeks Per Month)

Species	MONTH			
	JFM	AMJ	JAS	OND
Barracuda	- 1 -	- 1 -	- 1 -	- - -
Sand bass	- - 1	1 3 1	1 1 1	1 - -
Kelp bass	- - -	1 3 -	- - 2	1 - -
Bonito	- - -	- - -	- - 2	1 - -
Halibut	- - 1	1 4 1	1 1 2	1 - -
Mackeral	- - -	1 - 1	- - -	- - -
Rockfish	- - -	- 1 -	- - -	- - -
Sculpin	- - -	- 2 -	- - -	- - -

(Fishing also for sand drebs and white sea bass)
(Ref. 1, Appendix 6)

3.5.3 Military Uses

The area of the proposed pipeline route is not utilized for routine military uses. Upon the event of possible military usage, access is controlled during hazardous operations by radio broadcasts, patrol craft, and in the Local Notice to Mariners, published weekly by the 11th Coast Guard District, Long Beach. Once the pipeline has been installed, it will not be an obstacle to military operations.

3.5.4 Boating and Recreation

Recreation is an integral part of the Southern California economy and environment. The warm climate and variety of sporting opportunities combine to create a unique recreation situation. From the Long Beach area extending south to the Orange/San Diego County line there are over 42 miles (68 km) of shoreline. Numerous public beaches and coastal parks are located in this area. See Table 3-12 in the Environmental Report-Platform Edith (Ref. 1) for a comprehensive list of facilities. During the months of May-September, the coastal facilities are most heavily utilized. The number of visitors each year exceeds 28 million.

Recreational boating is a favorite and popular pastime in the San Pedro Channel and Santa Catalina Island area. See Table 3-13, Environmental Report-Platform Edith (Ref. 1) for

a listing of a number of berths in marinas under government jurisdiction in the Southern California coastal zone in 1978. Precise and current records are not available for the number of recreational boat visitors in the vicinity of the proposed pipeline location.

3.5.5 Kelp Harvesting or Other Commercial Uses

Macrocystis pyrifera or giant kelp appears along the coast between Point Fermin and Dana Point. These kelp beds are not excessively large and most have been harvested to some degree in the last 20 years.

These beds provide food and habitat for non-commercial, commercial and sport fish species, invertebrae species, and their larvae. The majority of the kelp beds in the vicinity are located south of Newport Beach, where the benthic substrate is suitable for holdfast attachment. Due to the distance (approximately 16 miles (25.8 km)) from the proposed activities to the kelp beds, no adverse impacts are to be expected (Ref. 5, p. 268). Also, due to the water depth of OCS Lease P 0296, and Union's Platform Eva these sites are not appropriate for immediate or future usage for mariculture.

3.5.6 Refuges, Preserves, Marine Sanctuaries

Along the proposed pipeline route there are no known biological areas of special significance. In the San Pedro Bay vicinity, there exists numerous reserves and refuges. These areas are a considerable distance from the proposed activities. A list designating the areas of special biological significance in the San Pedro area is in Table 3-14, Environmental Report-Platform Edith (Ref. 1),

3.6 Flora and Fauna

This section is a description of the plant and animal species and their communities that exist in the proposed gas pipeline immediate vicinity.

3.6.1 Pelagic Environment

The term planktonic refers to all the organisms that drift with the currents. The plankton includes the phytoplankton (i.e., the drifting plant matter such as diatoms and dinoflagellates) and the zooplankton (i.e., the slightly mobile animals such as small crustaceans, swimming molluscs, jellyfish, and free swimming larvae of fishes and bottom animals). Planktonic communities are characterized by patchiness or unevenness in distribution, composition, and abundance.

The State Water Quality Control Board (Ref. 15) collected phytoplankton samples with a Nansen reversing water bottle in the general area of the proposed pipeline. Phytoplankton were less abundant than at stations sampled closer to Los Angeles-Long Beach Harbor. The dominant genera in the Huntington Beach samples were Chaetoceros spp. and Nitzchia sp. Leptocylindris danicus exhibited high abundances occasionally. The dominant dinoflagellate was Pronocentrum micans, while an unidentified euglenid displayed occasionally high values.

There are no site-specific zooplankton data comparable to the State Water Quality Control Board data on phytoplankton. Most of the data for zooplankton off the California coast have come from the CalCOFI (California Cooperative Oceanic Fisheries Investigation) program initiated in 1949. Table 1 of Appendix 6, Platform Edith-Environmental Report, (Ref. 1) summarizes the distribution data on the major zooplankton taxa in the Southern California Bight.

In the CalCOFI data, 12 types of larval fishes comprised 90 to 93 percent of all the fish larvae collected. Table 2 Appendix 6, Environmental Report-Platform Edith (Ref. 1) summarizes the most probable depth range and temperature range for abundant species of fish eggs and larvae in the California current.

3.6.2 Benthic Environment

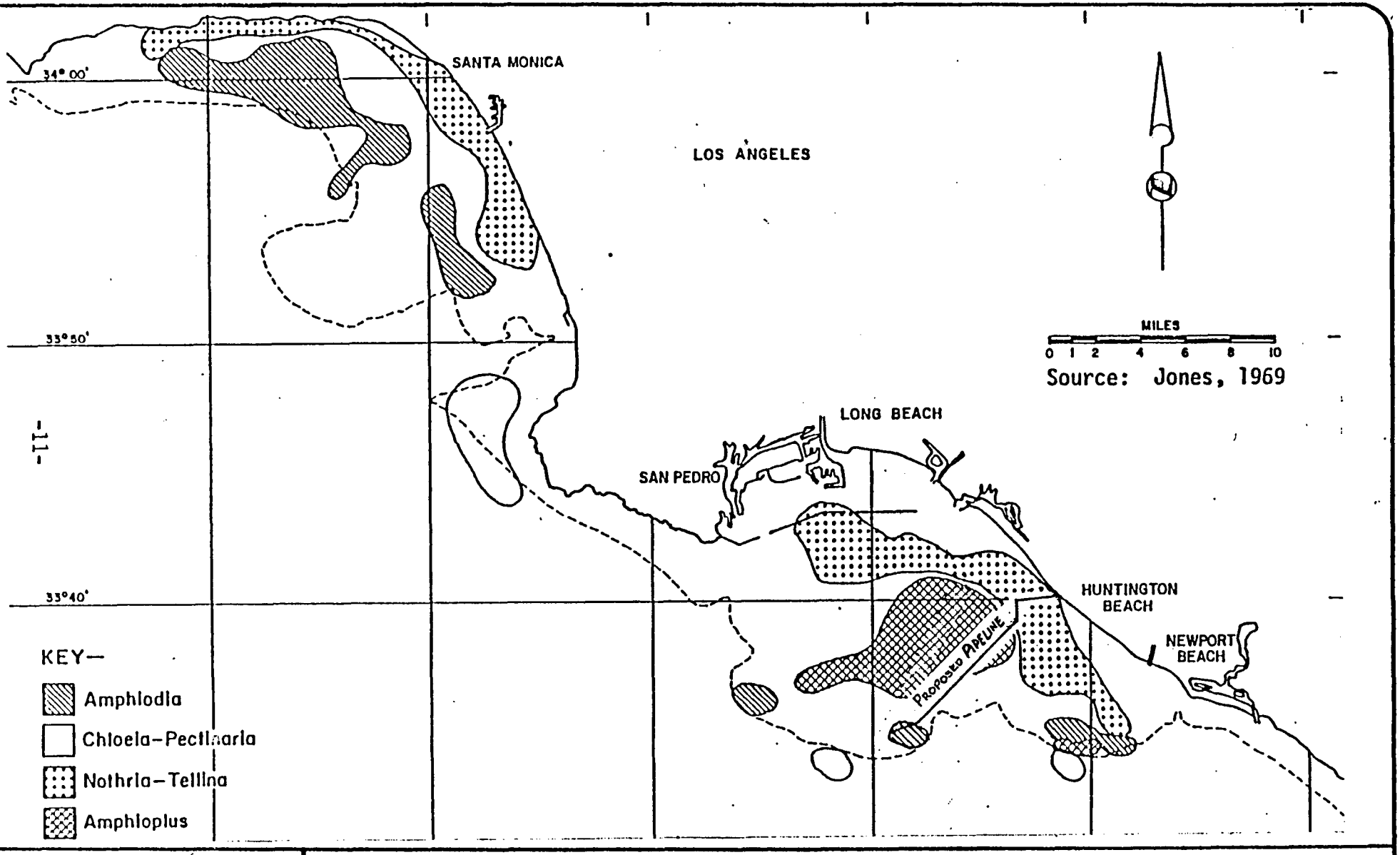
There is a considerable existing data base for benthic communities of the San Pedro Shelf. The Allan Hancock Foundation has been sampling benthic populations throughout the Southern California Bight since 1952 (for example, Ref. 16, Ref. 17, Ref. 18, Ref. 19, Ref. 20, Ref. 21, Ref. 22). This program included intensive sampling of benthic fauna on the San Pedro Shelf. These studies reported that benthic biomasses on the San Pedro Shelf are medium to low and the number of species runs high (Ref. 18). Scientists contacted at the Allan Hancock Foundation who are familiar with the biota of the San Pedro Shelf said they knew of no unique marine communities or rare organisms in the area (Richard Klink, personal communication).

Jones (Ref. 21) identified faunal assemblages along the coast of southern California. He named each assemblage for the numerically dominant species or co-dominant species. Faunal assemblages identified by Jones in the area of the proposed pipeline are shown in Appendix 6, Environmental Report-Platform Edith. In the vicinity of the pipeline route, Jones located a station that was the shallowest on the mainland shelf and could be characterized as a shallow-water subcommunity of the larger Amphiodia urtica community. The presence of species associated with the polychaete Onuphis nebulosa were indicative of this, consistent with Jones, 1969. In addition to the subdominant polychaete Onuphis, species characteristic of this subcommunity included the polychaetes Streblosoma crassibranchia,

Apoprionospio pygmaea, Asychis disparidentata, Melinna oculata, and Spiophanes bombyx, the gastropods Cylichna attonsa and Volvulella panamica, and the crustacean Pinnixa schmitti (Ref. 21). Intermediate depths are characterized by the Amphioplus association, the second most dominant association on the San Pedro Shelf. The inshore area contains the Nothria-Tellina association, the most common assemblage in shallower areas throughout southern California. (See Figure 3-4.) Nothria is a polychaete and Tellina is a clam.

Grab samples within the project area were also taken by the Allan Hancock Foundation for the State Water Quality Control Board (Ref. 9). A sample taken in 170 feet of water within about a mile of proposed Platform Edith was dominated by the ophiuroid, Amphiodia urtica, and the polychaete, Lumbrineris cruzensis. Another sample obtained about 1.5 miles down-coast from the proposed Platform Edith in 240 feet of water was dominated by polychaetes with Onuphis nebulosa, the most abundant species. Further inshore, samples in 168 feet of water contained large numbers of bivalves, Axinopsida serricata and Tellina carpenteri, and the cumacean, Eudorella sp. Grab samples from a depth of 114 feet were dominated by Amphiodia urtica and the polychaete, Prionospio malmgreni.

The proposed pipeline will be routed to Union's existing Platform Eva. The biological communities surrounding Platform Eva have been the subject of several studies (Ref. 23, Ref. 24, Ref. 25). A transect done in 60 feet of water between the two platforms showed that the sand bottom was



CCP CHAMBERS CONSULTANTS AND PLANNERS

Figure 3-4 DISTRIBUTION OF BENTHIC MACROFAUNAL ASSOCIATIONS

characterized by species typical of sand bottoms at that depth in southern California. Abundant epifaunal animals included the tube worm, Diopatra ornata; the gastropods, Polinces altus, Terebra pedroana, and Kelletia kelletia; and the sand star, Astropecten verrilli. Core samples taken within 100 meters of Platform Eva included a total of 106 species with numerical dominance by polychaetes (47 species). A list of polychaetes contained in the samples taken 100 meters to the east of Platform Eva is shown in Appendix 6, Environmental Report-Platform Edith (Ref. 1). Core samples taken to the east of Platform Emmy in 45 feet of water contained a total of 42 taxa. Like those obtained near Platform Eva, the core samples near Platform Emmy were dominated by polychaetes. A complete species list for these core samples is shown in Appendix 6, Environmental Report-Platform Edith (Ref. 1).

3.6.3 Migration Routes and Breeding Groups

a) Marine Mammals

1. Pinnipeds

A study of marine birds and mammals in the Southern California Bight was conducted by the University of California at Santa Cruz (Ref. 26, 27 and 28). Results from this study suggested that marine mammals and birds concentrate over areas of high relief such as island and mainland shelves rather than over the deep basins. (Ref. 26). Table 3-6 contains a list of marine mammals of the Southern California Bight.

TABLE 3-6

Marine Mammals of the Southern California Bight
(Point Conception-Mexican Border). (Ref. 28 and 29)

Common Name	Genus/Species	Estimated Population 1979*
Pinnipeds		
California sea lion	(Zalophus californianus)	40,000
Steller sea lion	(Eumetopias jubatus)	5-20
Northern fur seal	(Callorhinus ursinis)	1,200
Guadalupe fur seal	(Arctocephalus townsendi)	1-5
Northern elephant seal	(Mirounga angustirostris)	16,000
Harbor seal	(Phoca vitulina)	1,400
Fissipeds		
Sea otter	(Enhydra lutris)	1-5
Cetaceans		
Bryde's whale	(Balaenoptera endeni)	-
Minke whale	(Balaenoptera acutorostrata)	60
Blue whale**	(Balaenoptera musculus)	7
Sei whale**	(Balaenoptera borealis)	-
Finback whale**	(Balaenopter physalus)	23
Humpback whale**	(Megaptera novaengliae)	6
Gray whale**	(Eschrichtius robustus)	336
Common dolphin	(Delphinus delphis)	33,564
Pacific pilot whale	(Globicephala macrorhynoa)	4,333
Risso's porpoise	(Grampus griseus)	556
White-sided dolphin	(Lagenorhynchus obliquidens)	10,007
Northern right whale dolphin	(Lissodelphis borealis)	1,848
Killer whale	(Orcinus orca)	122
Harbor porpoise	(Phocean phocoena)	0
Dall porpoise	(Phocoenoides dalli)	647
False killer whale	(Pseudorca crassidens)	0
Long-beaked dolphin	(Stenella coeruleoalba)	0
Pacific bottlenose dolphin	(Tursiops gilli)	557
Sperm whale**	(Physeter catadon)	0
Pygmy sperm whale	(Kogia breviceps)	0
Baird's beaked whale	(Berardius bairdii)	-
Ginko-toothed whale	(Mesopolodon ginkgodens)	-
Cuvier's beaked whale	(Ziphius cavirostris)	0
Pacific right whale**	(Balaena glacialis)	0
Pacific spotted dolphin	(Stenella graffmani)	0
Rough-toothed dolphin	(Steno bredanensis)	0
Hubb's beaked whale	(Mesoplodon carlhubbsi)	0
TOTAL SIGHTED		52,066

* Numbers of cetaceans indicate sighting from air and ship during 1975-76 study, not populations.
** Endangered species

The Southern California Bight is an important breeding area for pinnipeds along the west coast of the North American continent. In the San Pedro Channel, the most common pinniped is the harbor seal. Other species less common or rare in the region are the northern fur seal, the Steller sea lion, the northern elephant seal, and the California sea lion (Ref. 5). The harbor seal is coastal in distribution with a sedentary, stable, local population. The harbor seal was sighted in three aggregations along the coast of Santa Catalina Island during the 1976 U.C. Santa Cruz survey. In the three groupings, a total of 152 animals were sighted. Sitings along the coast of San Clemente Island ranged from 20-60 animals depending on the time of year. The harbor seal most often occurs in the Santa Barbara Channel. Due to the considerable distance of the main aggregations of harbor seals to the proposed pipeline, impact from installation activities is expected to be minimal.

The northern fur seal has rookeries on San Miguel Island in the Santa Barbara Channel, with 2,000 animals sighted in 1975. The Steller sea lion has a range from the Pribilof Islands (Alaska) to San Miguel Island. It is observed rarely in the San Pedro area.

The northern elephant seal is the largest pinniped at sea. It breeds along the west coast of North America, from Point Reyes peninsula to Isla Cedros in Baja, California. It is not often seen in the San Pedro region and does not breed there.

The California sea lion has a range from Mazatlan, Mexico to British Columbia. It is the most abundant pinniped in the Southern California Bight. The breeding grounds are in the Santa Barbara Channel Islands. Substantial numbers (1,846 animals sighted in June, 1976) were observed on San Clemente Island. Only a few California sea lions (10-20 in number) were sighted on Santa Catalina Island. The San Pedro Basin which includes the San Pedro Channel, Lausen knoll and Catalina escarpment could be an area of seasonal importance due to winter spawning of squid, a food source for the California sea lion. Sea lions will be minimally impacted (if at all) from the pipeline installation due to the distance from San Clemente and Santa Catalina Islands, 55 and 20 miles respectively.

Pinnipeds have rookeries and foraging grounds in the San Pedro Channel area, but not to the same extent as in the Santa Barbara Channel, which contains extensive rookeries on the San Miguel, Santa Rosa, and Santa Cruz Islands.

Pinnipeds are most impacted in rookery or haulout areas by noise and/or human disturbance. The pipeline route is located 20 and 55 miles from Santa Catalina and San Clemente (rookery/haulout sites) respectively and noise from installation operations will have little or no impact.

2. Cetaceans

The U. C. Santa Cruz report (Ref. 28) included a survey of cetaceans. Table 3-6 lists the Marine Mammals of the Southern California Bight and their estimated population in 1976.

The most common cetaceans to occur in the San Pedro Channel are the California gray whale, common dolphin, pilot whale, Pacific white side dolphin, and fin whale. In addition to these species, others occur that are considered uncommon or rare in the region: the minke whale, Sei whale, blue whale, humpback whale, killer whale, sperm whale, and (in this area) the very rare California sea otter.

The gray, fin, sei, Pacific right, sperm, blue, and humpbacked whales, which have been sighted in the Southern California Bight and may use the San Pedro Channel as a migration route, are listed endangered species (Ref. 30, pp. 336-340).

Several thousand California gray whales, fully protected by state, federal, and international statutes, migrate southward from their summer feeding grounds in Alaskan waters along the coast of California to their winter calving grounds in the lagoons of Baja, California. Gray whales generally migrate very close inshore, frequently navigating from one prominent point to another. The U. C. Santa Cruz study reported sightings of gray whales along the Newport - Oceanside coastline, San Pedro Channel and Point Fermin. For this reason, whale watchers often have best results in such localities as Point Dume in Malibu, Point Fermin on the Palos Verdes Peninsula, and Dana Point in southern Orange County. Migrating gray whales are commonly sighted in the San Pedro Channel. After calving has been completed, the whales move northward again through the San Pedro Channel close to the coastline on their way to the Arctic Circle (Ref. 28, p. 261).

There is currently no evidence that structures such as oil platforms and pipelines disturb cetaceans. The proposed pipeline will have no impact on cetaceans as once the pipeline is laid, there will be no disturbance of the water column.

Regarding the California gray whale (Eschrichtius robustus) and the Pacific right whale (Eubalena glacialis), contact was made with Drs. William C. Cummings and Raymond Gilmore, scientists at the Natural History Museum in San Diego. Dr. Cummings was formerly Senior Scientist at the Naval Ocean Systems Center in San Diego, and has spent the last 15 years doing bioacoustic and marine biological research related to whales. Dr. Gilmore is considered one of the top authorities in the nation on the California gray whale. Both Dr. Cummings and Dr. Gilmore indicated that the internal navigational systems of whales are highly sophisticated and that it would be very unlikely for such whales to come into contact with any objects in the ocean. They stated that whales are very adept at avoiding even "whale-watching" boats attempting to follow migrating whales as closely as possible. Also, the gray whale is very accustomed to both natural and man-made objects and noises, and frequently travels in the shipping lanes where noise levels are at their highest.

As to the Pacific right whales, the last sighting of such a whale was off the coast of California near Santa Barbara in April 1981. One sighting every 20-25 years is about normal for this species. Drs.

Cummings and Gilmore both stated that, in their opinion, drilling and development as proposed does not pose any threat to the whales or their migratory patterns.

b) Marine Birds

Within the offshore marine habitat, non-breeding transients or visitors make up the bulk of the avaifauna. The major breeding populations are found in the northern Channel Islands. The pipeline route is located in the San Pedro Channel area which does not have major seabird colonies. Bird Rock on Catalina Island was observed to be a breeding ground for the Western Gull in 1975 (See Table 3-7). Brandt's cormorant was found to be nesting on San Clemente Island. The Western Gull also had a nesting location on Bird Rock, San Clemente Island (Ref. 26). The Least Tern, an endangered species is located along the coast (see Section 3.6.5). Due to the distance (6.6. to 55 mi.) of the proposed activities from breeding and nesting areas, no disturbance is anticipated.

3.6.4 Sensitive Underwater Features

There are no known sensitive underwater features along the gas pipeline route such as coral beds, fishing banks, etc.

TABLE 3-7

Number of Breeding
Seabirds in the Long Beach Area

	Breeding Species	Numbers
1) Anaheim Bay and Surfside Beach	Least Tern	80- 96
2) San Gabriel River	Least Tern	24- 30
3) Bolsa Chica Beach	Least Tern	40- 52
4) Santa Catalina Island, Bird Rock	Western Gull	52
5) Bird Rock and N.W. San Clemente Island	Brandt's Cormorant	10
	Black Oystercatcher	2
	Western Gull	56
6) San Clemente Island, Seal Cove to Coast Point	Brandt's Cormorant	30
	Black Oystercatcher	2
	Western Gull	56
	Xantu's Murrelet	present
7) Huntington Beach	Least Tern	140-180

(Ref. 26)

3.6.5 Endangered Species

All marine mammals are afforded complete protection by the Marine Mammal Protection Act of 1972. Several cetaceans which occur in California waters (California gray, blue, Sei, humpback, fin, Pacific right, and sperm whales) are designated as endangered species by the federal government. One species of pinniped, the Guadelupe fur seal is designated rare by the State of California. The California sea otter is also characterized as rare, though seldom seen in this area. Only the California gray whale commonly occurs in the San Pedro Channel.

Five species of rare or endangered birds occur within the San Pedro Channel.

The California brown pelican (Pelecanus occidentalis californicus) breeds on Anacapa Island (Santa Barbara Channel), but occurs both within the estuaries, along shoreline, coastline, and in the open ocean in the San Pedro area on a frequent basis.

California least tern (Sterna albifrons brownii) nests along the coastline in the Hungington Beach area. Portions of San Gabriel River/Alamitos Bay, Anaheim Bay/Huntington Harbour and the mouth of the Santa Ana River have been designated as proposed Essential Habitat for the species.

Light-footed clapper rail (Rallus longirostris levipes) is found in the marshland area. The U.S. Fish and Wildlife Service has designated portions of Anaheim Bay and Upper Newport Bay as proposed Critical Habitat for the species.

Belding's Savannah sparrow (Passerculus sandwichensis beldingi) is concentrated in Anaheim Bay, salt flats along the coast in Huntington Beach, and Upper Newport Bay.

The Southern bald eagle (Heliaeetus leucociphalus) is frequently observed along the coast and within estuaries in the San Pedro area.

3.7 Socio Economics

3.7.1 Related Employment and Unemployment

The proposed pipeline construction and pipeline operation activities will utilize the already existing labor force in the Orange/Los Angeles county area. The proposed activities will help maintain offshore related employment but will not affect the local population to any great extent.

3.7.2 Public Opinion As It Relates to Additional Industrialization

Public opinion can be summarized into three distinct sections:

- A small minority which vocally opposes offshore petroleum development in any form; included in this group are the officers, employees, and many of the active members of environmental special-interest groups plus some persons in the fishing and tourist industries.

- A small minority (less vocally) supports offshore petroleum development; this group includes officers and many employees and stockolders of oil, service and support companies, as well as some local businessmen who view an increase in oil company and related activity as a stimulus to long term economic growth.

- A large majority which appear to be neutral toward the proposed activities.

3.7.3 Existing Transportation Systems and Facilities

The addition of crew and workboats during the pipeline installation, will have a negligible impact on the existing public transportation services in Los Angeles/Orange counties.

3.7.4 Supply and/or Existence of Coastal Resources

The proposed activities on OCS Lease P 0296 and surrounding area (pipeline route) do not require additional coastal resources or supplies. Nor shall coastal resources require modifications in the future. Long Beach Harbor has provisions for bulk storage of diesel fuel in relation to pipeline construction.

4.0 ENVIRONMENTAL CONSEQUENCES

The purpose of this section is to outline and describe "the direct, indirect, and cumulative effects on the onshore and offshore environments expected to occur as a result of implementation of the plan" (NTL 80-2, p. 9). It is also noted "this discussion need only include those adverse impacts that are not effectively minimized by proposed mitigating measures."

The environmental values that may affect or be affected by the proposed activities have been noted in Section 3. The few activities that may cause adverse environmental impacts have been described in Sections 2 and 3 (e.g.: the disturbance of the benthos and the impact of gaseous emissions). For convenience, all of the environmental values are recapitulated in this section. The proposed activities are not expected to result in any significant adverse environmental effect.

4.1 Geologic Hazards

This section discusses the potential impacts of the proposed project on the aspects of the environment discussed in Section 3.1 Geology. Certain geologic conditions and processes must be recognized and considered in project design, construction and operation in order to minimize any possibility of damage to the facilities or hazard to personnel. Since the pipeline will be carrying gas, a rupture will not incur an significant environmental impact. (See Section 2.8 for monitoring systems.)

4.1.1 Disturbance of Bottom Sediments

This proposed project will not cause any modification of the sea floor, and therefore no impact is anticipated on the rates of erosion or sedimentation.

A minor temporary disturbance of the bottom sediments along the pipeline route will occur from the anchoring system employed by a barge used to pull the line along the ocean floor.

4.1.2 Slope Stability and Submarine Landslides

Woodward-Clyde Consultants (Reference 4), identified and mapped a burried channel near the southwest end of the proposed route. There are no significant

changes in either the ocean floor topography or sedimentary composition in the area of the buried channel. There will be no impacts from laying the proposed gasline across the buried channel. Sections 3.1.3.1 and 3.1.3.2 should be referred to for more detail on ocean floor conditions along the proposed pipeline route.

4.1.3 Earthquake Shaking

Ground shaking of varying magnitudes will occur along the pipeline route whenever earthquakes of sufficient magnitude occur within a perceptible range of the project. The ocean floor along the pipeline route consists of a gentle slope that is presently undisturbed. This indicates that past earthquake activity, in both geologic and historical time, has not had any effect on these sediments. The pipeline which will rest on these sediments will be designed to withstand the same level of shaking as the platform.

4.1.4 Ground Rupture

Ocean floor rupturing along the pipeline route is not expected to occur. Evidence for this conclusion is based on the observations of the present ocean floor conditions and the lack of any near surface faulting (Sections 3.1.3.1 and 3.1.3.2). Also, there are no dramatic or sudden changes in the character of the ocean floor sediments along which differential movements might occur. Instead the composition of the sedimentary section is quite uniform along the entire route.

4.1.5 Liquefaction

If liquefaction of the ocean floor mud line sediments should occur, it will not effect the pipeline integrity because of its strength. Some minor settlement into these watery sediments may however occur.

4.2 Meteorology

4.2.1 Weather

The weather has been described in Section 3.2. The mild weather patterns of Southern California will have no effect on the proposed activities other than possible infrequent, short-duration limitation or suspension of operations during high winds and heavy fog.

A criticial operations and curtailment plan is on file with the MMS in Los Angeles (submitted with the Platform Edith's Oil Spill Contingency Plan.) It states critical operations (defined per OCS Order No. 2) will not be conducted when significant wave height is greater than 20 feet when winds exceed 40 knots, or when fog is so dense that visibility is limited.

4.2.2 Air Quality

4.2.2.1 South Coast Air Quality Management District

The New Source Review Rule (Rule 13) was adopted on October 5, 1979 by the South Coast Air Quality Management District (SC-AQMD). It was later amended on March 7, 1980. The rule is applicable to new stationary sources or modifications to existing stationary sources which result in an emission increase (from the source) of any non-attainment air contaminant greater than 150 pounds (68 kg) per day, except for CO, for which the value is an increase of 750 pounds (340 kg) per day.

The proposed subsea gas pipeline project does not fall under the provisions of Rule 13 for the following reasons:

1) The construction and installation phase of the proposed subsea gas pipeline would be exempt from Rule 13 as this phase is a temporary source for emissions (two weeks).

2) After installation, the only source for emissions from the gas pipeline, which would

occur in the SC-AQMD, would be 0.98 lbs./day total fugitive hydrocarbons; much less than the allowable 150 lbs./day.

4.2.2.2 Department of the Interior (DOI) Air Regulations

In response to increased participation in offshore oil development and the need to protect air quality in states adjacent to the offshore developments, the Minerals Management Service (MMS) established regulations concerning air emissions from oil and gas operations in the OCS. There are several stages of review an offshore development must go through to insure the activity will not adversely affect the air quality of an adjacent state. The MMS developed a screening process whereby a facility with emissions below a determined amount would be exempt from further air quality review. The exemption amount, "E", was the maximum amount an OCS facility could emit and not significantly effect the onshore air quality.

Per 30 CFR, Part 250.57, the exemption formulas are as follows:

E = exemption amount, tons/year

D = distance of facility from nearest shoreline in statute miles

E = 3,400 x $D^{2/3}$ for carbon monoxide

E = 33.3 x D for TSP, NOx, SO_2 and VOC

The regulations state that if a temporary or permanent facility's emissions on a yearly basis are less than "E" for all contaminants, the facility will not adversely effect onshore air quality, and therefore is exempt from further air quality review.

Construction and installation air emissions have been calculated for this project and appear in Appendix 3 of this supplement.

Table 4-1 shows the relationship between the related emission totals, from Appendix 3, and the exemption limit "E" as determined with respect to Huntington Beach; the nearest shoreline to the project. The project construction emissions are substantially less than the calculated emission limits. Thus, no further air quality review of this temporary "facility" is required by the DOI.

TABLE 4-1

AIR QUALITY IMPACT PER 30 CFR 250
CONSTRUCTION ACTIVITIES

Distance From Huntington Beach (D) (Statute Miles)	Exemption Limit (E) (Note a) for SO_2 TSP, NO_x, VOC (tons/yr.)	Installation emissions (Note b) NOx (tons/yr.)	VOC (tons/yr.) (Note d)	SO_2 (tons/yr.)	TSP (tons/yr.)	Exemption Limit (E) (Note c) for CO (tons/yr.)	Installation Emissions (Note b) CO (tons/yr.)
8.49 (Note e)	282.72	7.79	0.64	0.52	0.53	14,144.00	1.72

Note a: $E = 33.3\ D$, as stipulated in 30 CFR 250.57-1(d).

Note b: From Table 1, Appendix 4. These emission figures represent 78.3% of the total emissions as that is the amount which comes under Federal jurisdiction.

Note c: $E = 3400\ D^{2/3}$, as stipulated in 30 CFR 250.57-1(d).

Note d: VOC cannot be calculated from factors and/or test data now available. The quantities listed are total unburned hydrocarbons; in all instances, VOC is substantially less than this quantity.

Note e: Distance from Huntington Beach was calculated from Platform Edith.

4.3 Physical Oceanography

4.3.1 Effects on Proposed Activites

Water depths and oceanographic factors have been described in Section 3.4 of the Environmental Report-Platform Edith (Ref. 1); they will have no effect on the proposed activities other than possible infrequent short-duration limitations or suspension of construction operations due to fog.

4.3.2 Effects On Water Quality

There will be no significant effects on water quality besides temporary turbidity from the placement of the pipeline.

4.4 Other Uses

4.4.1 Shipping Activities

The northbound shipping lane will be minimally disturbed during installation activities. Such activities will be monitored by the U. S. Coast Guard.

4.4.2 Commercial and Sport Fishing

The proposed installation and location of the pipeline will have minimal impact on commercial and sport fishing.

All necessary precautions will be taken in setting and releasing anchors so that there is minimum disturbance of the sea floor.

4.4.3 Military Use

The proposed activities will have minimal or no effects on military usage. All work will be coordinated with the appropriate military agencies.

4.4.4 Existing Pipelines and Cables

The pipeline will cross over a 16-inch (40.6 cm) Shell Oil pipeline in approximately 155-ft. (47.2 m) water. Chevron proposes to cross over this line maintaining about 12 inches (30.5 cm) vertical separation between the lines. To assure isolation between the lines a sand/cement pack barrier will be installed. Details of the barrier are shown on Figure 2-4 of Section 2.5.1.11.

4.4.5 Mineral Resource Development Other Than Oil and Gas

There are no other known minerals developed other than hydrocarbon development in this area.

4.4.6 Mariculture Activities

There are no known mariculture activities in this area.

4.5 Flora and Fauna

The pelagic and benthic environments in the project area are discussed in Sections 3.6.1 and 3.6.2. The proposed activities will not affect the pelagic and benthic organisms except for the few benthic animals within the area of installation of pipeline route which may be adversely affected.

The pipeline will lay along the ocean floor. Construction will require disturbance of the sediments by barge anchoring, resulting in minor impact to the ocean floor. All necessary precautions will be taken in setting and releasing anchors so that there is minimum disturbance of the sea floor. Minor turbidity (possibly adversely affecting the nearby filter feeding mulluscan and crustacean benthic fauna due to clogging of gills, impairment of proper respiratory and excretory functions) is expected due to the placement of the pipeline, but this effect will be short term (approximately 2 weeks). The existing sediments and benthos will be physically disrupted during pipeline installation. However, following installation, normal recolonization by planktonic larvae would be anticipated in the disturbed area.

There are no known rare or endangered species of flora and fauna residing in the specific proposed project area. In the San Pedro Channel area, the California gray whale, an endangered species, commonly occurs during migration. Also, two species of rare and endangered marine birds (California brown pelican and California least tern) inhabit the San Pedro Channel area. The lightfooted clapper rail, Beldings Savannah sparrow, and Southern bald eagle are also observed along the coast and within estuaries in the San Pedro Channel. But, as discussed in Section 3.6.3 (a) and (b), the above mentioned species will not be affected by the proposed activities.

4.6 Onshore Impacts

4.6.1 Socioeconomics

As discussed in Sections 3.7.1, the proposed activities will serve to maintain existing levels of offshore employment and services; but will have no other perceptible impact on local employment, population and industry, community services, public opinion, transportation systems or facilities, or scarce coastal resources.

4.6.2 Demand for Supplies and Goods

The fabrication and installation of the proposed subsea gas pipeline will not place any demands on the resources within the affected area, other than those which the area has

experienced with past and present offshore pipeline construction work.

4.6.3 Impacts of Onshore Construction

The impacts of onshore construction will be temporary and minimal. These impacts will be associated with trucks used to bring in the pipeline joints, welding of the joints, and the private vehicles to be used by the construction workers. Emission calculations for these sources are found in Appendix 3.

4.7 Impacts on Offshore Cutural Resources

Woodward Clyde-Consultants (Ref. 4) and McClelland Engineers, Inc. (Ref. 3) utilized the services of marine archaeologist to review conditions along the pipeline route and in the area of Platform Edith. They concluded that there are no identifiable prehistoric cultural resources in the area of the pipeline route. In the Woodward Clyde-Consultant report a number of unidentifiable magnetometer and side scan sonar anomalies were recorded. Underwater dives on those located in shallow water (i.e. less than 60 feet (18.3 m)) found nothing. The few remaining small unidentifiable anomalies are located deeper waters off the pipeline route and can be avoided during the pipeline laying procedure.

5.0 MAJOR ACCIDENTS

In addition to the above considerations of the expected effects of the proposed activities, NTL 80-2 (Section VII.A (4)(g)) calls for a discussion of the potential for accidents, and of the possible impacts on the environment which might result from a major accident. In the context of the proposed activities, the only type of accident which might result in a minor environmental impact is a pipeline rupture. The gas will be piped at low pressure (150 psi) and if an accident were to occur, hydrocarbons would slowly seep to the surface. If such rupture were to occur, the high-low pressure pipeline leak detection system would automatically shut-in the pipeline on Platform Edith and/or Platform Eva. (See Section 2.5.1.10 for further discussion). This will cause negligible impact on the surrounding environment.

6.0 ALTERNATIVES TO THE PROPOSED ACTION

6.1 No Project

Should the proposed project be denied, the following negative impacts may result:

- Gas resources unavailable for use.
- Increase in adverse air quality impacts due to loss of source of natural gas and use of alternative liquid fossil fuels.

- Reduction in supply of energy available for consumption, resulting in increased energy prices to the consumer.

- Loss of potential income to Chevron, the Federal government, the State of California, the county, and the contractors and personnel.

- Decrease in long-term marine habitat enhancement in the vicinity of platform and pipeline.

Adverse impacts which would be eliminated will include:

- Increased marine traffic and potential for collisions.

- Increased equipment emissions.

- Temporary loss of benthic habitat.

- Minor localized impacts on traffic and noise onshore.

However, these potential impacts do not seem to be sufficient to offset the potential increase of energy which would be made available if the project were implemented. In addition, current Department of Interior policy states that oil and gas leases must be explored and developed within a reasonable time or the lessee may have to relinquish the lease to the government.

6.2 Project Postponement

In the unlikely event of the postponement of the installation of the gas pipeline, flaring would then be necessary to dispose the produced natural gas, which would result in increased air pollutant emissions and deny the L.A. Basin area the use of this clean fuel.

Other impacts which would be postponed include:

- Marine Traffic - potential for collision between shipping and the barge utilized for pipelaying;
- Marine Biology - short-term loss of benthic habitat due to pipeline installation;
- Onshore - minor localized impacts on traffic and noise.

In addition to these impacts, beneficial environmental effects of the project would not be realized, which includes:

Marine Biology - long-term marine habitat enhancement in vicinity of the pipeline as a natural reef.

6.3 Alternative Pipe Laying Methods

Utilization of the bottom pull method for fabrication and installation of the proposed subsea gas pipeline is considered the

primary method. This method provides for accurate construction and installation in conjunction with the most economical daily operating costs. The alternate method considered utilizes a conventional pipelaying barge. This method would allow the construction and installation of the gas pipeline to be accomplished from a single barge; however, at a substantially higher daily operating cost. A description of the alternate method is as follows:

The deck of the conventional lay barge serves as a work area for joining sections of pipe into a continuous pipeline. On deck, joints of pipe are welded together; the barge is then pulled slowly forward and a continuous welded pipeline is deployed from the stern of the barge. A mooring system, made up of several anchors and winches allows the barge to maintain its position along the pipeline right-of-way. The pipe descends along a sloping ramp on the barge and enters the water, where it is supported by a "stinger" which is attached to the barge.

When the pipe leaves the "stinger", it is unsupported until it reaches the sea bottom. Overbend radius and stress factors will determine the amount of tension that is to be held on the pipe during the lay process.

The typical conventional lay barge is 350 feet (107 m) long by 100 feet (30 m) wide and has a draft of 15-20 feet (4.5-6.0 m) of water.

The following is a summary of equipment normally provided for pipeline installation with a conventional lay barge:

Lay barge - outfitted with:

Tensioner

Anchoring equipment

Abandonment and recovery winch

Welding equipment

Crane

Pipe storage racks

Pipe conveyors and supports

Lineup station

X-ray equipment

Pipe joint coating facilities

Stinger

Anchor handling tugs

Cargo barge for transporting pipe

Tug for cargo barge

Crew boat

The conventional lay barge method would probably require the following onshore facilities:

- Pipe loadout--need dock with rail spur and crane; location not critical except as it affects overall job costs.

- Crew and support transport--need dock for crew boat; utilizing Long Beach facilities.

- Project offices.

6.4 Alternative Pipeline Route

No alternative route for the proposed subsea gas pipeline is anticipated.

6.5 Reinjection

An alternate to laying a gas pipeline, would be reinjecting the gas into the formation. The recovered gas from the casing-tubing annulus and all separators is piped to compressors, which compress it for injection into the reservoir. A smaller portion of the gas would be utilized as fuel gas for a heater that provides process heat.

The utilization of the gas produced from the proposed activities as an energy source far outweighs the alternative of re-injection.

7.0 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

As a result of the proposed activities, several necessary and unavoidable impacts are expected to occur.

There will be a slight temporary decrease in offshore air quality, alhough no regulatory limits will be exceeded. The emissions produced during the installation phase of the proposed project are an unavoidable factor.

Pipeline installation will result in localized disturbance of the sea floor and local turbidity. The normal functions and interactions of the local benthic communities will be most adversely affected. However, upon the stabilization of the disruptive activities, the benthic organisms should recolonize in a few years. The effects of the proposed pipeline installation on the flora and fauna are unavoidable but minor.

In considering the above mentioned impacts, the majority of which are reversible and localized in nature, and considering the extremely slight possibility of a pipeline rupture, the overall effect to the environment is considered to be insignificant.

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A P P E N D I X 1

GEOLOGIC AND GEOPHYSICAL SURVEY

FIELD OPERATIONS
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1982 GEOPHYSICAL SURVEY

A.1 Offshore Geophysical Survey Operations

Field operations for the offshore geophysical investigation began on 1 February 1982 with the mobilization of the survey equipment aboard the vessel M/V Western Warrior in Long Beach, California. Survey operations commenced the following day on a 12 hour/day basis following an at-sea checkout of all geophysical systems. Survey operations to obtain high resolution geophysical data were conducted through 5 February. On 18 February the survey vessel was remobilized with a moderate penetration single-channel analog profiling system. Survey operations were conducted on February 19th and 20th, and the vessel subsequently demobilized in San Diego. Throughout the survey period the seas were moderate and the weather excellent. Several delays were experienced due to mechanical problems with the survey equipment.

Personnel involved in the field operations included: the Woodward-Clyde survey crew of a marine geophysicist and an electronics engineer; two navigators from Navigation Services, Inc.; the crew of the M/V Western Warrior; and a representative of Chevron, U.S.A.

The 1982 geophysical survey program was provided by Chevron. The survey was designed to supplement data collected in 1981 (Appendix B) and divided into three phases: a geologic hazards survey in federal waters, a geologic hazards survey in state waters, and a cultural survey in state waters. The plan for the shallow geologic hazards survey in state and federal waters consisted of three primary lines centered over the route of the proposed gas pipeline

from Platform Edith to Platform Eva, and along the proposed alternate route to shore, and 12 tie lines. The cultural survey in state waters consisted of seven primary lines and three tie lines, covering the area from the three mile line to Platform Eva. This phase was designed to supplement cultural survey data obtained during the 1981 investigation for a proposed power cable from Platform Edith to shore.

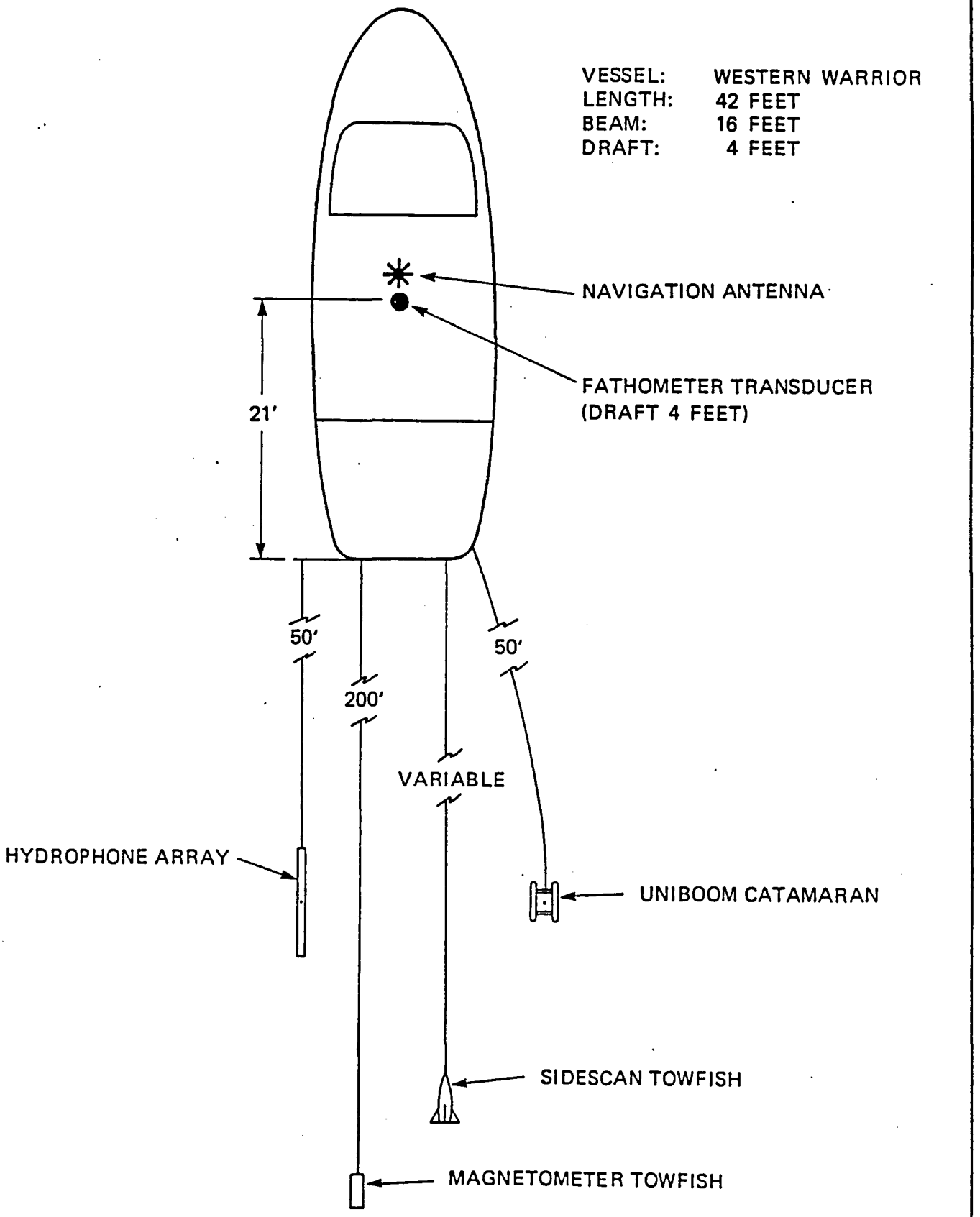
The survey vessel utilized for this study was the M/V Western Warrior, a 42-foot commercial vessel based in San Diego, California. During the survey, the following systems were run simultaneoulsy in various combinations, depending on the requirements for each individual phase of the survey:

- Motorola Mini-Ranger Electronic Navigation System
- Raytheon DE-719 Precision Survey Fathometer
- Klein Model-400 Side Scan Sonar System
- GeoMetrics Model G-801/3 Marine Magnetometer System
- Edo Western Model 515A HiPACT Tuned Transducer System
- EG&G UNIBOOM High Resolution Seismic Reflection Profiling System
- SSI Watergun Moderate to Deep Penetration Reflection Profiling System

The layout of the equipment aboard the survey vessel M/V Western Warrior is shown in Figure A.1. Details of the specific instrument settings are given in the Geophysical Systems Logs at the end of this appendix.

A.2 Navigation

Offshore positioning was subcontracted to Navigation Services, Incorporated, of Ventura, California, who utilized a Motorola Mini-Ranger III electronic navigation system.



Project: PLATFORM EDITH Project No. PIPELINE SURVEY 414991	GEOPHYSICAL SURVEY VESSEL EQUIPMENT LAYOUT	Fig. A–1

The Motorola Mini-Ranger III is a short range (approximately 20 nautical miles) line of sight, range-range navigation system. The basic system consists of a range console, receiver-transmitter, and an omni-directional antenna installed on the boat. Two or more reference transponders are located at pre-surveyed points on shore. The measured ranges to the two transponders are displayed, in metres or feet, on the range console onboard ship. The accuracy of the ranges is ±3 metres at 20 nautical miles. The actual accuracy of the system is a function of the ranges and the angle of intersection of the two range lines.

A.3 Geophysical Systems

Bathymetric Measurements: A Raytheon DE-719 Precision Survey Fathometer was used to continuously record the bathymetric data. The fathometer emits a high-frequency (200 kHz) signal from a transducer mounted on the ship's hull. The return signal is graphically displayed on a continuous chart. Calibration adjustments account for the depth of the transducer beneath the water surface, and conversion of the acoustic signal travel-time to water depth using a calibrated velocity. This velocity value was established by conducting bar checks and from observed temperature profiles. Throughout this survey the calibration velocity was set for a speed of sound in sea water of 4,950 feet/second.

A fix mark is placed on the depth sounder record each time a navigation fix is recorded so that the measured water depth can be correlated with the positioning data.

Side Scan Sonar Measurements: A Klein Model-400 Side Scan Sonar System was used on this project. The side scan sonar record presents a continuous sonic picture of the sea floor

and may be used for identifying changes in bottom sediment characteristics, or for locating and identifying natural and man-made objects lying on the seabed. The side scan sonar technique is illustrated in Figure A.2. The system consists of a towed, dual-beam transducer, a dual-channel recorder, and associated cables. The side scan sonar emits a narrow acoustic beam perpendicular to the direction of travel of the towfish along the survey line. The acoustic beam's primary concentration of energy is directed slightly below the horizontal plane. Echoes are obtained from the bottom directly beneath the transducers to several hundred metres to the side, depending on the range setting. The range setting is adjusted to maintain the desired target resolution and bottom coverage consistent with survey objectives. Range settings from 100 to 150 metres were used throughout this survey, thereby providing 100% side scan coverage throughout the survey area. The combination of beam shape and short wavelength acoustic pulse (100 kHz) gives the side scan the ability to resolve small topographic irregularities and man-made objects on the sea floor. As the transducer is towed behind the ship, the reflected echoes are graphically recorded in a form which appears like a continuous photograph of a strip of sea floor.

The side scan towfish is towed behind the ship as illustrated in Figure A.1. Mapping of the data requires a correction for the layback of the system from the navigation antenna, conversion of slant ranges to horizontal distances, and elimination of distortions resulting from varying horizontal and vertical scales. A fix mark is placed on the side scan records each time a navigation fix is recorded so that the data can be correlated with the positioning information.

Magnetometer Measurements: A GeoMetrics Model G-801/3 Marine Magntometer was used to continuously record magnetic data along all survey lines. The marine magnetometer continuously measures the total intensity of the earth's magnetic field utilizing a sensor towed several hundred feet behind the survey vessel. The sensor is towed a sufficient distance behind the vessel to eliminate the effect of the ferromagnetic mass of the survey ship. Magnetic values are continuously displayed on a digital readout and recorded on a strip-chart recorder. A fix mark is placed on the magnetometer record each time a navigation fix is taken so that the records may be correlated with the navigation data.

Interpretation of the magnetometer data requires a correction for the layback of the sensor from the navigation antenna (Figure A.1). The presence of a ferromagnetic object on the sea floor, such as a wellhead, pipeline, discarded steel drum, etc., will locally alter the intensity of the earth's magnetic field and result in a magnetic "anomaly" on the recorded data. The intensity of the recorded anomaly is a function of the ferromagnetic mass of the object and the distance of closest approach of the magnetometer sensor. These data are correlated with side scan sonar targets to identify objects which could represent cultural resources or constraints sea floor operations.

Subbottom Profiling: Three subbottom profiling systems were used on this survey: a very-high resolution, shallow-penetration, tuned transducer system; a high resolution, medium-penetration boomer system; and a deep-penetration watergun system.

An Edo Western Model 515A HiPACT tuned transducer system utilizing a towed transducer assembly was used to provide maximum resolution of near-bottom reflectors. The tuned transducer system consists of an Edo Western Model 248E/465 variable frequency (3.5 kHz and 7.0 kHz) transceiver, a towed transducer assembly, and a dry paper recorder. Output power of the system is variable up to 10 kw. An EG&G Model 255 seismic recorder was used to record the tuned transducer data.

An EG&G Seismic Reflection Profiling System was used to provide information on the nature and geometry of the subbottom soil and bedrock horizons. A UNIBOOM sound source was utilized to provide shallow to moderate penetration high resolution subbotom data. The EG&G UNIBOOM system consists of an EG&G 231/232 power source, a UNIBOOM plate mounted on a towed catamaran, a receiving hydrophone and an EPC Model 3200 or 4100 seismic recorder. The UNIBOOM sound source is an electromechanical boomer plate which generates a broadband acoustic pressure pulse with a frequency spectrum from 400 Hz to 8 kHz.

A watergun energy source was used to obtain deep penetration seismic data. The SSI Watergun system used during this survey consists of an SSI Model S-15 sound source, a low-frequency towed hydrophone array, a Marinco SSP-8000 seismic signal processor, and an EPC Model 3200 or 4100 seismic recorder. The watergun sound source is a pneumatically-operated implosive acoustic source that is characteristically free of bubble oscillations. It has a broad output spectrum extending into the high frequencies with a high concentration of energy within a narrow low frequency band. The SSP-8000 seismic signal processor is a real-time

single-channel digital signal processor. It can be operated in a spreading mode to provide horizontal record enhancement or in a stacking mode to provide noncumulative averaging of consecutive traces to improve signal to noise ratio.

The resulting seismic records generated by the subbottom profiling systems are similar to a geologic cross section except that the vertical axis represents the two-way travel time of the reflected seismic signal rather than a true depth. Reflection times are converted to depths of the sedimentary layers using an assumed or measured value for the velocity of sound in the sediments. The systems are towed behind the ship and mapping of the data requires a correction for the layback of each system from the positioning antenna as illustrated in Figure A.1. A fix mark is placed on the seimic records each time a navigation fix is recorded so that the data can be correlated with the positioning information.

A.4 Geophysical Systems Logs

The operators' logs for the various systems are included as an aid for persons who may be reviewing the original field records.

Woodward-Clyde Consultants

MARINE SURVEY LOG

AREA Huntington Beach CLIENT CHEVRON

JOB NO. 41499 CLIENT REP. Patry DATE 2/2/82

VESSEL Western Warrior PARTY CHIEF Maddux PAGE 1

			DEPTH SOUNDER	SIDE SCAN SONAR		MAGNETOMETER						
LINE NUMBER	FIX NUMBER	TIME	SCALE RANGE (ft/m)	SLANT RANGE (m)	SENSOR LAYBACK (ft/m)	TOTAL FIELD	FULL SCALE	SENSOR LAYBACK (ft/m)	VESSEL SPEED (kts/rpm)	SEA STATE	REMARKS	OBSERVER
106	120	1753	50-105	100	100	49xxx	100ϒ	200	4	2	SOL	
	108				50						Change layback	
	100	1812									EOL	
112	100	1847	50-105	150	50	49xxx	100ϒ	200	4	2	SOL	
	122	1908									EOL	
108	120	1916	50-105	100	50	49xxx	100ϒ	200	4	2	SOL	
	100	1932									EOL	
110	100	1950	50-105	100	50	49xxx	100ϒ	200	4	2	SOL	
	121	2010									EOL	
104	119	2020	50-105	100	50	49xxx	100ϒ	200	4	2	SOL	
	100	2036									EOL	
100	100	2045	50-105	150	50	49xxx	100ϒ	200	4	2	SOL	
	117	2102									EOL	
102	118	2110	50-105	100	50	49xxx	100ϒ	200	4	2	SOL	
	100	2125									EOL	

Woodward-Clyde Consultants

MARINE SURVEY LOG

AREA Huntington Beach CLIENT Chevron

JOB NO. 41499 CLIENT REP. Patry DATE 2/2/82

VESSEL Western Warrior PARTY CHIEF Maddux PAGE 2

			DEPTH SOUNDER	SIDE SCAN SONAR		MAGNETOMETER						
LINE NUMBER	FIX NUMBER	TIME	SCALE RANGE (ft/m)	SLANT RANGE (m)	SENSOR LAYBACK (ft/m)	TOTAL FIELD	FULL SCALE	SENSOR LAYBACK (ft/m)	VESSEL SPEED (kts/rpm)	SEA STATE	REMARKS	OBSERVER
101	105	2138	50-105	100	50	49xxx	100γ	200	4	2	SOL	
	100	2143									EOL	
103	100	2204	50-105	100	50	49xxx	100γ	200	4	2	SOL	
	105	2208									EOL	
105	105	2222	50-105	100	50	49xxx	100γ	200	4	2	SOL	
	100	2226									EOL	

Woodward-Clyde Consultants

AREA Huntington Beach CLIENT Chevron

JOB NO. 41499 CLIENT REP. Patry DATE 2/3/82

MARINE SURVEY LOG – SUBBOTTOM PROFILING VESSEL Western Warrior PARTY CHIEF Maddux PAGE 3

			TUNED TRANSDUCER								UNIBOOM/SPARKARRAY										DEPTH SOUNDER		
							FILTER								FILTER								
LINE NUMBER	FIX NUMBER	TIME	TOWFISH LAYBACK (ft/m)	ENERGY (kw)	FREQUENCY (kHz)	PULSE LENGTH (ms)	LOW CUT	HIGH CUT	TVG (in/out)	SCALE RANGE (ms)	SOURCE LAYBACK (ft/m)	PHONE LAYBACK (ft/m)	ENERGY (j)	SYSTEM GAIN (db)	LOW CUT	HIGH CUT	TVG (in/out)	PRINT PHASE (+/-)	SWEEPS PER KEY	SCALE RANGE (ms)	SCALE RANGE (ft/m)	REMARKS	OBSERVER
402	140	1442	25*	6	3.5	0.3	1000	-	OUT	12-62	50	50	500	20	400	4000	OUT	-	2	0-250	50-105	SOL	
	125									0-50												c/s	
	115																				0-55	c/s	
	106	1520																				EOL	
404	104	1525	25*	6	3.5	0.3	1000	-	OUT	0-50	50	50	500	20	400	4000	OUT	-	2	0-250	0-55	SOL	
	115																				50-105	c/s	
	125									12-62												c/s	
	134	1555																				EOL	
400	135	1615	25*	6	3.5	0.3	1000	-	OUT	12-62	50	50	500	20	400	4000	OUT	-	2	0-250	50-105	SOL	
	124									0-50												c/s	
	112																				0-55	c/s	
	103	1648																				EOL	
401	100	1702	25*	6	3.5	0.3	1000	-	OUT	0-50	50	50	500	20	400	4000	OUT	-	2	0-250	0-55	SOL	
	104	1708																				EOL	

* Layback 25' and tow depth 25'

Woodward-Clyde Consultants

AREA Huntington Beach CLIENT Chevron

JOB NO. 41499 CLIENT REP. Patry DATE 2/3/82

MARINE SURVEY LOG – SUBBOTTOM PROFILING VESSEL Western Warrior PARTY CHIEF Maddux PAGE 1

			TUNED TRANSDUCER								UNIBOOM/SPARKARRAY										DEPTH SOUNDER		
LINE NUMBER	FIX NUMBER	TIME	TOWFISH LAYBACK (ft/m)	ENERGY (kw)	FREQUENCY (kHz)	PULSE LENGTH (ms)	FILTER LOW CUT	FILTER HIGH CUT	TVG (in/out)	SCALE RANGE (ms)	SOURCE LAYBACK (ft/m)	PHONE LAYBACK (ft/m)	ENERGY (j)	SYSTEM GAIN (db)	FILTER LOW CUT	FILTER HIGH CUT	TVG (in/out)	PRINT PHASE (+/-)	SWEEPS PER KEY	SCALE RANGE (ms)	SCALE RANGE (ft/m)	REMARKS	OBSERVER
403	104	1725	25*	6	3.5	0.3	1000	-	OUT	0-50	50	50	500	20	400	4000	OUT	-	2	0-250	50-105	SOL	
	100	1729																				EOL	
423	100	1735	25*	6	3.5	0.3	1000	-	OUT	0-50	50	50	500	20	400	4000	OUT	-	2	0-250	50-105	SOL	
	105	1741																				EOL	

* Layback 25' and tow depth 25'

Woodward-Clyde Consultants

MARINE SURVEY LOG – SUBBOTTOM PROFILING

AREA Huntington Beach CLIENT Chevron

JOB NO. 41499 CLIENT REP. Maxwell DATE 2/4/82

VESSEL Western Warrior PARTY CHIEF Maddux PAGE 5

			TUNED TRANSDUCER								UNIBOOM/SPARKARRAY										DEPTH SOUNDER			
							FILTER								FILTER									
LINE NUMBER	FIX NUMBER	TIME	TOWFISH LAYBACK (ft/m)	ENERGY (kw)	FREQUENCY (kHz)	PULSE LENGTH (ms)	LOW CUT	HIGH CUT	TVG (in/out)	SCALE RANGE (ms)	SOURCE LAYBACK (ft/m)	PHONE LAYBACK (ft/m)	ENERGY (j)	SYSTEM GAIN (db)	LOW CUT	HIGH CUT	TVG (in/out)	PRINT PHASE (+/-)	SWEEPS PER KEY	SCALE RANGE (ms)	SCALE RANGE (ft/m)	REMARKS	OBSERVER
406	100	1211	25*	6	3.5	0.3	1000	-	OUT	0-50	50	50	500	20	400	4000	OUT	-	2	0-250	50-105	SOL	
	112	1224																				EOL	
408	114	1238	25*	6	3.5	0.3	1000	-	OUT	0-50	50	50	500	20	400	4000	OUT	-	2	0-250	50-105	SOL	
	100	1255																				EOL	
410	100	1302	25*	6	3.5	0.3	1000	-	OUT	0-50	50	50	500	20	400	4000	OUT	-	2	0-250	50-105	SOL	
	116	1320																				EOL	
407	104	1338	25*	6	3.5	0.3	1000	-	OUT	0-50	50	50	500	20	400	4000	OUT	-	2	0-250	50-105	SOL	
	100	1343																				EOL	
405	100	1354	25*	6	3.5	0.3	1000	-	OUT	0-50	50	50	500	20	400	4000	OUT	-	2	0-250	50-105	SOL	
	106	1401																				EOL	
402	141	1518									50	50	5000	20	400	4000	OUT	-	2	0-250	100-155	SOL	
	171																				150-205	c/s	
	188	1600																				EOL	

* Layback 25' and tow depth 25'

Woodward-Clyde Consultants

MARINE SURVEY LOG – SUBBOTTOM PROFILING

AREA Huntington Beach　CLIENT Chevron

JOB NO. 41499　CLIENT REP. Maxwell　DATE 2/4/82

VESSEL Western Warrior　PARTY CHIEF Maddux　PAGE 6

			TUNED TRANSDUCER								UNIBOOM/SPARKARRAY										DEPTH SOUNDER		
							FILTER								FILTER								
LINE NUMBER	FIX NUMBER	TIME	TOWFISH LAYBACK (ft/m)	ENERGY (kw)	FREQUENCY (kHz)	PULSE LENGTH (ms)	LOW CUT	HIGH CUT	TVG (in/out)	SCALE RANGE (ms)	SOURCE LAYBACK (ft/m)	PHONE LAYBACK (ft/m)	ENERGY (j)	SYSTEM GAIN (db)	LOW CUT	HIGH CUT	TVG (in/out)	PRINT PHASE (+/-)	SWEEPS PER KEY	SCALE RANGE (ms)	SCALE RANGE (ft/m)	REMARKS	OBSERVER
400	186	1609									50	50	500	20	400	4000	OUT	-	2	0-250	150-205	SOL	
	169																				100-155	c/s	
	140																				50-105	c/s	
	135	1654																					
404	135	1706									50	50	500	20	400	4000					50-105	SOL	
	139																				100-155	c/s	
	154																				OUT		
	187	1756																				EOL	

Woodward-Clyde Consultants

MARINE SURVEY LOG – SUBBOTTOM PROFILING

AREA Huntington Beach CLIENT Chevron

JOB NO. 41499 CLIENT REP. Maxwell DATE 2/5/82

VESSEL Western Warrior PARTY CHIEF Maddux PAGE 7

			TUNED TRANSDUCER								UNIBOOM/SPARKARRAY										DEPTH SOUNDER		
LINE NUMBER	FIX NUMBER	TIME	TOWFISH LAYBACK (ft/m)	ENERGY (kw)	FREQUENCY (kHz)	PULSE LENGTH (ms)	FILTER LOW CUT	FILTER HIGH CUT	TVG (in/out)	SCALE RANGE (ms)	SOURCE LAYBACK (ft/m)	PHONE LAYBACK (ft/m)	ENERGY (j)	SYSTEM GAIN (db)	FILTER LOW CUT	FILTER HIGH CUT	TVG (in/out)	PRINT PHASE (+/-)	SWEEPS PER KEY	SCALE RANGE (ms)	SCALE RANGE (ft/m)	REMARKS	OBSERVER
421	100	0754									50	50	500	20	400	4000	OUT	-	2	0-250	150-205	SOL	
	104	0758																				EOL	
419	104	0812									50	50	500	20	400	4000	OUT	-	2	0-250	150-205	SOL	
	100	0816																				EOL	
417	100	0830									50	50	500	20	400	4000	OUT	-	2	0-250	150-205	SOL	
	104	0835																				EOL	
415	104	0848									50	50	500	20	400	4000	OUT	-	2	0-250	100-155	SOL	
	100	0852																				EOL	
413	100	0906									50	50	500	20	400	4000	OUT	-	2	0-250	100-155	SOL	
	104	0910																				EOL	
411	104	0924									50	50	500	20	400	4000	OUT	-	2	0-250	100-155	SOL	
	100	0928																				EOL	
409	100	0942									50	50	500	20	400	4000	OUT	-	2	0-250	50-105	SOL	
	104	0946																				EOL	

Woodward-Clyde Consultants

MARINE SURVEY LOG – SUBBOTTOM PROFILING

AREA Huntington Beach CLIENT Chevron

JOB NO. 41499 CLIENT REP. Maxwell DATE 2/19/82

VESSEL Western Warrior PARTY CHIEF Maddux PAGE 8

			TUNED TRANSDUCER								WATERGUN										DEPTH SOUNDER		
LINE NUMBER	FIX NUMBER	TIME	TOWFISH LAYBACK (ft/m)	ENERGY (kw)	FREQUENCY (kHz)	PULSE LENGTH (ms)	FILTER LOW CUT	FILTER HIGH CUT	TVG (in/out)	SCALE RANGE (ms)	SOURCE LAYBACK (ft/m)	PHONE LAYBACK (ft/m)	ENERGY (j)	SYSTEM GAIN (db)	FILTER LOW CUT	FILTER HIGH CUT	TVG (in/out)	PRINT PHASE (+/-)	SWEEPS PER KEY	SCALE RANGE (ms)	SCALE RANGE (ft/m)	REMARKS	OBSERVER
404	105	2323									75	75	15k	20	30	500	OUT	+	6	0-500		SOL	
	134	2348																				EOL	
2/20/82																							
402	135	0007									75	75	15k	20	30	300	OUT	+	3	0-1000		SOL	
	103	0037																				EOL	
400	103	0042									75	75	15k	20	30	300	OUT	-	3	0-1000		SOL	
	134	0109																				EOL	
406	112	0138									75	75	15k	20	30	300	IN	-	3	0-1000		SOL	
	99	0150																				EOL	
408	100	0157									75	75	15k	20	30	300	IN	-	3	0-1000		SOL	
	115	0210																				EOL	
410	116	0223									75	75	15k	20	30	300	IN	-	3	0-1000		SOL	
	99	0239																				EOL	
401	100	0253									75	75	15k	20	30	300	IN	-	3	0-1000		SOL	
	105																					EOL	

Woodward-Clyde Consultants

AREA Huntington Beach CLIENT Chevron

JOB NO. 41499 CLIENT REP. Maxwell DATE 2/20/82

MARINE SURVEY LOG – SUBBOTTOM PROFILING VESSEL Western Warrior PARTY CHIEF Maddux PAGE 9

			TUNED TRANSDUCER								WATERGUN										DEPTH SOUNDER		
LINE NUMBER	FIX NUMBER	TIME	TOWFISH LAYBACK (ft/m)	ENERGY (kw)	FREQUENCY (kHz)	PULSE LENGTH (ms)	FILTER LOW CUT	FILTER HIGH CUT	TVG (in/out)	SCALE RANGE (ms)	SOURCE LAYBACK (ft/m)	PHONE LAYBACK (ft/m)	ENERGY (j)	SYSTEM GAIN (db)	FILTER LOW CUT	FILTER HIGH CUT	TVG (in/out)	PRINT PHASE (+/-)	SWEEPS PER KEY	SCALE RANGE (ms)	SCALE RANGE (ft/m)	REMARKS	OBSERVER
403	104	0309									75	75	15k	20	30	300	IN	-	3	0-1000		SOL	
	99	0314																				EOL	
423	104	0328									75	75	15k	20	30	300	IN	-	3	0-1000		SOL	
	99	0332																				EOL	
405	100	0346									75	75	15k	20	30	300	IN	-	3	0-1000		SOL	
	107	0352																				EOL	
407	104	0409									75	75	15k	20	30	300	IN	-	3	0-1000		SOL	
	99	0413																				EOL	

A P P E N D I X 2

OFFSHORE CULTURAL SURVEY

ERA
ENVIRONMENTAL RESEARCH ARCHAEOLOGISTS — A SCIENTIFIC CONSORTIUM

26 March 1982

Dr. Jan D. Rietman
Woodward-Clyde Consultants
203 N. Golden Circle Dr.
Santa Ana, California 92705

Dear Dr. Rietman:

SUBJECT: ARCHAEOLOGICAL AND CULTURAL RESOURCE INVESTIGATION FOR A PROPOSED GAS PIPELINE ROUTE FROM PLATFORM EDITH TO PLATFORM EVA

This correspondence will constitute my report relative to the Woodward-Clyde Consultants' geophysical survey for the gas pipeline from Platform Edith to Platform Eva. I previously provided background data on the area's general cultural history and actual and potential cultural resources in a report entitled: "Archaeological and Cultural Resource Investigation for a proposed Cable Route from Platform Edith to Huntington Beach, California." A copy of that report is included and thereby made a part of this letter report. That initial report also discussed a diver-archaeologist survey of unexplained anomalies. None of those anomalies proved to be cultural resources and there was a negative declaration regarding them.

The report referenced above covers the proposed gas pipeline route from Platform Edith to the State waters boundary and the area from the State waters directly into shore at Huntington Beach. Similarly, I have reviewed the side scan sonar, magnetometer and subbottom profiler records for this recent phase of work which covered the short portion of the proposed gas pipeline route that covers the State waters from the three-nautical-mile limit northwest to Platform Eva. Altogether there were 10 track lines which ran across the area in question. These provided adequate coverage in terms of the search for cultural resources. The quality of the records ranged from good to fair (the magnetometer records were only fair with some "noise"). All recorded anomalies could be attributed to: known features (platforms and pipelines), anchor drag marks, boat wakes, "cross talk", machine error miss-prints, or to small features which cannot

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4032 Wilshire Blvd., Suite 507, Los Angeles, CA 90010 — (213) 384-5231

be reasonably interpreted as cultural resources. Hence, no cultural resources were indicated by these data and no further cultural resources investigations are warranted.

Please feel free to contact me should there be any question concerning sea floor cultural resources and this project.

Very truly yours,

E. Gary Stickel

E. Gary Stickel, Ph.D.
Marine Archaeologist

EGS/md

ERA
ENVIRONMENTAL RESEARCH ARCHAEOLOGISTS – A SCIENTIFIC CONSORTIUM

ARCHAEOLOGICAL AND CULTURAL RESOURCE INVESTIGATION

for a

PROPOSED CABLE ROUTE FROM
PLATFORM EDITH TO HUNTINGTON BEACH, CALIFORNIA

Prepared for

Woodward-Clyde Consultants
Orange, California

by

E. Gary Stickel, Ph.D.
Environmental Research Archaeologists
4032 Wilshire Blvd. Suite 507
Los Angeles, California 90010

TABLE OF CONTENTS

TABLES

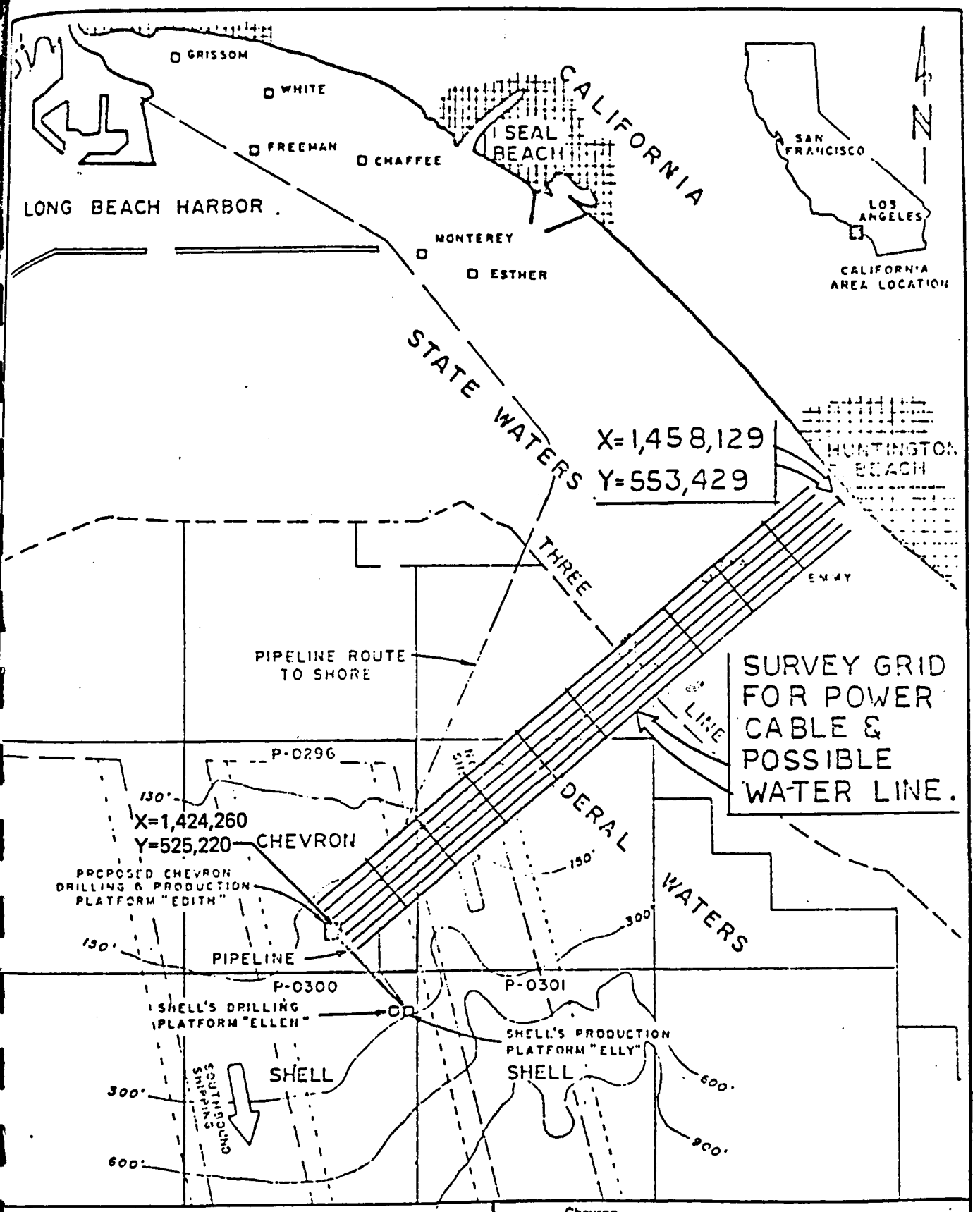
FIGURES

1.0 INTRODUCTION

This report is presented in response to a request by Woodward-Clyde Consultants to provide an Archaeological and Cultural Resource Review of remote sensing data obtained for Chevron U.S.A., Inc. in OCS Tract P-0296 of the Beta Unit, San Pedro Channel, California. The geophysical data, which included fathometer, side scan sonar, magnetometer, and subbottom profiler records, were obtained by Woodward-Clyde Consultants along the proposed cable route from the location of Chevron's proposed Platform Edith to Huntington Beach, a distance of approximately 8 miles (Figure 1).

The purpose of this investigation was to ascertain if there were any significant cultural resources lying along the proposed route that would suffer disturbance, damage or destruction if the proposed cable is laid as planned. The remote sensing data from the offshore geophysical survey were initially reviewed, and a recommendation made to have a selected number of unidentified anomalies investigated by a team of diving archaeologists in order to determine whether any of the anomalies represented a significant cultural resource.

This report presents the findings of both the geophysical data review and results of the subsequent underwater diving survey to further investigate the critical unidentified anomalies, as well as an inshore visual search of the proposed route by the diving team. Finally, the report outlines appropriate recommendations based on the review and analysis of the remote sensing data and the diving survey.


GRISSOM
WHITE
FREEMAN
CHAFFEE
SEAL BEACH
CALIFORNIA
LONG BEACH HARBOR
MONTEREY
ESTHER
SAN FRANCISCO
LOS ANGELES
CALIFORNIA AREA LOCATION
N
STATE WATERS
X=1,458,129
Y=553,429
HUNTINGTON BEACH
THREE
PIPELINE ROUTE TO SHORE
SURVEY GRID FOR POWER CABLE & POSSIBLE WATER LINE.
P-0296
130'
X=1,424,260
Y=525,220
CHEVRON
PROPOSED CHEVRON DRILLING & PRODUCTION PLATFORM "EDITH"
PIPELINE
P-0300
P-0301
SHELL'S DRILLING PLATFORM "ELLEN"
SHELL'S PRODUCTION PLATFORM "ELLY"
SHELL
SHELL
SOUTHBOUND SHIPPING
300'
600'
900'
150'
WATERS
8000' 0 8000' 16000'
SCALE IN FEET
Chevron
Chevron U.S.A., Inc.
Western Region Production Department
PLATFORM EDITH CABLE SURVEY
GEOPHYSICAL SURVEY LINES
Fig. 1

2.0 RESOURCE INVESTIGATION

2.1 Methods of Site Investigation

The project area was investigated three ways. These included the review of published and unpublished literature, a review of the remote sensing data, and a visual search conducted by a team of divers to examine the critical anomalies seen on the geophysical records which could not be correlated with known cultural features.

A comprehensive literature survey on the archaeology of the southern California offshore area by Stickel (1978) clearly documents the actual presence of cultural resources in the general region of this investigation. Another recent review of the area is provided by Bean and Smith (1978) on the archaeology and ethnology of the area, with the latter emphasized. More specifically, the prehistoric underwater resources of the general area have been assessed by Hudson (1976) and Stickel (1978), which also documents actual historic shipwrecks and other sites in the greater study area, as well as in the immediate environs of the proposed cable route. A number of unpublished reports have been compiled for the immediate area of the proposed project (Hole 1976a, 1976b, 1976c; Hudson, 1977; Desautels, 1980). These are cultural resource surveys conducted within Block 254, OCS Tract P-0296. All of these literature sources have been reviewed during the course of this investigation.

A geohysical investigation of the proposed cable route was conducted by Woodward-Clyde Consultants in order to fulfill Chevron's requirements for pre-construction data on the ocean floor, provide information on possible geologic constraints, and obtain data for an archaeological and cultural resource evaluation. Sixty-three nautical miles

of remote sensing data consisting of fathometer, side scan sonar, magnetometer, and subbottom profiler records was obtained. A detailed description of the field operations and the equipment utilized during the survey are outlined in Woodward-Clyde Consultants (1981). The side scan sonar, magnetometer, and subbottom profiler records of all survey lines were reviewed in detail to detect any anomalies which might indicate the existance of cultural resources.

An underwater search survey of the critically-significant anomalies identified on the geophysical records was conducted on 13 August 1981. The field team consisted of personnel from Woodward-Clyde Consultants and Environmental Research Archaeologists. Unidentified anomalies were considered critical if they were located within close proximity (approximately 150 metres) to the proposed cable route. In addition, a shallow-water geophysical investigation and diver inspection of the nearshore portion of the proposed cable route, that portion not previously covered during the offshore geophysical survey, was conducted. A detailed description of the field operations and the equipment used during this phase of the investigation is contained in Woodward-Clyde Consultants (1981).

During the diving investigation the seas were calm with a 2 to 3-foot swell and minimal chop. Water visibility was generally limited in the deeper sections to 12 to 15 feet at the bottom with slightly better conditions near the surface. Closer to the surf zone, visibility decreased to 5 to 10 feet. Water temperature was approximately 68° at the surface. Several search methods were utilized during the diving operation. Circle searches, towed diver technique, and linear swim searches were all employed during the course of the survey. The circle search survey pattern was utilized in the areas where the sea bed was relatively

smooth. The circular search method was carried out at each buoyed location marking the area of a critical anomaly. A dive team consisting of an archaeologist and a geotechnical engineer set out a central anchor point. From this anchor point a calibrated line was attached and laps were swum in search of objects of cultural origin.

2.2 Regional Review

Significant cultural resources may be classified into three primary catagories. The prehistoric period covers the time frame from the earliest habitation of man in California (circa 50,000 years B.P.) to the beginning of the ethnohistoric/historic period, approximately 400 years B.P. The advent of this period was marked by the beginning of specialized adaptations of cultural groups to their own localized environments. The start of this era coincides with the discovery of California in 1542 A.D. and the subsequent influx of large numbers of Spanish settlers.

Prehistoric cultural resources have been evaluated around all the submarine shores of the U.S. (Dixon, 1976; Stickel, 1978; Science Applications, Inc., 1979; Gagliano, 1977; and Roberts, 1979). Specifically, for the offshore areas of California, these sites may range from individual finds of stone mortars (Hudson, 1976) to sites containing a full array of artifacts including scrapers, points, manos, etc. (Moriarty, 1964; Stickel, 1978; Muche, 1980). Since such sites document early human presence and adoptations in California, possibly before the sea level rose and inundated them, they are considered to be critically significant.

Ethnohistoric sites in the study area would consist of material either intentionally (ie: ceremonial deposition)

or inadvertantly (ie: capsizing of a native canoe) deposited into the ocean. The project area lies within the territory of the native Gabrielino Indians who had adaptations oriented to the ocean and who carried on active sea commerce, such as obtaining steatite material fom Catalina Island quarries (Bean and Smith, 1978). If such data were to be found in the study area, it would be considered significant, for it would help fill the current knowledge gaps not fully documented by the ethnographic record.

Historical cultural resources in the study area would consist of shipwrecks, sunken historic buildings or shore facilities (ie: docks and wharves) and sunken aircraft. The ages of the resources presumably would post-date the discovery of California by Juan Cabrillo in 1542 A.D. and range from then until the present (Marshall, 1978). For recent shipwrecks to be culturally significant, they must have unique features, such as the type of vessel, cargo, etc., and/or be associated with persons significant to the history of California.

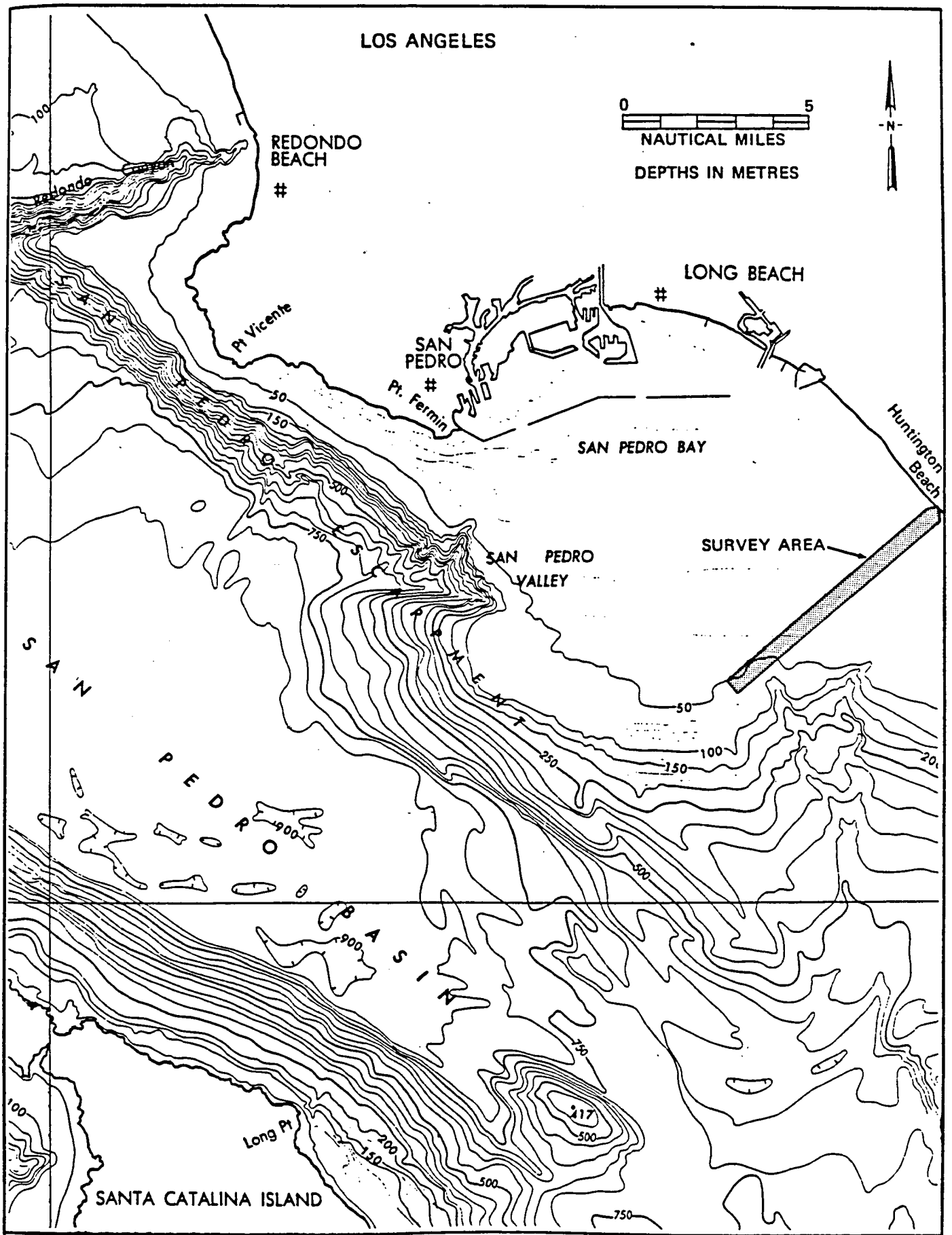
The research potential of underwater archaeological sites for generating significant knowledge via the application of formal scientific research designs has recently been asserted (Stickel, 1981). Similarly, the research significance of shipwrecks, in terms of what they can tell us about past human behavior (they have been called "microcosms" of the culture of which they were a part) is being supported (Gould, 1981). All of these types of resources have been found in the general area of southern California and in the greater environs of the project's study area. Thus, they were specifically sought in the literature search, in the geophysical records review, and during the diving survey.

2.3 Site Investigation

The study area is located off Huntington Beach and extends southwestward to the location of proposed Platform Edith, encompassing a rectangular area approximately 8 miles long and 3000 feet wide (Figure 1). The surveyed area ranges in water depth from 12 feet inshore to 165 feet near Platform Edith. The sea floor has a very gradual descent out to Platform Edith and is comprised mostly of smooth sand, with only incidental rock outcrops. To the southeast of the proposed platform location is a major underwater drainage channel which may represent an ancient course of the Los Angeles River or the San Gabriel River, which helped form San Pedro Bay (Figure 2). Such watercourses on land have a high number of archaeological sites associated with them and their ancient counterparts most probably did as well (Stickel, 1978). Since the project area lies just to the west of the ancient channel, there is the probability of the occurence of submerged prehistoric sites. Of importance to this particular study is the fact that Chevron is planning to lay a 4-inch diameter cable directly on the sea floor, and therefore would not disturb any subbottom area which might contain buried cultural resources. Thus, the utmost concern was for any cultural resources residing directly on the sea floor which would be disturbed by the cable. Nonetheless, the subbottom profile records were also studied to search for buried cultural resources.

2.4 Results

A review of published and unpublished literature sources failed to locate any known prehistoric sites directly in the study area. A summary of historical shipwrecks by Desautels (1980) listed a number of sunken vessels as being located in "San Pedro". Most of these that have been accurately located are actually within San Pedro Harbor. No known shipwrecks are located within the study area.



PLATFORM EDITH CABLE SURVEY	SAN PEDRO CHANNEL BATHYMETRY	Fig. 2

Sixty-three nautical miles of remote sensing data, which consisted of side scan sonar, magnetometer, and subbottom profiler records, were carefuly examined for any indication of the presence of cultural resources. Side scan sonar and magnetometer anomalies were mapped by Woodward-Clyde Consultants' geophysicists, and are shown on Table 1 and Figure 3. (Figure 3.3, Woodward-Clyde Consultants, 1981). No anomalous features were noted on the subbottom profiler records. Most of the anomalies can be clearly attributed to the presence of sea floor pipelines, cables, abandoned wells, and existing platforms. Some of them, however, could not.

The geophysical anomalies, as noted during the initial data review, could possibly represent significant cultural resources, either prehistoric or historic. Prehistoric cultural sites could have been represented by anomalies L and M now identified as "rock or debris", and historic cultural resources could have been represented by the magnetometer anomalies U and V. Since some or all of these anomalies may have represented significant cultural resources, further investigation was required to properly identify them. Thus, it was recommended that more field work be done in order to address the possible presence of cultural resources, and that a diver/archaeologist inspect the anomalies to determine whether or not they were cultural resources of significance.

Five geophysical anomalies, which were considered significant because of their close proximity to the proposed cable route, were investigated during the diving survey. These included anomalies S, U, F, T, and V. None were found to be an archaeological or cultural resource.

In addition, additional geophysical data consisting of bathymetric and side scan sonar records, were obtained in the nearshore area. This researcher inspected the side scan sonar records and found no additional anomalies of interest to the cultural resources assessment. Linear diver searches of this same area confirmed this assessment. A summary of the cultural resource survey dives is presented in Table 2.

TABLE 1

SIDE SCAN SONAR AND MAGNETOMETER ANOMALIES

(Table 4.1, Woodward-Clyde Consultants (1981). All anomalies are plotted on Figure 3).

Anomaly	Line	Fix #	Magnetometer (Gammas)	Side Scan Sonar	Description/Remarks
A	1	6.8	12	Yes	Shell 16" pipeline.
	2	64.6	18	Yes	
	3	132.6	18	Yes	
	4	279	20	Yes	
	5	56	15	Yes	
	6	124.5	12	Yes	
	7	192.3	6	Yes	
	8	266	18	Yes	
B	4	276.5	No	Yes	Linear target, scrap cable(?).
C	3	128.5	No	Yes	Linear target, scrap cable (?), possibly same cable as anomaly B.
D	2	65.5	23	Yes	Abandoned well and associated debris.
	3	133.6	40	Yes	
E	15	230.6	650	No	Abandoned well, no surface expression.
F	3	337.2	12	No	Abandoned well, no surface expression,
	4	309.1	26	No	confirmed by diver inspection.
	5	353.1	8	No	
G	2	330.5	195	No	Abandoned well, no surface expression.
H	7	384.6	95	No	Platform Emmy and associated debris.
	5	357.4	205	No	
	4	313.7	30	No	
	6	368.2	375	Yes	

Table 1 (Page 2)

Anomaly	Line	Fix #	Magnetometer (Gammas)	Side Scan Sonar	Description
I	1	321.4	78	Yes	Platform Eva and associated debris.
	2	329.3	32	No	
J	6	370.2	1600	No	Four partially-buried pipelines and power cable from Platform Emmy to shore.
	6	369.7	1650	No	
	7	386	150	No	
	17	372	470	No	
	4	314.5	40	No	
K	2	62.5	No	Yes	Anchor drag mark.
	3	130.5	No	Yes	
L	2	83.6	No	Yes	Rock or debris pile, approximately 25' diameter, 1200' NW of proposed cable route.
M	2	84.6	No	Yes	Rock or debris pile, approximately 100' diameter, 1100' NW of proposed cable route.
N	6	101.3	No	Yes	Side scan sonar target (5'x10'), 1000' SE of proposed cable route.
O	7	172.7	No	Yes	Side scan sonar target (10'x30'), 1400' SE of proposed cable route.
P	7	174.4	10	Yes	Side scan sonar target (5'x5'), 1800' SE of proposed cable route.
	7	175.2	10	Yes	Side scan sonar target (5'x70'), 1200'
	6	108.1	12	Yes	SE of proposed cable route.
Q	6	105.3	8	Yes	Side scan sonar target (10'x15'), 1000' SE of proposed cable route.

Table 1 (Page 3)

Anomaly	Line	Fix #	Magnetometer (Gammas)	Side Scan Sonar	Description
R	15	233.7	20	No	Magnetometer signature: peak half-width 140 feet.
	1	319.9	24	No	Complex magnetometer signature: approximately 800 feet long. Both anomalies approximately 1700' NW of proposed cable route.
S	4	306.3	30	No	Sharp magnetometer signature: peak half-width 50 feet, no surface source seen in diver inspection.
T	4	310.2	20	No	Sharp magnetometer signature: peak half-width 100 feet, no surface source seen in diver inspection.
U	5	352.3	20	No	Complex magnetometer signature: approximately 800 feet long, no surface source seen in diver inspection.
V	3	341.5	20	No	Complex magnetometer signature: approximately 1000 feet long, no surface source seen in diver inspection.
W	2	333.3	25	No	Sharp magnetometer signature: peak half-width 75 feet, 800' NW of proposed cable route.
X	2	334.4	48	No	Sharp magnetometer signature: peak half-width 150 feet, 800' NW of proposed cable route.
Y	1	325	20	No	Complex magnetometer signature: approximately 800 feet long, 1600' NW of proposed cable route.

Table 1 (Page 4)

Anomaly	Line	Fix #	Magnetometer (Gammas)	Side Scan Sonar	Description
Z	1	327	22	No	Sharp magnetometer signature: peak half-width 100 feet, 1600' NW of proposed cable route.
AA	6	121.3	No	Yes	Possible seep.
	7	188.7	No	Yes	
BB	1	8.5	No	Yes	Anchor drag mark.
CC	101	8.2	-	Yes	Outfall and pipeline.
	103	24.8	-	Yes	
CC'	-	-	-	-	Octagonal concrete block approximately 3' high and 6' across, observed during diver inspection (Appendix E).

TABLE 2

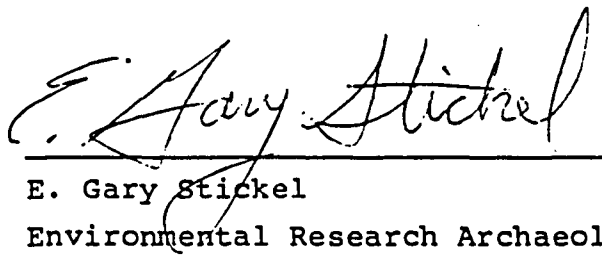
DIVING INVESTIGATION

Dive	Anomaly (re:Table 1)	Value (gammas)	Time (minutes)	Water Depth (feet)	Technique	Comments
1	S	30	11	72	Circle Search	Smooth bottom; no artifacts located
2	U	20	8	65	Circle Search	"
3	F	26	8	60	Circle Search	"
4	T	20	8	57	Circle Search	"
5	V	20	10	46	Circle Search	"
6	-	-	16	12-38	Towed Diver	Transect along proposed cable route; smooth sand bottom, rock outcrops observed; no artifacts located
7	-	-	42	10-15	Towed Diver & Linear Swim	Transects parallel to shore; smooth sand bottom; outfall pipeline located

TOTAL DIVE TIME ..... 103 MINUTES

3.0 CONCLUSIONS AND RECOMMENDATIONS

It was initially concluded during the early phase of this investigation that significant cultural resources could exist at the various unidentifiable geophysical anomalies listed in Table 1 and that a diving survey should be conducted to determine whether in fact any of the anomalies were indeed significant cultural resources. The subsequent survey confirmed that none were cultural resources. Thus, given the extensive data from both the geophysical records and the diving survey, it is the conclusion of this investigator that there are no cultural resources that will be affected by this project.



E. Gary Stickel
Environmental Research Archaeologists
Los Angeles, California
25 September 1981

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A P P E N D I X 3

EMISSION CALCULATIONS

MOBILE SOURCE EMISSIONS

APPENDIX 3

Emission Calculations

Mobile Sources

Note: Emission Factors for this Appendix are found in Appendix 5.

Crewboat cruise speed 16 knots.

Tugboat cruise speed 13 knots (with Barge in tow).

PART I

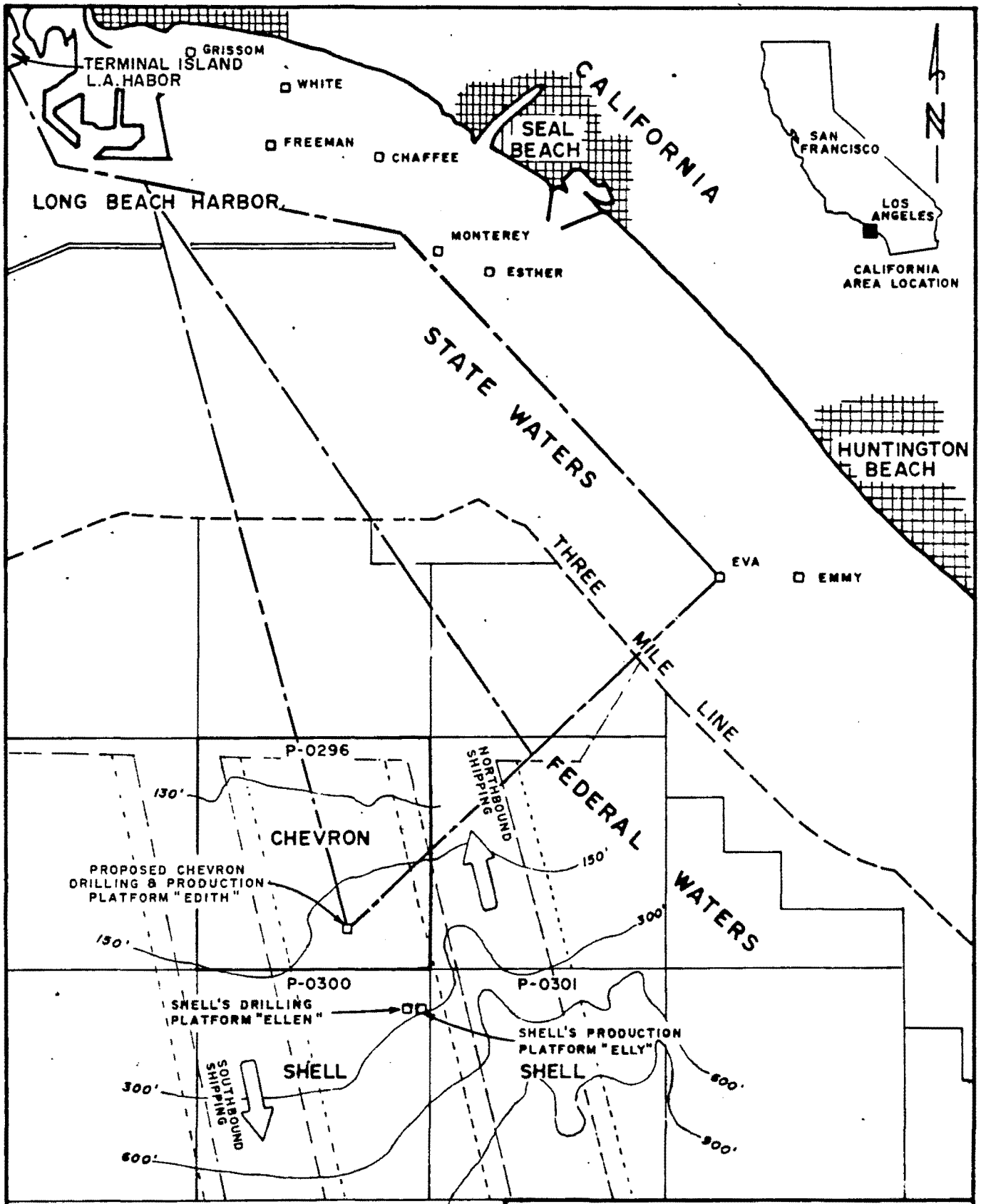
Distances (Refer Appendix 3, Fig. 1)

A) Terminal Island - L.A. Harbor to Platform Eva 10.07nm (nautical miles) Round trip 20.14nm.

B) Terminal Island - L.A. Harbor to Platform Eva to halfway point to Platform Edith and return to Terminal Island 22.47nm.

C) Terminal - L.A. Harbor to Platform Eva to Platform Edith and return to Terminal Island 26.11nm.

D) Terminal Island - L.A. Harbor to Platform Edit 10.44nm; Round trip 20.88nm.



CHEVRON PLATFORM "EDITH" LOCATION

X=1,424,260 Y=525,220

CALIFORNIA (LAMBERT) COORDINATE SYSTEM ZONE 6

Chevron U.S.A. Inc

Western Region Production Department

CHEVRON'S PLATFORM "EDITH"

SAN PEDRO BAY DEVELOPMENT

TRAVEL ROUTES-MOBILE SOURCES

DATE 3-22-82 APPENDIX 3, FIGURE 1

A-H-2334

PART II

Crewboat Emissions (Two engines at 174 shaft horse power (shp) each; at 9 gal/hr fuel consumption each, cruise mode and 0.9 gal/hr idle mode each to be calculated for the first week will use distance "B" from Part I. Time required to travel 22.47nm is 1.40 hr. Assume two round trips per day.

Crewboat Emissions (Cruise Mode)

$$1.40 \frac{\text{hr}}{\text{trip}} \times 2 \text{ engines} \times 9 \frac{\text{gal}}{\text{hr/engine}} \times \frac{14 \text{ trips}}{14 \text{ days}} = 25.2 \frac{\text{gal}}{\text{day}}$$

$$25.2 \frac{\text{gal}}{\text{day}} \times \frac{422.9 \text{ lb}}{1000 \text{ gal}} \ NO_x = 10.7 \frac{\text{lb}}{\text{day}} \ NO_x$$

$$25.2 \frac{\text{gal}}{\text{day}} \times \frac{170.2 \text{ lb}}{1000 \text{ gal}} \ \text{THC} = 4.3 \frac{\text{lb}}{\text{day}} \ \text{THC}$$

$$25.2 \frac{\text{gal}}{\text{day}} \times \frac{126.3 \text{ lb}}{1000 \text{ gal}} \ \text{CO} = 3.2 \frac{\text{lb}}{\text{day}} \ \text{CO}$$

$$25.2 \frac{\text{gal}}{\text{day}} \times \frac{29.2 \text{ lb}}{1000 \text{ gal}} \ SO_2 = 0.7 \frac{\text{lb}}{\text{day}} \ SO_2$$

Crewboat Emissions (Idle Mode)

Assume one hour idle per round trip.

$$\frac{14 \text{ trips}}{14 \text{ days}} \times \frac{1 \text{ hr}}{\text{trip}} \times 2 \text{ engines} \times 0.9 \frac{\text{gal}}{\text{hr/engine}} = 1.8 \frac{\text{gal}}{\text{day}}$$

$$1.8 \frac{\text{gal}}{\text{day}} \times \frac{6.4 \text{ lb}}{1000 \text{ gal}} \ NO_x = 0.01 \frac{\text{lb}}{\text{day}} \ NO_x$$

$$1.8 \frac{\text{gal}}{\text{day}} \times \frac{391.2 \text{ lb}}{1000 \text{ gal}} \ \text{THC} = 0.7 \frac{\text{lb}}{\text{day}} \ \text{THC}$$

$$1.8 \frac{\text{gal}}{\text{day}} \times \frac{210.3 \text{ lb}}{1000 \text{ gal}} \ \text{CO} = 0.4 \frac{\text{lb}}{\text{day}} \ \text{CO}$$

$$1.8 \frac{\text{gal}}{\text{day}} \times \frac{29.2 \text{ lb}}{1000 \text{ gal}} \ SO_2 = 0.05 \frac{\text{lb}}{\text{day}} \ SO_2$$

Crewboat Emissions (Two engines at 174 shp each; at 9 gal/hr fuel consumption each at cruise mode and 0.9 gal/hr idle mode each). Emissions to be calculated for the second week will use distance "C" from Part I. Time required to travel 26.11nm is 1.63 hr. Assume two round trips per day.

Crewboat Emissions (Cruise Mode)

$$1.63 \frac{\text{hr}}{\text{trip}} \times 2 \text{ engines} \times 9 \frac{\text{gal}}{\text{hr/engine}} \times \frac{14 \text{ trips}}{14 \text{ days}} = 29.3 \frac{\text{gal}}{\text{day}}$$

$$29.3 \frac{\text{gal}}{\text{day}} \times \frac{422.9 \text{ lb}}{1000 \text{ gal}} \ NO_x = 12.4 \frac{\text{lb}}{\text{day}} \ NO_x$$

$$29.3 \frac{\text{gal}}{\text{day}} \times \frac{170.2 \text{ lb}}{1000 \text{ gal}} \ \text{THC} = 5.0 \frac{\text{lb}}{\text{day}} \ \text{THC}$$

$$29.3 \frac{\text{gal}}{\text{day}} \times \frac{126.3 \text{ lb}}{1000 \text{ gal}} \ \text{CO} = 3.7 \frac{\text{lb}}{\text{day}} \ \text{CO}$$

$$29.3 \frac{\text{gal}}{\text{day}} \times \frac{29.2 \text{ lb}}{1000 \text{ gal}} \ SO_2 = 0.9 \frac{\text{lb}}{\text{day}} \ SO_2$$

Crewboat Emissions (Idle Mode)

Assume one hour idle per round trip.

$$\frac{14 \text{ trips}}{14 \text{ days}} \times \frac{1 \text{ hr}}{\text{trip}} \times 2 \text{ engines} \times 0.9 \frac{\text{gal}}{\text{hr/engine}} = 1.8 \frac{\text{gal}}{\text{day}}$$

$$1.8 \frac{\text{gal}}{\text{day}} \times \frac{6.4 \text{ lb}}{1000 \text{ gal}} \ NO_x = 0.01 \frac{\text{lb}}{\text{day}} \ NO_x$$

$$1.8 \frac{\text{gal}}{\text{day}} \times \frac{391.2 \text{ lb}}{1000 \text{ gal}} \ \text{THC} = 0.7 \frac{\text{lb}}{\text{day}} \ \text{THC}$$

$$1.8 \frac{\text{gal}}{\text{day}} \times \frac{210.3 \text{ lb}}{1000 \text{ gal}} \ \text{CO} = 0.4 \frac{\text{lb}}{\text{day}} \ \text{CO}$$

$$1.8 \frac{\text{gal}}{\text{day}} \times \frac{29.2 \text{ lb}}{1000 \text{ gal}} \ SO_2 = 0.05 \frac{\text{lb}}{\text{day}} \ SO_2$$

PART III

Tugboat Emissions (Two engines at 450 shp each; at 24 gal/hr fuel consumption each, cruise mode, and 2.4 gal/hr idle mode each). Emissions to be calculated are:

1) One round trip to Platform Edit to bring riser pipe, use distance "D" from Part I. Time required to travel 20.88nm is 1.60 hr.

Tugboat Emissions (Cruise Mode - round trip supply mission to Platform Edith)

$$1.60 \frac{\text{hr}}{\text{trip}} \times 2 \text{ engines} \times 24 \frac{\text{gal}}{\text{hr/engine}} \times \frac{1 \text{ trip}}{14 \text{ days}} = 5.5 \frac{\text{gal}}{\text{day}}$$

$$5.5 \frac{\text{gal}}{\text{day}} \times \frac{338.6}{1000 \text{ gal}} \ NO_x = 1.9 \frac{\text{lb}}{\text{day}} \ NO_x$$

$$5.5 \frac{\text{gal}}{\text{day}} \times \frac{44.5 \text{ lb}}{1000 \text{ gal}} \ \text{THC} = 0.2 \frac{\text{lb}}{\text{day}} \ \text{THC}$$

$$5.5 \frac{\text{gal}}{\text{day}} \times \frac{99.7 \text{ lb}}{1000 \text{ gal}} \ \text{CO} = 0.5 \frac{\text{lb}}{\text{day}} \ \text{CO}$$

$$5.5 \frac{\text{gal}}{\text{day}} \times \frac{29.2 \text{ lb}}{1000 \text{ gal}} \ SO_2 = 0.2 \frac{\text{lb}}{\text{day}} \ SO_2$$

Tugboat Emissions (Idle Mode - round trip supply mission to Platform Edith)

Assume one hour idle per round trip.

$$\frac{1 \text{ trip}}{14 \text{ days}} \times \frac{1 \text{ hr}}{\text{trip}} \times 2 \text{ engines} \times 2.4 \frac{\text{gal}}{\text{hr/engine}} = 0.3 \frac{\text{gal}}{\text{day}}$$

$$0.3 \frac{\text{gal}}{\text{day}} \times \frac{99.4 \text{ lb}}{1000 \text{ gal}} \; NO_x = 0.03 \frac{\text{lb}}{\text{day}} \; NO_x$$

$$0.3 \frac{\text{gal}}{\text{day}} \times \frac{118.1 \text{ lb}}{1000 \text{ gal}} \; \text{THC} = 0.04 \frac{\text{lb}}{\text{day}} \; \text{THC}$$

$$0.3 \frac{\text{gal}}{\text{day}} \times \frac{282.5 \text{ lb}}{1000 \text{ gal}} \; \text{CO} = 0.1 \frac{\text{lb}}{\text{day}} \; \text{CO}$$

$$0.3 \frac{\text{gal}}{\text{day}} \times \frac{29.2 \text{ lb}}{1000 \text{ gal}} \; SO_2 = 0.01 \frac{\text{lb}}{\text{day}} \; SO_2$$

Worker Transportation (Offshore - Daily)

Crewboat origination point - Terminal Island, L.A. Harbor round trip commute distance from L.A. and surrounding communities is approximately 60 miles.

$$50 \frac{\text{vehicles}}{\text{day}} \times \frac{60 \text{ miles}}{\text{vehicles}} = 3000 \frac{\text{miles}}{\text{day}}$$

$$3000 \frac{\text{miles}}{\text{day}} \times 2.44 \frac{\text{g}}{\text{mi.}} \; NO_x \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 16.1 \frac{\text{lb}}{\text{day}} \; NO_x$$

$$3000 \frac{\text{miles}}{\text{day}} \times 1.3 \frac{\text{g}}{\text{mi.}} \; \text{THC} \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 8.6 \frac{\text{lb}}{\text{day}} \; \text{THC}$$

$$3000 \frac{\text{miles}}{\text{day}} \times 12.25 \frac{\text{g}}{\text{mi.}} \; \text{CO} \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 81.0 \frac{\text{lb}}{\text{day}} \; \text{CO}$$

$$3000 \frac{\text{miles}}{\text{day}} \times 0.13 \frac{\text{g}}{\text{mi.}} \; SO_2 \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 0.9 \frac{\text{lb}}{\text{day}} \; SO_2$$

$$3000 \frac{\text{miles}}{\text{day}} \times 0.35 \frac{\text{g}}{\text{mi.}} \; \text{TSP} \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 2.3 \frac{\text{lb}}{\text{day}} \; \text{TSP}$$

Worker Transportation (Onshore - Daily)

Assume commute distance from L.A. and surrounding communities to Terminal Island, L.A. is approximately 60 miles. Assume a work force of 25 people.

$$\frac{25 \text{ vehicles}}{\text{day}} \times \frac{60 \text{ miles}}{\text{vehicle}} \times 1500 \frac{\text{miles}}{\text{day}}$$

$$1500 \frac{\text{miles}}{\text{day}} \times 2.44 \frac{\text{g}}{\text{mi.}} \text{ } NO_x \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 8.1 \frac{\text{lb}}{\text{day}} \text{ } NO_x$$

$$1500 \frac{\text{miles}}{\text{day}} \times 1.3 \frac{\text{g}}{\text{mi.}} \text{ THC} \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 4.3 \frac{\text{lb}}{\text{day}} \text{ THC}$$

$$1500 \frac{\text{miles}}{\text{day}} \times 12.25 \frac{\text{g}}{\text{mi.}} \text{ CO} \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 40.5 \frac{\text{lb}}{\text{day}} \text{ CO}$$

$$1500 \frac{\text{miles}}{\text{day}} \times 0.13 \frac{\text{g}}{\text{mi.}} \text{ } SO_2 \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 0.4 \frac{\text{lb}}{\text{day}} \text{ } SO_2$$

$$1500 \frac{\text{miles}}{\text{day}} \times 0.35 \frac{\text{g}}{\text{mi.}} \text{ TSP} \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 1.2 \frac{\text{lb}}{\text{day}} \text{ TSP}$$

Supply Truck Transportation (Onshore)

Long Beach - L.A. surrounding area near Terminal Island. Assume approximately 50 miles round trip; 21 round trips over the 8 week time prior to offshore pipeline installation. (Assume 5 days per work week.)

$$\frac{21 \text{ vehicle trips}}{40 \text{ days}} \times \frac{50 \text{ miles}}{\text{vehicle trip}} = 26.2 \frac{\text{miles}}{\text{day}}$$

$$26.2 \frac{\text{miles}}{\text{day}} \times 20.49 \frac{\text{g}}{\text{mi.}} \text{ } NO_x \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 1.2 \frac{\text{lb}}{\text{day}} \text{ } NO_x$$

$$26.2 \frac{\text{miles}}{\text{day}} \times 2.11 \frac{\text{g}}{\text{mi.}} \text{ THC} \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 0.1 \frac{\text{lb}}{\text{day}} \text{ THC}$$

$$26.2 \frac{\text{miles}}{\text{day}} \times 13.14 \frac{\text{g}}{\text{mi.}} \text{ CO} \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 0.8 \frac{\text{lb}}{\text{day}} \text{ CO}$$

$$26.2 \frac{\text{miles}}{\text{day}} \times 2.73 \frac{\text{g}}{\text{mi.}} \text{ } SO_2 \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 0.2 \frac{\text{lb}}{\text{day}} \text{ } SO_2$$

$$26.2 \frac{\text{miles}}{\text{day}} \times 1.96 \frac{\text{g}}{\text{mi.}} \text{ TSP} \times \frac{1 \text{ lb}}{453.6 \text{ g}} = 0.1 \frac{\text{lb}}{\text{day}} \text{ TSP}$$

APPENDIX 3

Table 1

Offshore Mobile Source Pipeline Construction Phase Emission Summary

Note: Emission factors are in Appendix 5

	Activity Duration days	NOx lb/day	VOC(1) lb/day	CO lb/day	SO_2 lb/day	TSP lb/day
Crewboat Emissions(2)	14	10.71	5.0	3.6	0.75	N/A
Crewboat Emissions(3)	14	12.41	5.7	4.1	0.95	N/A
Tugboat Emissions(4)	14	1.93	0.24	0.6	0.21	N/A
Worker Transportation	14	16.1	8.6	81.0	0.9	2.3
Total(5) (Tons)		0.29	0.14	0.63	0.02	0.02

N/A = Not available

(1) Values listed are actually THC. The corresponding VOC emissions are less than the values shown.

(2) Crewboat emissions for the first week of operations were calculated with respect to distance "B" of Part I of Appendix 3.

(3) Crewboat emissions for the second week of operations were calculated with respect to distance "C" of Part I of Appendix 3.

(4) Tugboat emissions for one supply mission to Platform Edith to deliver riser pipe.

(5) Total is determined by multiplying pollutant x duration and converting to tons (2,000 lbs/ton).

APPENDIX 3

Table 2

Note: Emission factors are in Appendix 5

Onshore Mobile Source Pipeline Construction Emission Summary
(Onshore welding of pipeline sections prior to offshore construction.)

	Activity Duration days	NOx lb/day	VOC(1) lb/day	CO lb/day	SO_2 lb/day	TSP lb/day
Worker Transportation	40	8.1	4.3	40.5	0.4	1.2
Supply Truck Transportation	40	1.2	0.1	0.8	0.2	0.1
Total(2) (Tons)		0.19	0.09	0.83	0.01	0.03

N/A = Not available

(1) Values listed are actually THC. The corresponding VOC emissions are less than the values shown.

(2) Total is determined by multiplying pollutant x duration and converting to tons (2,000 lbs/ton).

A P P E N D I X 4

EMISSION CALCULATIONS

FACILITY CONSTRUCTION EMISSIONS

APPENDIX 4

Emissions Calculations
Facility Construction Emissions

Note: Emission Factors for this Appendix are found in Appendix 5.

OFFSHORE

Fabrication Barge Emissions

Deck Winches (Three engines at 185 hp each at 9 gal/hr fuel consumption each) Winches are used twice - once to set anchors and once to retrieve anchors. Time required to set anchors - 2 hrs; time required to retrieve anchors 2 hrs.

$$3 \text{ engines} \times 9 \frac{\text{gal}}{\text{hr/engine}} \times \frac{4 \text{ hr}}{14 \text{ days}} = 7.7 \frac{\text{gal}}{\text{day}}$$

$$7.7 \frac{\text{gal}}{\text{day}} \times \frac{469 \text{ lb}}{1000 \text{ gal}} \ NO_x = 3.6 \frac{\text{lb}}{\text{day}} \ NO_x$$

$$7.7 \frac{\text{gal}}{\text{day}} \times \frac{37.5 \text{ lb}}{1000 \text{ gal}} \ \text{THC} = 0.3 \frac{\text{lb}}{\text{day}} \ \text{THC}$$

$$7.7 \frac{\text{gal}}{\text{day}} \times \frac{102.0 \text{ lb}}{1000 \text{ gal}} \ \text{CO} = 0.8 \frac{\text{lb}}{\text{day}} \ \text{CO}$$

$$7.7 \frac{\text{gal}}{\text{day}} \times \frac{31.2 \text{ lb}}{1000 \text{ gal}} \ SO_2 = 0.2 \frac{\text{lb}}{\text{day}} \ SO_2$$

$$7.7 \frac{\text{gal}}{\text{day}} \times \frac{33.5 \text{ lb}}{1000 \text{ gal}} \ \text{TSP} = 0.3 \frac{\text{lb}}{\text{day}} \ \text{TSP}$$

Pipe Line-up Powerpack (One engine at 175 hp at 10 gal/hr fuel consumption)

$$10 \frac{\text{gal}}{\text{hr}} \times \frac{24 \text{ hr}}{\text{day}} = 240 \frac{\text{gal}}{\text{day}}$$

$$240 \frac{\text{gal}}{\text{day}} \times \frac{469.0 \text{ lb}}{1000 \text{ gal}} \ NO_x = 112.6 \frac{\text{lb}}{\text{day}} \ NO_x$$

$$240 \frac{\text{gal}}{\text{day}} \times \frac{37.5 \text{ lb}}{1000 \text{ gal}} \ \text{THC} = 9.0 \frac{\text{lb}}{\text{day}} \ \text{THC}$$

$$240 \frac{\text{gal}}{\text{day}} \times \frac{102.0 \text{ lb}}{1000 \text{ gal}} \ \text{CO} = 24.5 \frac{\text{lb}}{\text{day}} \ \text{CO}$$

$$240 \frac{\text{gal}}{\text{day}} \times \frac{31.2 \text{ lb}}{1000 \text{ gal}} \ SO_2 = 7.5 \frac{\text{lb}}{\text{day}} \ SO_2$$

240 $\frac{\text{gal}}{\text{day}}$ x $\frac{33.5\ \text{lb}}{1000\ \text{gal}}$ TSP = 8.0 $\frac{\text{lb}}{\text{day}}$ TSP

Crane-pipe handling (One engine at 175 hp at 10 gal/hr fuel consumption)

10 $\frac{\text{gal}}{\text{hr}}$ x $\frac{24\ \text{hr}}{\text{day}}$ = 240 $\frac{\text{gal}}{\text{day}}$

240 $\frac{\text{gal}}{\text{day}}$ x $\frac{469.0\ \text{lb}}{1000\ \text{gal}}$ NO_x = 112.6 $\frac{\text{lb}}{\text{day}}$ NO_x

240 $\frac{\text{gal}}{\text{day}}$ x $\frac{37.5\ \text{lb}}{1000\ \text{gal}}$ THC = 9.0 $\frac{\text{lb}}{\text{day}}$ THC

240 $\frac{\text{gal}}{\text{day}}$ x $\frac{102.0\ \text{lb}}{1000\ \text{gal}}$ CO = 24.5 $\frac{\text{lb}}{\text{day}}$ CO

240 $\frac{\text{gal}}{\text{day}}$ x $\frac{31.2\ \text{lb}}{1000\ \text{gal}}$ SO_2 = 7.5 $\frac{\text{lb}}{\text{day}}$ SO_2

240 $\frac{\text{gal}}{\text{day}}$ x $\frac{33.5\ \text{lb}}{1000\ \text{gal}}$ TSP - 8.0 $\frac{\text{lb}}{\text{day}}$ TSP

Welding Engines - electric configuration (Six engines at 102 hp each at 6 gal/hr fuel consumption each)

6 engines x 6 $\frac{\text{gal}}{\text{hr/engine}}$ x 24 $\frac{\text{hrs}}{\text{day}}$ = 864 $\frac{\text{gal}}{\text{day}}$

864 $\frac{\text{gal}}{\text{day}}$ x $\frac{469.0\ \text{lb}}{1000\ \text{gal}}$ NO_x = 405.2 $\frac{\text{lb}}{\text{day}}$ NO_x

864 $\frac{\text{gal}}{\text{day}}$ x $\frac{37.5\ \text{lb}}{1000\ \text{gal}}$ THC = 32.4 $\frac{\text{lb}}{\text{day}}$ THC

864 $\frac{\text{gal}}{\text{day}}$ x $\frac{102.0\ \text{lb}}{1000\ \text{gal}}$ CO = 88.1 $\frac{\text{lb}}{\text{day}}$ CO

864 $\frac{\text{gal}}{\text{day}}$ x $\frac{31.2\ \text{lb}}{1000\ \text{gal}}$ SO_2 = 27.0 $\frac{\text{lb}}{\text{day}}$ SO_2

864 $\frac{\text{gal}}{\text{day}}$ x $\frac{33.5\ \text{lb}}{1000\ \text{gal}}$ TSP = 29.0 $\frac{\text{lb}}{\text{day}}$ TSP

Generators (Two engines at 102 hp each at 6 gal/hr fuel consumption each)

2 engines x 6 $\frac{\text{gal}}{\text{hr/engine}}$ x 24 $\frac{\text{hrs}}{\text{day}}$ = 288 $\frac{\text{gal}}{\text{day}}$

288 $\frac{\text{gal}}{\text{day}}$ x $\frac{469.0 \text{ lb}}{1000 \text{ gal}}$ NO_x = 135.0 $\frac{\text{lb}}{\text{day}}$ NO_x

288 $\frac{\text{gal}}{\text{day}}$ x $\frac{37.5 \text{ lb}}{1000 \text{ gal}}$ THC = 10.8 $\frac{\text{lb}}{\text{day}}$ THC

288 $\frac{\text{gal}}{\text{day}}$ x $\frac{102.0 \text{ lb}}{1000 \text{ gal}}$ CO = 29.4 $\frac{\text{lb}}{\text{day}}$ CO

288 $\frac{\text{gal}}{\text{day}}$ x $\frac{31.2 \text{ lb}}{1000 \text{ gal}}$ SO_2 = 8.9 $\frac{\text{lb}}{\text{day}}$ SO_2

288 $\frac{\text{gal}}{\text{day}}$ x $\frac{33.5 \text{ lb}}{1000 \text{ gal}}$ TSP = 9.6 $\frac{\text{lb}}{\text{day}}$ TSP

Compressors (Two engines at 102 hp each at 6.2 gal/hr fuel consumption each)

2 engines x 6.2 $\frac{\text{gal}}{\text{hr/engine}}$ x 24 $\frac{\text{hrs}}{\text{day}}$ = 297.6 $\frac{\text{gal}}{\text{day}}$

297.6 $\frac{\text{gal}}{\text{day}}$ x $\frac{469.0 \text{ lb}}{1000 \text{ gal}}$ NO_x = 139.6 $\frac{\text{lb}}{\text{day}}$ NO_x

297.6 $\frac{\text{gal}}{\text{day}}$ x $\frac{37.5 \text{ lb}}{1000 \text{ gal}}$ THC = 11.2 $\frac{\text{lb}}{\text{day}}$ THC

297.6 $\frac{\text{gal}}{\text{day}}$ x $\frac{102.0 \text{ lb}}{1000 \text{ gal}}$ CO = 30.4 $\frac{\text{lb}}{\text{day}}$ CO

297.6 $\frac{\text{gal}}{\text{day}}$ x $\frac{31.2 \text{ lb}}{1000 \text{ gal}}$ SO_2 = 9.3 $\frac{\text{lb}}{\text{day}}$ SO_2

297.6 $\frac{\text{gal}}{\text{day}}$ x $\frac{33.5 \text{ lb}}{1000 \text{ gal}}$ TSP = 10.0 $\frac{\text{lb}}{\text{day}}$ TSP

PART V

Pull Barge Emissions

Deck Winches (Three engines at 102 hp each at 6 gal/hr fuel consumption each. Winches are used to set and retrieve anchors 7 times. Time required to set anchors, 2 hrs., time required to retrieve anchors, 2 hrs. Total time required, 28 hrs.)

3 engines x 6 $\frac{\text{gal}}{\text{hr/engine}}$ x $\frac{28 \text{ hrs}}{14 \text{ days}}$ = 36 $\frac{\text{gal}}{\text{day}}$

$36 \frac{gal}{day} \times \frac{469.0\ lb}{1000\ gal}\ NO_x = 16.9 \frac{lb}{day}\ NO_x$

$36 \frac{gal}{day} \times \frac{37.5\ lb}{1000\ gal}\ THC = 1.4 \frac{lb}{day}\ THC$

$36 \frac{gal}{day} \times \frac{102.0\ lb}{1000\ gal}\ CO = 3.7 \frac{lb}{day}\ CO$

$36 \frac{gal}{day} \times \frac{31.2\ lb}{1000\ gal}\ SO_2 = 1.1 \frac{lb}{day}\ SO_2$

$36 \frac{gal}{day} \times \frac{33.5\ lb}{1000\ gal}\ TSP = 1.2 \frac{lb}{day}\ TSP$

Generators (Two engines at 143 hp each at 6.4 gal/hr fuel consumption each)

$2\ engines \times 6.4 \frac{gal}{hr/engine} \times 24 \frac{hrs}{day} = 307.2 \frac{gal}{day}$

$307.2 \frac{gal}{day} \times \frac{469.0\ lb}{1000\ gal}\ NO_x = 144.1 \frac{lb}{day}\ NO_x$

$307.2 \frac{gal}{day} \times \frac{37.5\ lb}{1000\ gal}\ THC = 11.5 \frac{lb}{day}\ THC$

$307.2 \frac{gal}{day} \times \frac{102.0\ lb}{1000\ gal}\ CO = 31.3 \frac{lb}{day}\ CO$

$307.2 \frac{gal}{day} \times \frac{31.2\ lb}{1000\ gal}\ SO_2 = 9.6 \frac{lb}{day}\ SO_2$

$307.2 \frac{gal}{day} \times \frac{33.5\ lb}{1000\ gal}\ TSP = 10.3 \frac{lb}{day}\ TSP$

Generator (One engine at 102 hp at 6 gal/hr fuel consumption)

$6 \frac{gal}{day} \times 24 \frac{hr}{day} = 144 \frac{gal}{day}$

$144 \frac{gal}{day} \times \frac{469.0\ lb}{1000\ gal}\ NO_x = 67.5 \frac{lb}{day}\ NO_x$

$144 \frac{gal}{day} \times \frac{37.5\ lb}{1000\ gal}\ THC = 5.4 \frac{lb}{day}\ THC$

$144 \frac{gal}{day} \times \frac{102.0\ lb}{1000\ gal}\ CO = 14.7 \frac{lb}{day}\ CO$

144 gal/day x 31.2 lb/1000 gal SO_2 = 4.5 lb/day SO_2

144 gal/day x 33.5 lb/1000 gal TSP = 4.8 lb/day TSP

Compressor (One engine of 102 hp at 6.2 gal/hr fuel consumption)

6.2 gal/hr x 24 hr/day = 148.8 gal/day

148.8 gal/day x 469.0 lb/1000 gal NO_x = 69.8 lb/day NO_x

148.8 gal/day x 37.5 lb/1000 gal THC = 5.6 lb/day THC

148.8 gal/day x 102.0 lb/1000 gal CO = 15.2 lb/day CO

148.8 gal/day x 31.2 lb/1000 gal SO_2 = 4.6 lb/day SO_2

148.8 gal/day x 33.5 lb/1000 gal TSP = 5.0 lb/day TSP

Pull Winch (One engine at 462 hp at 24 gal/hr fuel consumption; Engine is used 30 minutes per each hour as each pipeline section is welded on.)

24 gal/day x 12 hr/day = 288 gal/day

288 gal/day x 469.0 lb/1000 gal NO_x = 135.0 lb/day NO_x

288 gal/day x 37.5 lb/1000 gal THC = 10.8 lb/day THC

288 gal/day x 102.0 lb/1000 gal CO = 29.4 lb/day CO

288 gal/day x 31.2 lb/1000 gal SO_2 = 9.0 lb/day SO_2

288 gal/day x 33.5 lb/1000 gal TSP = 9.6 lb/day TSP

Crane (One engine at 525 hp at 29 gals/hr fuel consumption; Engine is used for only 12 hours at each platform for riser installation.)

$$29 \frac{\text{gal}}{\text{hr}} \times \frac{24 \text{ hrs}}{14 \text{ days}} = 49.7 \frac{\text{gal}}{\text{day}}$$

$$49.7 \frac{\text{gal}}{\text{day}} \times \frac{469.0 \text{ lb}}{1000 \text{ gal}} \ NO_x = 23.3 \frac{\text{lb}}{\text{day}} \ NO_x$$

$$49.7 \frac{\text{gal}}{\text{day}} \times \frac{37.5 \text{ lb}}{1000 \text{ gal}} \ THC = 1.9 \frac{\text{lb}}{\text{day}} \ THC$$

$$49.7 \frac{\text{gal}}{\text{day}} \times \frac{102.0 \text{ lb}}{1000 \text{ gal}} \ CO = 5.1 \frac{\text{lb}}{\text{day}} \ CO$$

$$49.7 \frac{\text{gal}}{\text{day}} \times \frac{31.2 \text{ lb}}{1000 \text{ gal}} \ SO_2 = 1.6 \frac{\text{lb}}{\text{day}} \ SO_2$$

$$49.7 \frac{\text{gal}}{\text{day}} \times \frac{33.5 \text{ lb}}{1000 \text{ gal}} \ TSP = 1.7 \frac{\text{lb}}{\text{day}} \ TSP$$

Tugboat Emissions (Anchor Setting Mode - Two engines at 450 shp each at 24 gal/hr fuel consumption each.)

Assume anchors for fabrication barge will be set once with the Tugboat; anchors for the pull barge will be set 7 times. Setting anchors 8 times requires 32 hours.

$$2 \text{ engines} \times 24 \frac{\text{gal}}{\text{hr/engine}} \times \frac{32 \text{ hrs}}{14 \text{ days}} \times 109.7 \frac{\text{gal}}{\text{day}}$$

$$109.7 \frac{\text{gal}}{\text{day}} \times \frac{338.6 \text{ lb}}{1000 \text{ gal}} \ NO_x = 37.1 \frac{\text{lb}}{\text{day}} \ NO_x$$

$$109.7 \frac{\text{gal}}{\text{day}} \times \frac{44.5 \text{ lb}}{1000 \text{ gal}} \ THC = 4.9 \frac{\text{lb}}{\text{day}} \ THC$$

$$109.7 \frac{\text{gal}}{\text{day}} \times \frac{99.7 \text{ lb}}{1000 \text{ gal}} \ CO = 10.9 \frac{\text{lb}}{\text{day}} \ CO$$

$$109.7 \frac{\text{gal}}{\text{day}} \times \frac{29.2 \text{ lb}}{1000 \text{ gal}} \ SO_2 = 3.2 \frac{\text{lb}}{\text{day}} \ SO_2$$

Tugboat Emissions (2 rount trips to Platform Eva for initial set-up of fabrication and pull barges. Use distance "A" from Part I of Appendix 3. Time required to travel 20.14 nm is 1.54 hr.) (Cruise Mode)

$$1.54 \frac{\text{hr}}{\text{trip}} \times 2 \text{ engines} \times 24 \frac{\text{gal}}{\text{hr/engine}} \times \frac{2 \text{ trips}}{14 \text{ days}} = 10.6 \frac{\text{gal}}{\text{day}}$$

$$10.6 \frac{\text{gal}}{\text{day}} \times \frac{338.6 \text{ lb}}{1000 \text{ gal}} \ NO_x = 3.6 \frac{\text{lb}}{\text{day}} \ NO_x$$

$10.6 \frac{gal}{day} \times \frac{44.5\ lb}{1000\ gal}$ THC = 0.5 $\frac{lb}{day}$ THC

$10.6 \frac{gal}{day} \times \frac{99.7\ lb}{1000\ gal}$ CO = 1.1 $\frac{lb}{day}$ CO

$10.6 \frac{gal}{day} \times \frac{29.2\ lb}{1000\ gal}$ SO_2 = 0.3 $\frac{lb}{day}$ SO_2

Tugboat Emissions (Emissions to be calculated for the travel distance required to reposition the pull barge, for the first 3 relocations, will use distance "B" from Part I of Appendix 3. Time required to travel 22.47 nm is 1.72 hr.) (Cruise Mode)

$1.72 \frac{hr}{trip} \times 2$ engines $\times 24 \frac{gal}{hr/engine} \times \frac{3\ trips}{14\ days} = 17.7 \frac{gal}{day}$

$17.7 \frac{gal}{day} \times \frac{338.6\ lb}{1000\ gal}$ NO_x = 6.0 $\frac{lb}{day}$ NO_x

$17.7 \frac{gal}{day} \times \frac{44.5\ lb}{1000\ gal}$ THC = 0.8 $\frac{lb}{day}$ THC

$17.7 \frac{gal}{day} \times \frac{99.7\ lb}{1000\ gal}$ CO = 1.8 $\frac{lb}{day}$ CO

$17.7 \frac{gal}{day} \times \frac{29.2\ lb}{1000\ gal}$ SO_2 = 0.5 $\frac{lb}{day}$ SO_2

Tugboat Emissions (Emissions to be calculated for the travel distance required to reposition the pull barge, for the final 4 relocations, will use distance "C" from Part I of Appendix 3. Time required to travel 26.11 nm is 2.0 hrs.) (Cruise Mode)

$2.0 \frac{hr}{trip} \times 2$ engines $\times 24 \frac{gal}{hr/engine} \times \frac{4\ trips}{14\ days} = 27.4 \frac{gal}{day}$

$27.4 \frac{gal}{day} \times \frac{338.6\ lb}{1000\ gal}$ NO_x = 9.3 $\frac{lb}{day}$ NO_x

$27.4 \frac{gal}{day} \times \frac{44.5\ lb}{1000\ gal}$ THC = 1.2 $\frac{lb}{day}$ THC

$27.4 \frac{gal}{day} \times \frac{99.7\ lb}{1000\ gal}$ CO = 2.7 $\frac{lb}{day}$ CO

$27.4 \frac{gal}{day} \times \frac{29.2\ lb}{1000\ gal}$ SO_2 = 0.8 $\frac{lb}{day}$ SO_2

Facility Construction Emissions

ONSHORE

Welding Engines - Electric Configuration (4 engines at 102 hp each at 6 gal/hr fuel consumption each. Welding will take place over a period of 8 weeks at 5 days in a work week at 8 hrs. a day.)

$$4 \text{ engines} \times \frac{6 \text{ gal}}{\text{hr/engine}} \times \frac{320 \text{ hrs}}{40 \text{ days}} = 192.0 \frac{\text{gal}}{\text{day}}$$

$$192.0 \frac{\text{gal}}{\text{day}} \times \frac{469.0 \text{ lb}}{1000 \text{ gal}} \quad NO_x = 90.0 \frac{\text{lb}}{\text{day}} NO_x$$

$$192.0 \frac{\text{gal}}{\text{day}} \times \frac{37.5 \text{ lb}}{1000 \text{ gal}} \quad THC = 7.2 \frac{\text{lb}}{\text{day}} THC$$

$$192.0 \frac{\text{gal}}{\text{day}} \times \frac{102.0 \text{ lb}}{1000 \text{ gal}} \quad CO = 19.6 \frac{\text{lb}}{\text{day}} CO$$

$$192.0 \frac{\text{gal}}{\text{day}} \times \frac{31.2 \text{ lb}}{1000 \text{ gal}} \quad SO_2 = 6.0 \frac{\text{lb}}{\text{day}} SO_2$$

$$192.0 \frac{\text{gal}}{\text{day}} \times \frac{33.5 \text{ lb}}{1000 \text{ gal}} \quad TSP = 6.4 \frac{\text{lb}}{\text{day}} TSP$$

Crane (One engine at 525 hp at 29 gal/hr fuel consumption; engine is used for 12 hours to load welded pipeline sections onto fabrication barge.)

$$29 \frac{\text{gal}}{\text{hr}} \times \frac{12 \text{ hr}}{40 \text{ days}} = 8.7 \frac{\text{gal}}{\text{day}}$$

$$8.7 \frac{\text{gal}}{\text{day}} \times \frac{469.0 \text{ lb}}{1000 \text{ gal}} \quad NO_x = 4.1 \frac{\text{lb}}{\text{day}} NO_x$$

$$8.7 \frac{\text{gal}}{\text{day}} \times \frac{37.5 \text{ lb}}{1000 \text{ gal}} \quad THC = 0.3 \frac{\text{lb}}{\text{day}} THC$$

$$8.7 \frac{\text{gal}}{\text{day}} \times \frac{102.0 \text{ lb}}{1000 \text{ gal}} \quad CO = 0.9 \frac{\text{lb}}{\text{day}} CO$$

$$8.7 \frac{\text{gal}}{\text{day}} \times \frac{31.2 \text{ lb}}{1000 \text{ gal}} \quad SO_2 = 0.3 \frac{\text{lb}}{\text{day}} SO_2$$

$$8.7 \frac{\text{gal}}{\text{day}} \times \frac{33.5 \text{ lb}}{1000 \text{ gal}} \quad TSP = 0.3 \frac{\text{lb}}{\text{day}} TSP$$

Fugitive Emissions (From compressor on Platform Eva.)

Component	Service	VOC(1) Emission Factor lb/day	Number of Components	VOC Total Emissions lb/day
Seal Packing (SP)				
Reciprocating	Gas	0.225	4	0.90
MESL(2)	Gas	0.193 E-01	4	0.08

(1) Emission factors from Volume 1, Fugitive Emissions from Petroleum Production Operations, March 1980, SPI, Appendix E, Table E-2.

(2) MESL means packing which includes: clearance pockets on compressors, orifice, level controller floats, etc.

APPENDIX 4

Table 1

Offshore Facility Construction Emissions

Note: Emission factors are in Appendix 5.

	Activity Duration days	NOx lb/day	VOC(1) lb/day	CO lb/day	SO_2 lb/day	TSP lb/day
Gas Pipeline Construction						
Fabrication Barge	14	908.6	72.7	197.7	60.4	64.9
Pull Barge	14	456.6	36.6	99.4	30.4	32.6
Tugboat	14	56.0	7.4	16.5	4.8	N/A
Total(2) (Tons)		9.95	0.82	2.20	0.67	0.68

N/A = Not available

(1) Values listed are actually THC. The corresponding VOC emissions are less than the values shown.

(2) Total is determined by multiplying pollutant x duration and converting to tons.

APPENDIX 4

Table 2

Note: Emission factors are in Appendix 5.

Onshore Facility Construction Emissions

(Onshore welding of pipeline sections and loading onto fabrication barge prior to offshore construction.)

	Activity Duration days	NOx lb/day	VOC(1) lb/day	CO lb/day	SO_2 lb/day	TSP lb/day
Welding	40	90.0	7.2	19.6	6.0	6.4
Crane (Pipeline Loading)	40	4.1	0.3	0.9	0.3	0.3
Total(2) (Tons)		1.90	0.15	0.41	0.13	0.13

(1) Values listed are actually THC. The corresponding VOC emissions are less than the values shown.

(2) Total is determined by multiplying pollutant x duration and converting to tons. (2000 lbs/ton)

APPENDIX 4

Table 3

Facility Production Emissions

Equipment	NOx lb/day	VOC lb/day	CO lb/day	SO_2 lb/day	TSP lb/day
Fugitive Emissions Seals	--	0.98	--	--	--
Total (lb/day)		0.98			

A P P E N D I X 5

EMISSION FACTORS

APPENDIX 5

Emission Factors

	NO_x (as NO_2)	THC	CO	SO_2	TSP
Automobiles, g/mile[a]	2.44	1.3	12.25	0.13	0.35
Supply Truck, g/mile[b]	20.59	2.11	13.14	2.73	1.96
Crew Boat (Idle) lb/1000 gal[c]	6.4	391.2	210.3	29.2[d]	N/A
Crew Boat (Cruise) lb/1000 gal[c]	422.9	170.2	126.3	29.2[d]	N/A
Tug Boat (Idle) lb/1000 gal[c]	99.4	118.1	282.5	29.2[d]	N/A
Tug Boat (Cruise) lb/1000 gal[c]	338.6	44.5	99.7	29.2[d]	N/A
Fabrication Barge (all engines) lb/1000 gal[e]	469.0	37.5	102.0	31.2	33.5
Pull Barge (all engines) lb/1000 gal[e]	469.0	37.5	102.0	31.2	33.5

Note a Composite Emission Factors (stabilized at 45 mph); THC includes crankcase emissions Light Duty Passenger Vehicle, California Air Resources Board (CARB) 1979.

Note b Composite Emission Factors (stabilized at 45 mph); Heavy Duty Diesel Trucks, CARB 1979.

Note c Compilation of Air Pollutant Emission Factors, AP-42 (1/75); Table 3.2.3-3.

Note d Assumed Diesel Fuel Sulfur Content of 2000 ppm (by weight); 7.3 lb/gal diesel fuel.

Note e Compilation of Air Pollutant Emission Factors, AP-42 (1/75; Table 3.3.3-1.

N/A Not available.

Engine horsepower ratings and fuel consumption rates were obtained from Detroit Diesel Allison, 39465 Paseo Padre Parkway, Fremont, California 94538 on 2/2/82.