PHASE 1 DESCRIPTION
ENVIRONMENTAL RESTORATION PROGRAM
NEWPORT BANNING RANCH
WEST NEWPORT OIL COMPANY
ORANGE COUNTY, CALIFORNIA

Prepared for:

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31 January 1996

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1. INTRODUCTION

1.1 Terms of Reference

This report contains a description of activities associated with Phase 1 of the Environmental Restoration Program conducted at the Newport Banning Ranch (NBR). This report was prepared for the West Newport Oil Company (WNOC) by GeoSyntec Consultants (GeoSyntec). This report was developed by Mr. Jeffrey R. Raines, P.E., and Mr. Sam Kramer E.I.T., and reviewed by Dr. Bertrand S. Palmer, P.E. and Mr. Eric Smalstig, all of GeoSyntec, in accordance with the firm's internal review policy.

1.2 Project Overview

The NBR is a 400-acre (162 ha) oil and gas production facility located east of the mouth of the Santa Ana River near the Huntington Beach/Newport Beach city boundary in Orange County, California. Various structures and equipment which are necessary for the production of oil and gas are present at the NBR. These structures and equipment include oil wells, pipelines, drill rigs, tank farms, a steam generating plant, a compressed air plant, generators, and an equipment maintenance facility, as well as other structures and equipment. WNOC is in the process of phasing out crude oil production activities and environmentally restoring the NBR in preparation for site development. Following the environmental restoration of the NBR, it is anticipated that the site will be developed into a mixed-use planned community that may include the following uses: residential, commercial, parks, recreational, wetlands, roadways, and open space.

As part of the phased cessation of oil production activities and future site development, WNOC has initiated a program which includes environmental exploration work, development of site environmental restoration procedures, implementation of site environmental restoration in a phased manner, and monitoring and documentation of environmental restoration work. The environmental restoration plan implementation is conducted by WNOC with assistance from GeoSyntec for environmental exploration, environmental restoration procedures development, and monitoring and documentation of environmental restoration work.

The work conducted for the environmental restoration of the NBR is performed under the overall regulatory oversight of the California Department of Conservation Division of Oil, Gas, and Geothermal Resources (DOG), the Orange County Building Department (OCBD), and the Orange County Health Care Agency (OCHCA). However, other agencies, such as the California Regional Water Quality Control Board (CRWQCB), Santa Ana Region, have also provided approval of some specific aspects of the environmental restoration work for the NBR.

1.3 Report Purpose and Objectives

The Environmental Restoration Program of the NBR will be conducted in phases defined by WNOC. Phase 1, the first of these phases, was conducted from 20 July 1994 to 31 January 1996. The purpose of this document is to present the scope of work in Phase 1 of the Environmental Restoration Program of the NBR. Subsequent phases of the Environmental Restoration Program will be described in future reports.

Phase 1 of the Environmental Restoration Program of the NBR includes:

- abandonment and environmental restoration of 114 production and injection wells;
- removal and associated environmental restoration of approximately 28,400 ft (8,700 m) of oil production related pipeline;
- environmental evaluation of the condition of material in four drilling mud pits;
- environmental evaluation of asphalt-like material (ALM);
- removal, processing and/or and biotreatment of crude oil impacted soil;

- removal of various debris and equipment on site as described in this report;
- a soil gas survey; and
- a baseline ground-water and soil study.

This document does not include a description of the procedures and documentation of the Environmental Restoration Program of the NBR. The sampling procedures, analytical procedures, laboratory data, and field activity documentation forms produced in Phase 1 of the Environmental Restoration are presented in the Summary Report of the Environmental Restoration Program of the NBR and accompanying appendices (SRER) [GeoSyntec, 1996].

1.4 Report Organization

The remainder of this report is organized into three sections as follows:

- Section 2, "General Site Information," contains site background information as well as a description of local topography, geology, hydrogeology, and water quality, general environmental site conditions, and the general Environmental Restoration Plan (ERP).
- Section 3, "Phase 1 Environmental Work Description," contains a summary of environmental exploration and restoration work conducted at the NBR as part of Phase 1.
- Section 4, "Conclusions," Summarizes the progress of the environmental restoration of the NBR.

Tables and figures are included at the end of each section.

2. GENERAL SITE INFORMATION

2.1 Introduction

This section provides background information regarding the NBR. The background information is based on work conducted by GeoSyntec at the NBR since 1989 [GeoSyntec, 1989; 1991a,b; 1993a,b,c; 1994a,b,c; 1995a,b,c,d,e,f], conversations with WNOC employees, reports of work activities conducted by the United States Army Corps of Engineers (USCOE) [1988], Mitech [1988], Earth Technology Corporation [1990], and Levine-Fricke [1986a,b], and data collected from governmental agencies pertaining to this area of Orange County.

2.2 Location

The NBR is located east of the mouth of the Santa Ana River near the Huntington Beach/Newport Beach city boundary in Orange County, California. The location of the NBR, which encompasses approximately 400 acres (162 ha), is shown in Figure 2-1. A site map is shown on Figure 2-2. The NBR is jointly owned by the Mobil Oil Corporation and the Rancho Santiago Partnership. The NBR is currently operated as a crude oil and gas production facility by WNOC.

2.3 History and Features

The NBR has been used as an oil and gas production facility since 1944 [Jay Stair, WNOC, Personal Communication, 1993]. Before 1944, the NBR was used for agricultural purposes. The NBR previously included the 92-acre (37-ha) Santa Ana River Marsh (SARM) area, the location of which is shown in Figure 2-2. The SARM was purchased by the USCOE and restored as a wetlands as part of the USCOE Santa Ana River Flood Control Project.

The majority of the NBR infrastructure consists of oil and gas production equipment and appurtenances. Present at the NBR are both active and idle oil production wells, active and idle steam/air/water injection wells, and equipment

associated with the production of oil and gas including transport piping and above-ground crude oil storage tanks. Steam/air/water injection wells were used to inject steam, air and water into deep crude oil reservoirs to increase the production quantities of crude oil from production wells. The steam/air/water injection practices for the purpose of increased oil production have been discontinued. WNOC continues to return water produced during oil recovery operations back to the formation where it originated.

Also present at the site are pipeline networks used to transport crude oil, water, gas, or compressed air tanks and tank farms, a steam generating plant, a compressed air generating plant, maintenance area, various small buildings, scrubbers, transformers, and other miscellaneous equipment used for oil production operation.

2.4 Topography

The topographic relief across the NBR and adjacent SARM is shown in Figure 2-2. The topographic relief across the NBR site is approximately 105 ft (32 m). A bluff subdivides the NBR into two zones: the lowland river mouth zone and the upland Newport Mesa zone. For purposes of this report, these zones are referred to as the lowland and upland zone, respectively.

The elevation of the lowland zone shown in Figure 2-2 ranges from 0 to 10 ft (0 to 3 m) above mean sea level. The lowland zone consists of a relatively flat, undulating surface having no directional sloping trend. The western boundary of the SARM, adjoining the lowlands, is lined with levees constructed as part of the USCOE Santa Ana River Flood Control Project. From 19th Street to the Pacific Ocean, levee heights in the SARM vary from 10 to 15 ft (3 to 4.5 m) above the surrounding grade.

The lowland zone is bounded to the east by the uplands zone. The elevation of the uplands zone at the NBR ranges from 10 to 105 ft (3 to 32 m) above mean sea level. The westerly-dipping slopes of the upland zone slopes vary from approximately 10 to 65 percent. The southern section of the upland zone (along Pacific Coast Highway) is characterized by a gradual change of elevation. The southwesterly-dipping slopes in this section of the upland zone range from approximately 2 to 20 percent. The

slope of the mesa area of upland zone dips in a generally west-southwesterly direction at approximately 1 to 3 percent.

2.5 Geology and Hydrogeology

2.5.1 Geology

The NBR is located within the Orange County Coastal Plain, one of the coastal alluvial basins of the Los Angeles Sedimentary Basin. The Orange County Coastal Plain is shown on Figure 2-3. The Orange County Coastal Plain is bounded to the north by the Puente Hills, to the east by the Santa Ana Mountains, to the west by the San Gabriel River, and to the southwest by the San Joaquin Hills and the Pacific Ocean. The central portion of the coastal plain forms the broad alluvial floodplain of the Santa Ana River. The Santa Ana River originates in the San Bernardino Mountains. The river flows approximately 80 mi (130 km) from the San Bernardino Mountains to the NBR where it discharges into the Pacific Ocean.

The stratigraphy of the Orange County Coastal Plain consists of recent alluvial deposits overlying older sediments and bedrock. A generalized stratigraphic column of the Orange County Coastal Plain is shown in Figure 2-4. The Santa Ana River has eroded a channel across the alluvial deposits of the Orange County Coastal Plain and through the consolidated mesa sediments forming the 2.5-mi (4.2-km) wide Santa Ana Gap. This gap, a typical feature of Orange County, is located between the Huntington Beach Mesa and the Newport Mesa. The Newport-Inglewood fault zone runs through the southern portion of the NBR site, trending in a direction parallel to the Pacific Coast Highway [Earth Technology, 1986].

Part of the Newport Mesa forms the eastern, upland portion of the NBR. The mesa consists of consolidated alluvial sediments which have been uplifted along the fault zone. The lowland portion of the NBR consists of recent alluvial sediments. These alluvium sediments consist of fine to coarse sand, with fine silty sands, clayey silt, and silty clay. The alluvial sediments are underlain by older terrace and alluvial deposits. The bedrock formation consists of complex crystalline metamorphic and igneous rocks [California Department of Water Resources (CDWR), 1967].

Previous investigations at the SARM [GeoSyntec, 1989] included a description of the upper 10 to 12 ft (3 to 3.7 m) of alluvial sediments in the lowland zone. Three general soil layer classifications were encountered ranging in thickness from 1 to 4 ft (0.3 to 1.2 m) across the NBR. The uppermost soil layer consisted of dry to moist, silty sand. Below this layer, a stratum of silty to sandy clay was noted. The bottom soil layer was composed of fine-grained, moist, micaceous sand in which ground water was frequently observed.

2.5.2 Hydrogeology

The NBR is located within the Orange County Ground-Water Basin. The basin underlies the Orange County Coastal Plain, which is shown in Figure 2-3. A general hydrogeologic cross-section of the Orange County Ground-Water Basin is shown in Figure 2-5. The Newport-Inglewood fault zone, located along the southern boundary of the NBR, is the predominant hydrogeologic feature in the area, acting as a barrier to ground-water flow in the aquifers below the uppermost water-bearing units [CDWR, 1967].

The water-bearing formations in the Orange County water basin are composed of three intra-connected confined aquifer systems: the Lower, Middle, and Upper aquifer systems [CDWR, 1967]. The configuration of these aquifer systems is shown schematically in Figure 2-5.

The Lower Aquifer system consists of a series of hydraulically interconnected aquifers overlying the non water-bearing formations of consolidated sedimentary and basement rock.

The Middle Aquifer system consists of a series of aquifers mostly of the water-bearing San Pedro Formation. The predominant aquifer within the Middle Aquifer system (and the primary source of ground water for Orange County) is the Main Aquifer. The Main Aquifer consists of coarse sand and gravel, with interbedded layers of finer deposits. Ground-water studies of the Santa Ana Gap have concentrated on the hydrogeologic conditions of the Middle Aquifer system, specifically the Main

Aquifer, because it is the primary source of domestic water in the area. Ground-water studies conducted in November 1990 by the CDWR indicate that the piezometric surface of ground water in the confined Main Aquifer below the Santa Ana Gap ranges from 0 to 10 ft (0 to 3 m) below mean sea level.

The Upper Aquifer system consists of discontinuous lenses of coarse sand and gravel confined by lenses of clay sediments. The uppermost aquifer within the Upper Aquifer system is the Talbert Aquifer. Layers of fine grained material exist above the Talbert Aquifer resulting in perched or semi-perched water overlying the largely confined Talbert Aquifer. These perched aquifers serve as recharge sources through the local confining layers. The Talbert Aquifer acts as an unconfined aquifer in certain locations where the confining layer is absent or where the piezometric surface is below base of the confining layer [CDWR, 1967].

The NBR is hydraulically bounded to the west by the mouth of the Santa Ana River and to the south by marsh channels. The marsh channels are connected by a culvert to the mouth of the Santa Ana River. As water in the Santa Ana River mouth and marsh channel is directly connected to the Pacific Ocean, the aquifer located below the NBR is in direct connection with sea water. Depth to ground water at the NBR is approximately equal to mean sea level and is influenced by tidal fluctuations. Based on work conducted by the CDWR [1967], it appears likely that ground-water flow at the NBR is from the uplands zone toward the Santa Ana River in the northern portion of the site and from the mesa toward the Pacific Ocean in the southern portion of the site.

2.6 Environmental Site Conditions

Site exploration and environmental assessment work has been conducted at the NBR and/or the SARM since 1986. The data collected as part of this effort includes work conducted by GeoSyntec at the NBR since 1989 [GeoSyntec, 1989; 1991a,b; 1993a,b,c; 1994a,b,c; 1995a,b,c,d,e,f], conversations with WNOC employees, reports of work activities conducted by the USCOE [1988], Mitech [1988], Earth Technology Corporation [1990], and Levine-Fricke [1986a,b], and data collected from governmental agencies with purview over this area of Orange County.

The data collected as part of this effort was evaluated and synthesized to develop a summary of the environmental condition of the NBR. This summary which is presented in Table 2-1 is organized in three topics, including:

- site surface features;
- vadose zone; and
- ground water.

Site surface features include equipment and structures used for oil production operation and general site operation. The site surface features include:

- oil production and injection well equipment;
- pipelines;
- above-ground storage tanks;
- sumps/underground storage tanks;
- tank farm areas; and
- miscellaneous site features (including: steam generating plant, air compressor plant, scrubbers, transformers, wooden electric poles, WNOC headquarters unit and miscellaneous debris and waste material)

Most of these site surface features were identified and listed in the Phase I Environmental Site Assessment (ESA) report [GeoSyntec, 1993]. Some of these site surface features are impacted by crude oil and/or other chemicals which were present in the equipment for their proper operation.

The vadose zone at the NBR has been primarily impacted by crude oil. Soil impacted by crude oil has been noticed around oil wells, below pipelines, in drilling mud pits, in asphalt-like material (ALM), and at various locations across the site. In crude oil impacted soil, the petroleum hydrocarbon concentrations vary significantly. However, volatile organic compounds (VOC) and semi-VOC are generally below detection limits (except when the petroleum hydrocarbon concentrations are in the range of 100,000 parts per million (ppm)). Metals concentrations are generally equal to background concentrations.

Ground water at the site generally flows from the mesa toward the ocean and/or the Santa Ana River area. The quality of ground water at the NBR is strongly influenced by the ocean water quality. Therefore, because of salt water intrusion, ground water is brackish at the NBR. Low concentrations (less than 1 parts per million (ppb)) of a few VOCs were detected during a few sampling events. However, VOCs were generally not detected in most ground-water samples collected at the NBR.

The environmental restoration plan for site surface features, vadose zone soils, and ground water at the site is presented in Section 2.7

2.7 Site Environmental Restoration Plan Summary

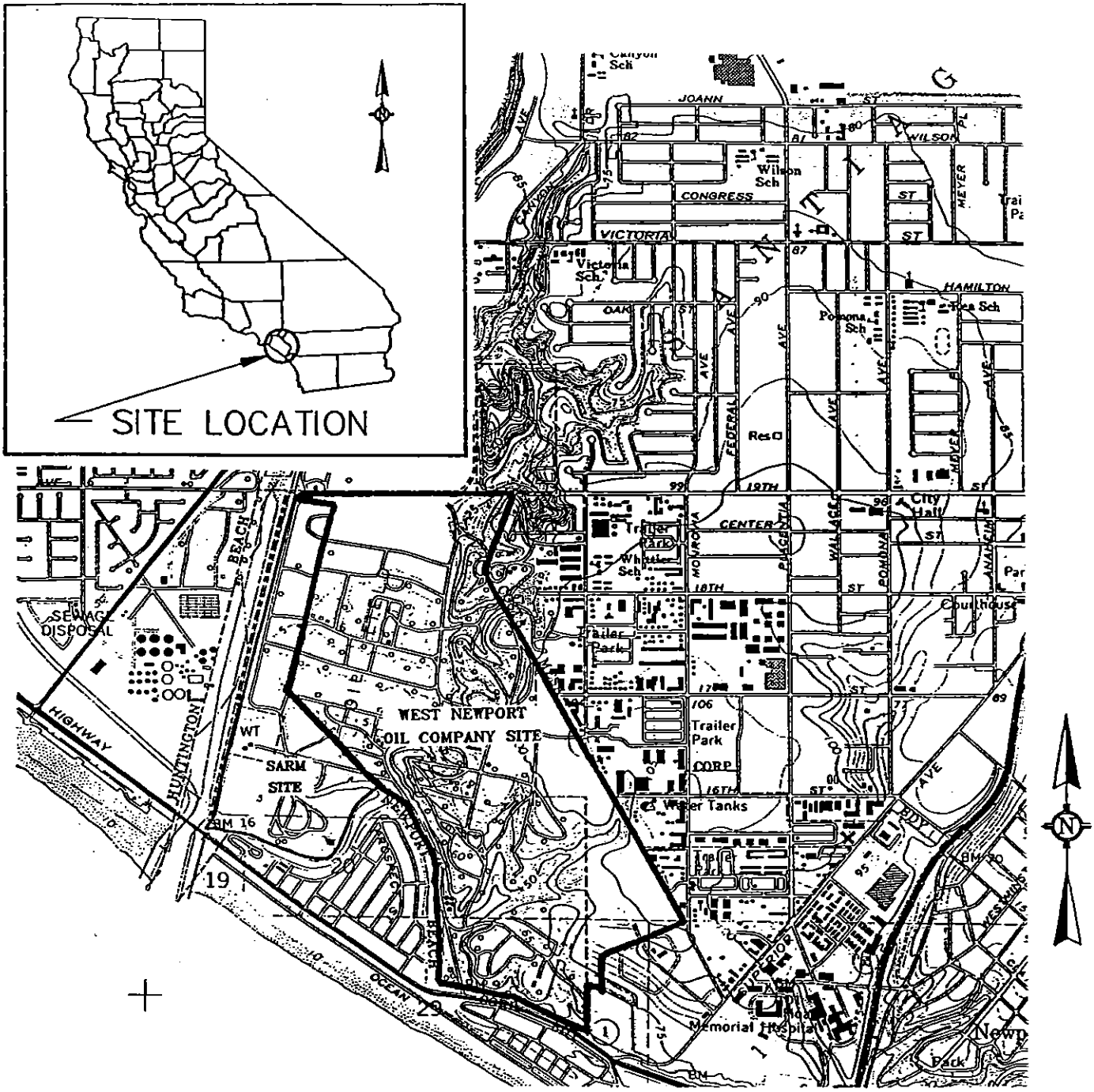
To prepare the NBR for future development, an ERP was prepared for the site [GeoSyntec, 1994]. This ERP provides general guidelines for environmental restoration of the NBR. The ERP requires that soil impacted by crude oil be remediated until the concentration of Total Recoverable Petroleum Hydrocarbons (TRPH) remaining in the soil is less than 1,000 ppm. Action levels for other chemical compounds, such as VOC, semi-VOC, and metals have not been specified by the ERP as VOC and semi-VOC were not detected in soil samples collected around oil production wells when TRPH concentrations in these samples were less than 1,000 ppm and metals were detected at concentrations generally similar to background concentrations. OCHCA, the lead regulatory agency for the environmental restoration of the NBR approved the proposed ERP [GeoSyntec, 1994] for the environmental closure of the NBR in a letter dated 21 April 1994 [Lodrigueza, 1994].

To complement the general ERP [GeoSyntec, 1994], specific procedures and methodologies were developed for the environmental restoration of oil wells, pipelines, drilling mud pits, and ALM. These methodologies are described in the SRER [GeoSyntec, 1996].

Oil production equipment and miscellaneous debris and structures identified during the Phase I ESA and during implementation of the ERP will be removed and recycled or disposed of off site.

Site soils at the NBR have the potential to be impacted by petroleum hydrocarbons associated with oil production equipment and structures. The ERP indicated that soil impacted by hydrocarbon above the Action Level be excavated and remediated on site in a biotreatment cell or, if necessary, treated off site.

A preliminary evaluation of the baseline ground-water and soil study conducted at the NBR during Phase 1 indicated that remedial action is not necessary for the ground water on site. If in the future the condition of the ground water is found to differ from what was observed during the evaluation an environmental restoration plan for the ground water of the site will be developed.



SCALE 1:24000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

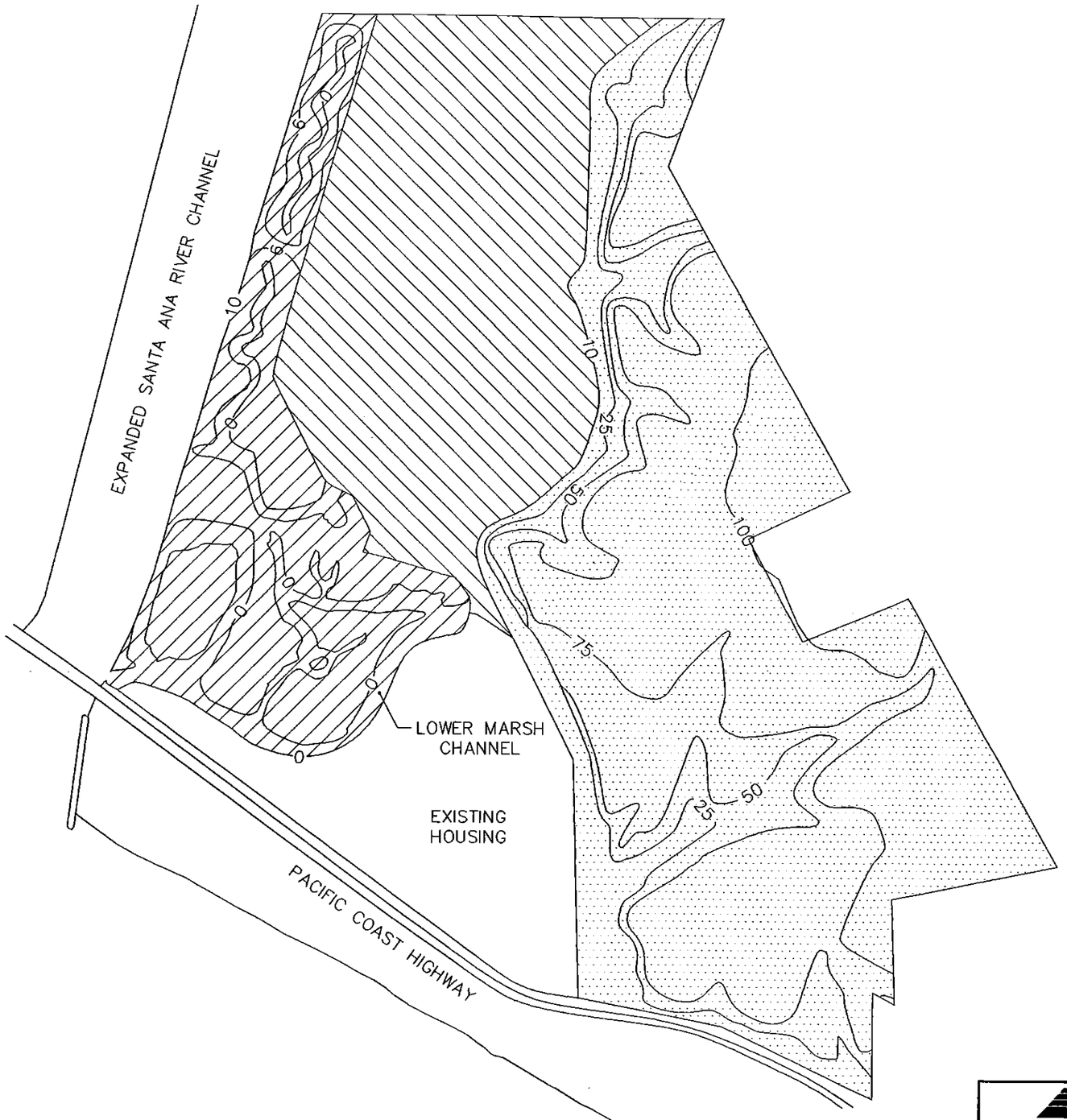
REFERENCE:

United States Geological Survey, Newport Beach Quadrangle, 1981.

GeoSyntec Consultants

SITE LOCATION MAP WEST NEWPORT OIL COMPANY ORANGE COUNTY, CALIFORNIA	FIGURE NO. 2-1 PROJECT NO. CE4057-02 DATE: JAN-15-96

DWG: 4057F010 199412211013 EB



800 400 0 800 1600

APPROXIMATE SCALE IN FEET

LEGEND

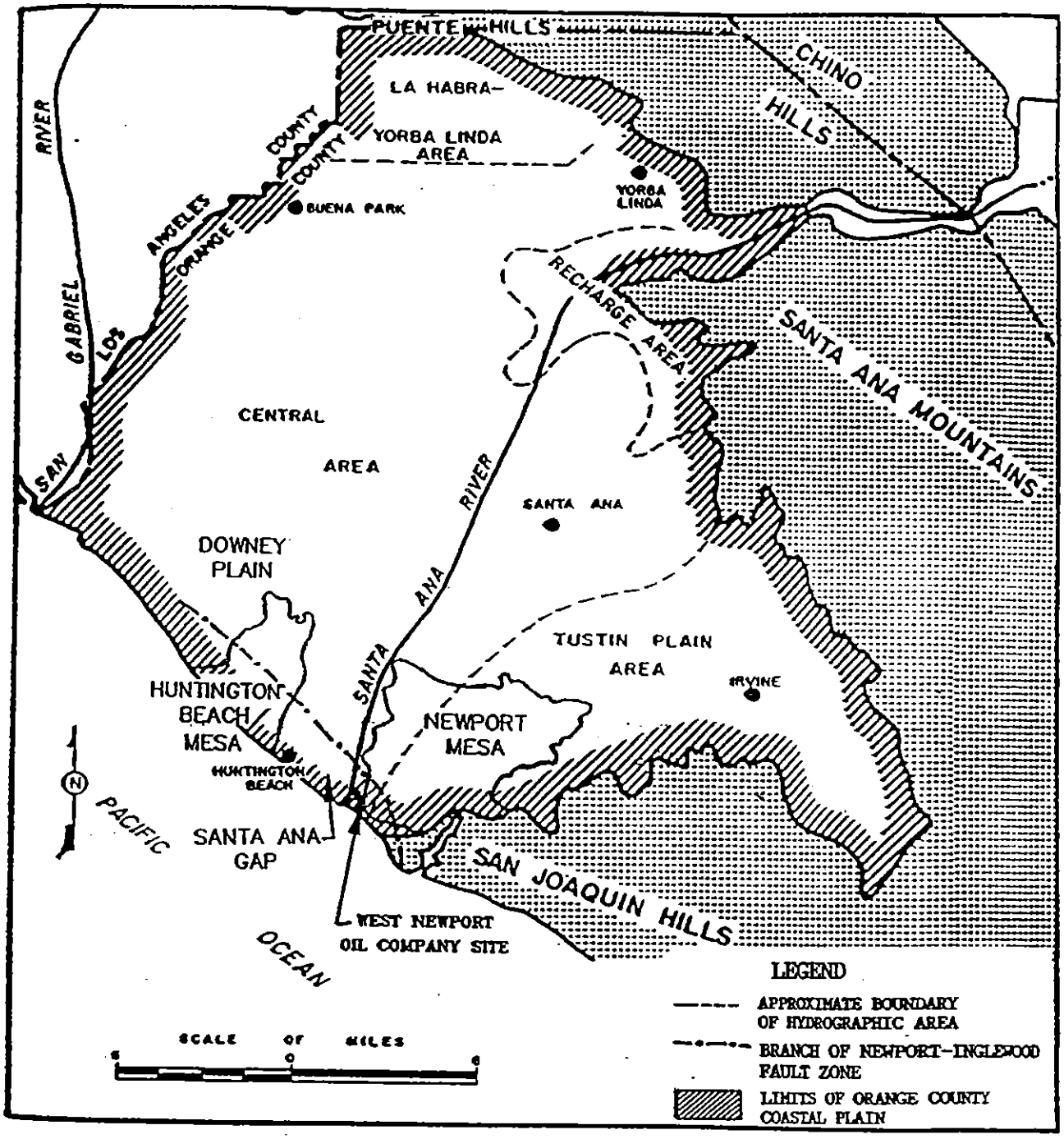
- Santa Ana River Marsh (SARM)
- Lowland (0 – 10 ft)
- Upland (10 – 105 ft)
- Existing Housing

GeoSyntec Consultants

SITE MAP
NEWPORT BANNING RANCH
WEST NEWPORT OIL COMPANY

FIGURE NO.	2–2
PROJECT NO.	CE4057–06
DATE:	JAN–15–96

DWG: 4057F610 199602050930 AB

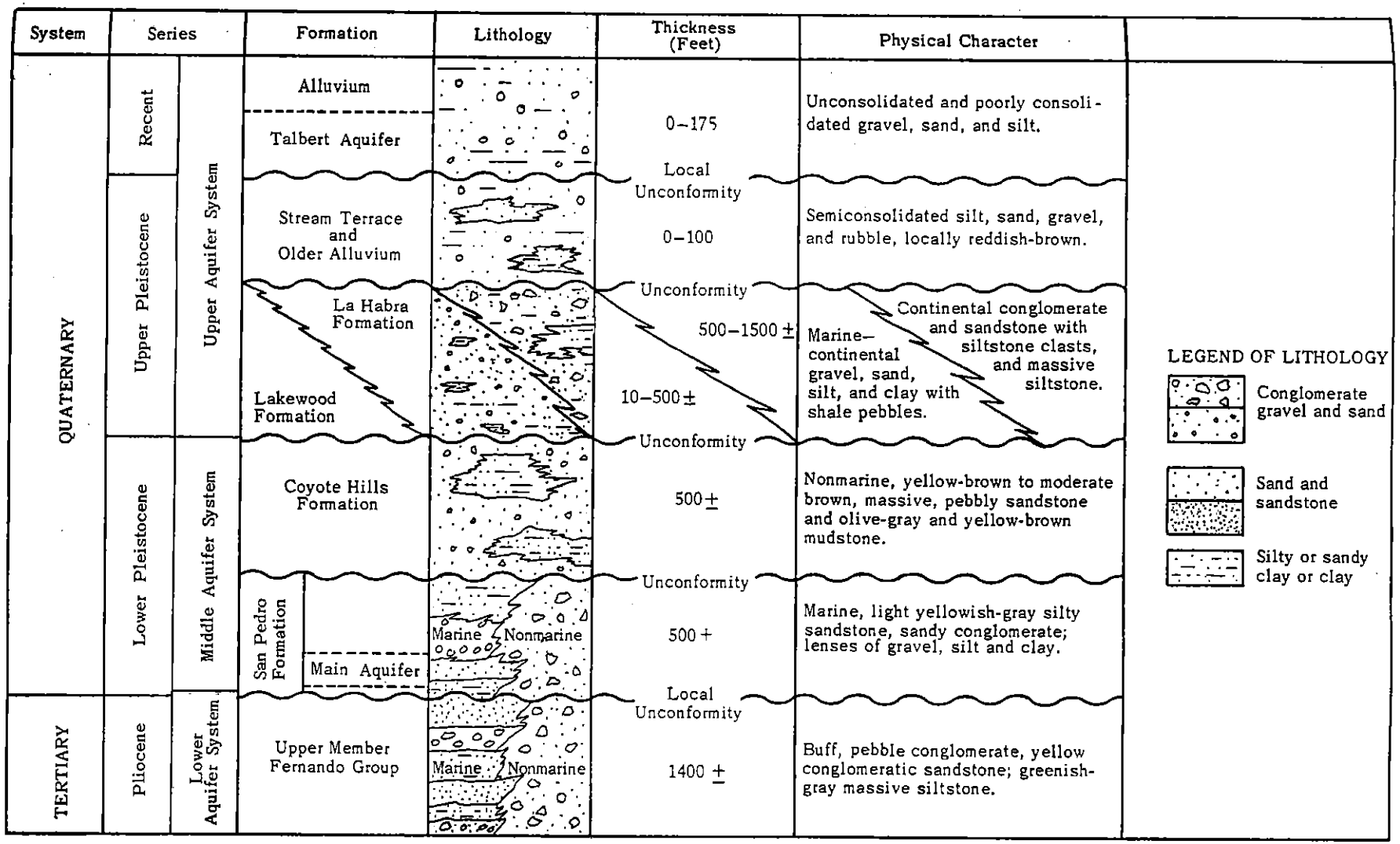


TAKEN FROM PROGRESS REPORT [CDWR, 1967]

GeoSyntec Consultants

ORANGE COUNTY COASTAL PLAIN WEST MEWPORT OIL COMPANY ORANGE COUNTY, CALIFORNIA	FIGURE NO. 2-3 PROJECT NO. CE4057-02 DATE: JAN-15-96

DWG: 4057F003 199601220955 AB



Taken From Progress Report [CDWR, 1967]

GeoSyntec Consultants

GENERALIZED STRATIGRAPHIC COLUMN OF
WATER–BEARING SEQUENCE, ORANGE COUNTY
WEST NEWPORT OIL COMPANY
ORANGE COUNTY, CALIFORNIA

FIGURE NO.	2–4
PROJECT NO.	CE4025
DRAWN BY:	
DATE:	03–13–92

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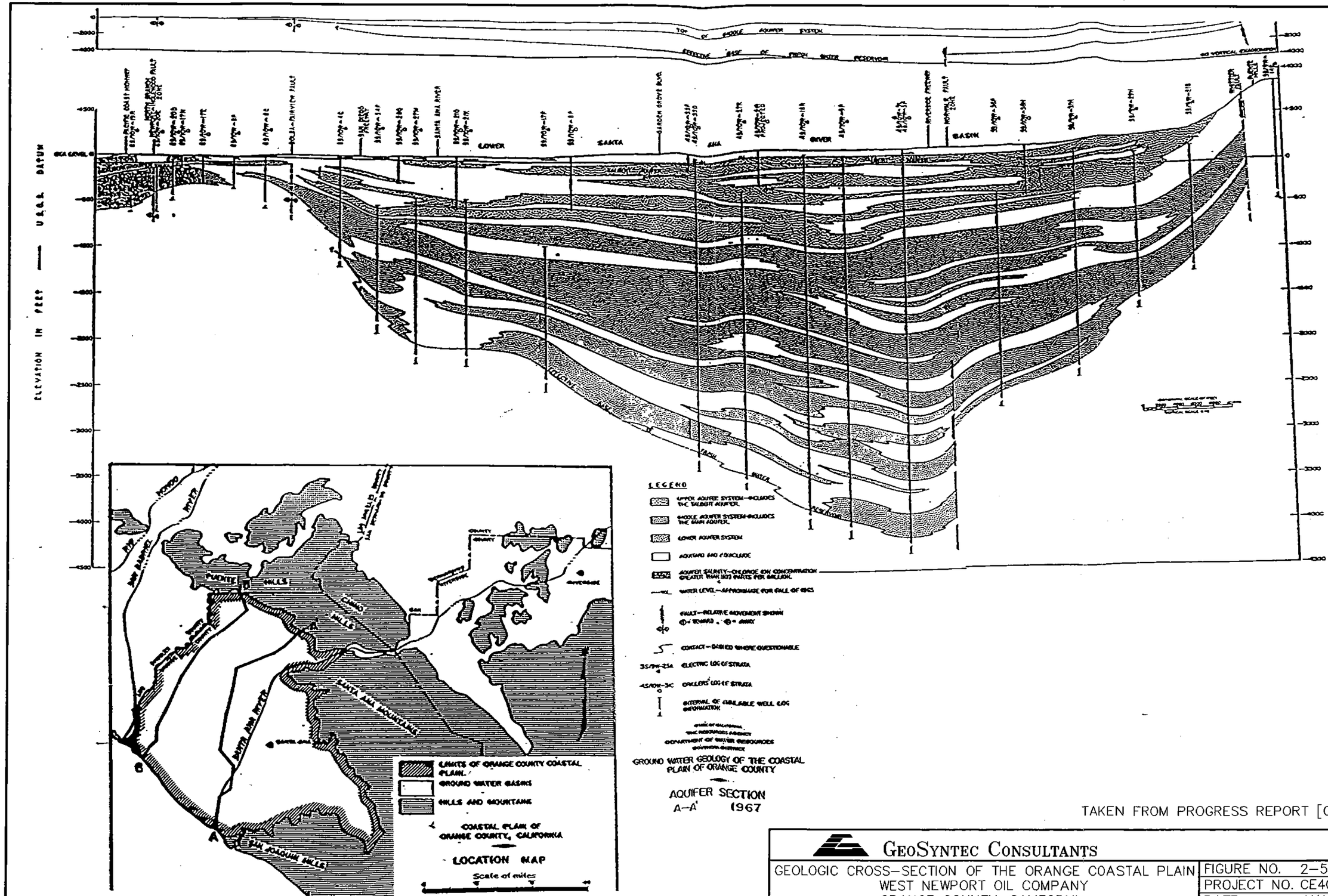


GeoSyntec Consultants

GEOLOGIC CROSS–SECTION OF THE ORANGE COASTAL PLAIN WEST NEWPORT OIL COMPANY ORANGE COUNTY, CALIFORNIA	FIGURE NO. 2–5 PROJECT NO. CE4057 DATE: JAN–15–96

DWG: 4057F002 199601121502 JT

TABLE 2-1
SUMMARY OF SITE AND ENVIRONMENTAL CONDITIONS
ENVIRONMENTAL RESTORATION
NEWPORT BANNING RANCH
WEST NEWPORT OIL COMPANY

AREA	ITEM DESCRIPTION
Site Surface Features	Oil Well Sites - Equipment/Surplus Equipment - Concrete Well Cellars Underground Storage Tanks (USTs) - Fuel USTs (2 - 10,000 gasoline, 2,000 diesel, 1,000 diesel) - Sumps (Tank Farm Area, Maintenance Yard, Air Compressor Plant) - Septic Tanks (near Office Area and Changing Room) Above Ground Storage Tanks (ASTs) - Approximately 50-80 Tanks (refer to Table 3-3, Phase 1 ESA [GeoSyntec, 1993]) Tank Farm Areas (Out of / In Service) - Tanks & Equipment - Foundations Pipelines - Oil/Gas/Water/Steam - City Water/Electric/Sewer (Active and Inactive) Miscellaneous Surface Features - Office Buildings/Changing Room - Maintenance Shop/Warehouse - Operations Shack - Electrical Distribution Equipment (Telephone Poles, Transformers) - Steam Generating Plant - Water Softening Plant - Air Compressor Plant - Oil/Water Separator - Concrete Pads/Foundations - Cement Settling Ponds - Field Gas Reactor - Drainage Culvert and Debris - Waste Disposal Areas (Drums, Truck Batteries, Construction Debris, Army Waste) - Biotreatment Cell
Vadose Zone	Drilling Mud Pits Asphalt and Asphalt-Like Material (ALM) - Roads - Parking Lots Potentially Impacted Site Soils - Soil Around Oil Well Sites (e.g. Oil-Impacted Soil, Corrosion Inhibitor Impacted Soil) - Soil Below Site Surface Features (e.g. UST, AST, Transformer Areas) Well Field Gas Leaks and Marsh Gas
Ground Water	Ground Water Impacted by Oil Production Operations

3. PHASE 1 ENVIRONMENTAL RESTORATION

3.1 Phase 1 Definition

WNOC is implementing a phased Environmental Restoration Program at the NBR. Phase 1 is the first in a series of work phases which will upon conclusion of the final work phase of the environmental restoration leave the site in a condition which will facilitate the development of the site. Phase 1 activities commenced 20 July 1994 and were completed 31January 1996.

The environmental work conducted as part of Phase 1 of the Environmental Restoration Program of the NBR consisted of the following tasks:

- abandonment and environmental restoration of 114 production and injection well locations;
- removal and associated environmental restoration of approximately 28,400 ft (8,700 m) of petroleum related production pipeline (i.e. crude oil, gas, water, and steam pipelines);
- evaluation of the environmental condition of drilling mud pit locations;
- evaluation of the environmental condition of ALM
- removal, processing, and/or biotreatment of crude oil impacted soil;
- removal of miscellaneous debris and equipment;
- a soil gas survey; and
- a baseline ground water and soil study.

Information pertaining to each of the items listed above is presented in the SRER [GeoSyntec Consultants, 1996]. Details of the regulatory requirements, closure procedures, abandonment or removal logs, and chemical analytical data from soil sampling conducted by GeoSyntec are provided either in the ERP [GeoSyntec, 1994] and or the SRER [GeoSyntec, 1996].

3.2 Injection and Production Wells Environmental Restoration

During Phase 1 of the environmental restoration of the NBR, 114 well sites were abandoned in accordance with DOG and OCHCA requirements. The various phases of the well closure and abandonment have been conducted by WNOC except confirmatory sampling which was conducted by GeoSyntec. A list of the well sites at the NBR, which have been abandoned during Phase 1, is included in Appendix A. The locations of the wells at the NBR which have been abandoned are presented in Figure 3-1.

The average volume of soil excavated from around each well is approximately 40 yd^3 (33 m^3). Well environmental restoration and associated soil sampling in the excavations around each well of the Phase 1 Environmental Restoration Program began on 1 June 1993, and continued on a regular basis until 31 January 1996.

3.3 Pipeline Removal

The quantity and types of pipelines removed from the NBR during Phase 1 are summarized in Table 3-1. As shown in Table 3-1, approximately 28,400 ft (8,700 m) of pipelines have been removed from their original locations at the NBR. The area from which the pipelines were removed is illustrated in Figure 3-2. The removed pipelines were transported to a storage area adjacent to the location of the former NBR air compression plant, also shown in Figure 3-2. In the pipeline storage area, the pipes are cut to approximately 20 ft (6 m) lengths. The pipe sections are then transported off site to metal recyclers for recycling.

3.4 Drilling Mud Pit Condition Assessment

Four drilling mud pits at NBR were located during Phase 1 of the Environmental Restoration Program to evaluate their condition. Each of the drilling mud pits was created during different periods in the operating history of the NBR (i.e., 1940's, 1950's, and 1960's). Two soil samples were retrieved from each drilling mud pit location. The location of the mud pits and the corresponding period in which they were in use are indicated in Figures 3-3 and Table 3-2.

3.5 Asphalt-Like Materials Condition Assessment

To evaluate the leachability potential of the ALM, a toxicity characteristics leaching procedure (TCLP) was conducted on the ALM; and the leachate was analyzed for volatile organic compounds (VOC), semi-VOC, TRPH, and heavy metals. The results of this test indicate that the sample of ALM did not leach detectable quantities of VOC, semi-VOC, petroleum hydrocarbons, or metals (except for low concentrations [0.8 ppm] of barium). Therefore, it was proposed that ALM be used as backfill material in some of the low areas of the uplands zone at the NBR. The plan to use ALM as backfill material was approved by the CRWQCB in a letter from Ms. Dixie Lass, dated 28 September 1995. Implementation of this plan has not been started at the NBR as part of Phase 1.

3.6 Crude Oil Impacted Soil

Crude oil impacted soils removed from excavations at the NBR (i.e., soils having TRPH concentration above 1,000 ppm) were stockpiled on site in the lowlands and some of these soils were placed on the pilot-scale biotreatment cell installed in the site lowlands area. Petroleum-impacted soil to be biotreated in the NBR pilot-scale biotreatment cell is mixed with nutrients (e.g., nitrogen and phosphorus), watered to create an environment conducive for bacteria growth and activity, and tilled to mix oxygen into the soil. Under these conditions, naturally-occurring bacteria in the site soils digest the petroleum contained in the soil. Biotreatment has been shown to be an

effective tool for remediating site soils (with initial TRPH concentrations of up to 50,000 ppm) to below the 1,000 ppm action level.

Soils which have been successfully biotreated in the pilot-scale biotreatment cell are stockpiled in a central location on site which location is shown in Figure 3-4.

3.7 Miscellaneous Debris and Equipment Removal

During Phase 1, miscellaneous debris were removed from the Phase 1 area and stockpiled on site pending recycling or disposal. In addition, the following equipment were removed from the site:

- water softening facility;
- steam generator No. 2;
- drilling rig No. 926;
- the main pipe storage area;
- telephone poles
- compressor engines/buildings
- underground diesel storage tanks; and
- field gas reactors.

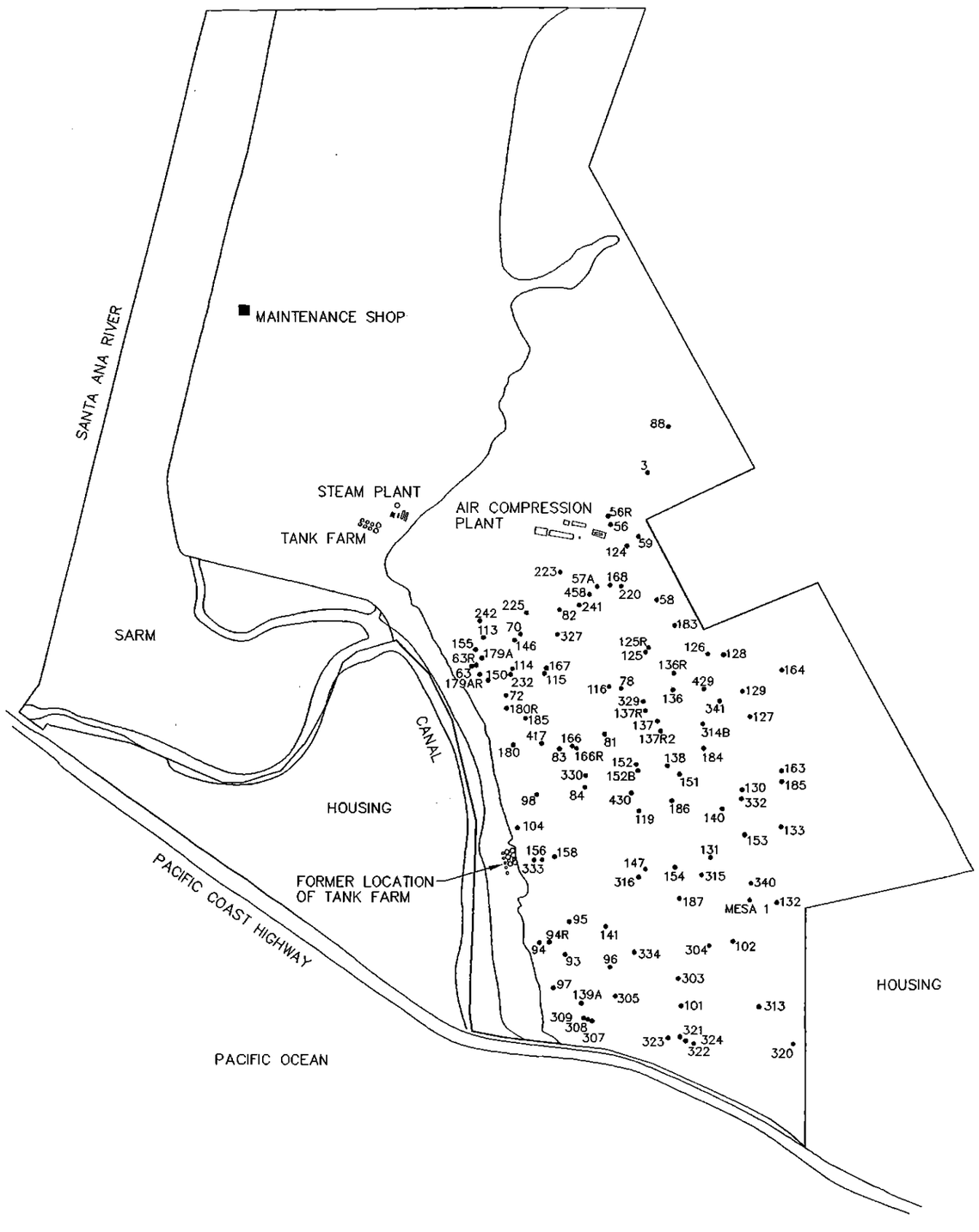
This equipment was also stockpiled on site pending recycling or disposal.

3.8 Soil Gas Survey

A surface aerial survey, surface point survey, and subsurface survey were conducted at the NBR in order to monitor for the possible presence of methane and non-methane VOCs [GeoSyntec, 1993]. The surface aerial survey was used to evaluate the potential for soil gas emission through the surface from non-point sources over large (greater than one acre) surface areas. Surface point surveys were used to evaluate the potential for gas emissions from potential specific point gas sources. The subsurface survey was performed to evaluate the potential for presence of gas in the subsurface. The location of soil gas survey points is indicated in Figure 3-5.

3.9 Baseline Ground-Water and Soil Study

A baseline ground-water and soil study was conducted at the NBR in order to further evaluate the environmental quality of site soils and the ground water in the uppermost aquifer at the site [GeoSyntec, 1994]. Ground-water samples were collected at four locations, three in the lowlands and one in the uplands. The ground-water samples were collected in temporary ground-water monitoring wells that were abandoned after sampling. Three soil samples were collected during the installation of the temporary ground-water monitoring well in the uplands. Soil samples were also collected in eight additional locations, three in the uplands and five in the lowlands. The ground-water and soil sampling locations are included in Figures 3-6 and 3-7. The results of this baseline ground water and soil study generally confirmed previous site investigation work. The impact of oil production operations at the NBR on the soil and ground water at the site appears to be limited to the presence of crude oil and crude oil derived material such as ALM.



800 400 0 800 1600

APPROXIMATE SCALE IN FEET

LEGEND

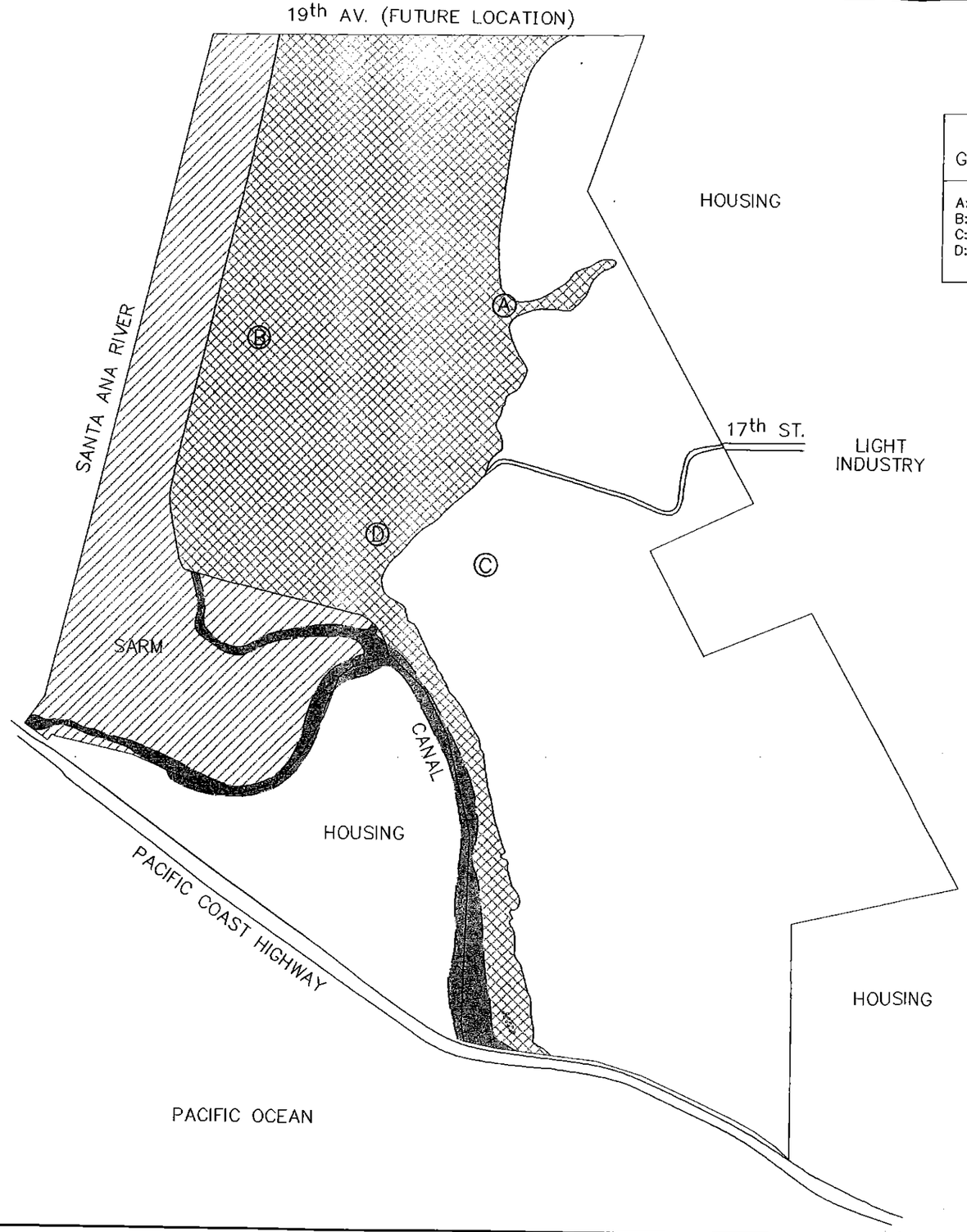
• APPROXIMATE LOCATION OF OIL WELLS ABANDONED TO DATE

GeoSyntec Consultants

APPROXIMATE LOCATION OF WELLS ABANDONED TO DATE
NEWPORT BANNING RANCH
WEST NEWPORT OIL COMPANY

FIGURE NO. 3-1
PROJECT NO. CE4057-06
DATE: JAN-15-96

DWG: 4057F606 199602121040 AB



Approximate
Ground Water Sampling Locations

A: Drainage Gully
B: Maintenance Shop Sump
C: Upland Well -- Air Compression Plant
D: Main Site Tank Farm

N

800 400 0 800 1600

APPROXIMATE SCALE IN FEET

LEGEND

- SANTA ANA RIVER MARSH
- LOWLAND ZONE
- UPLANDS AND TRANSITION ZONES
- Ⓒ GROUND-WATER SAMPLING LOCATION

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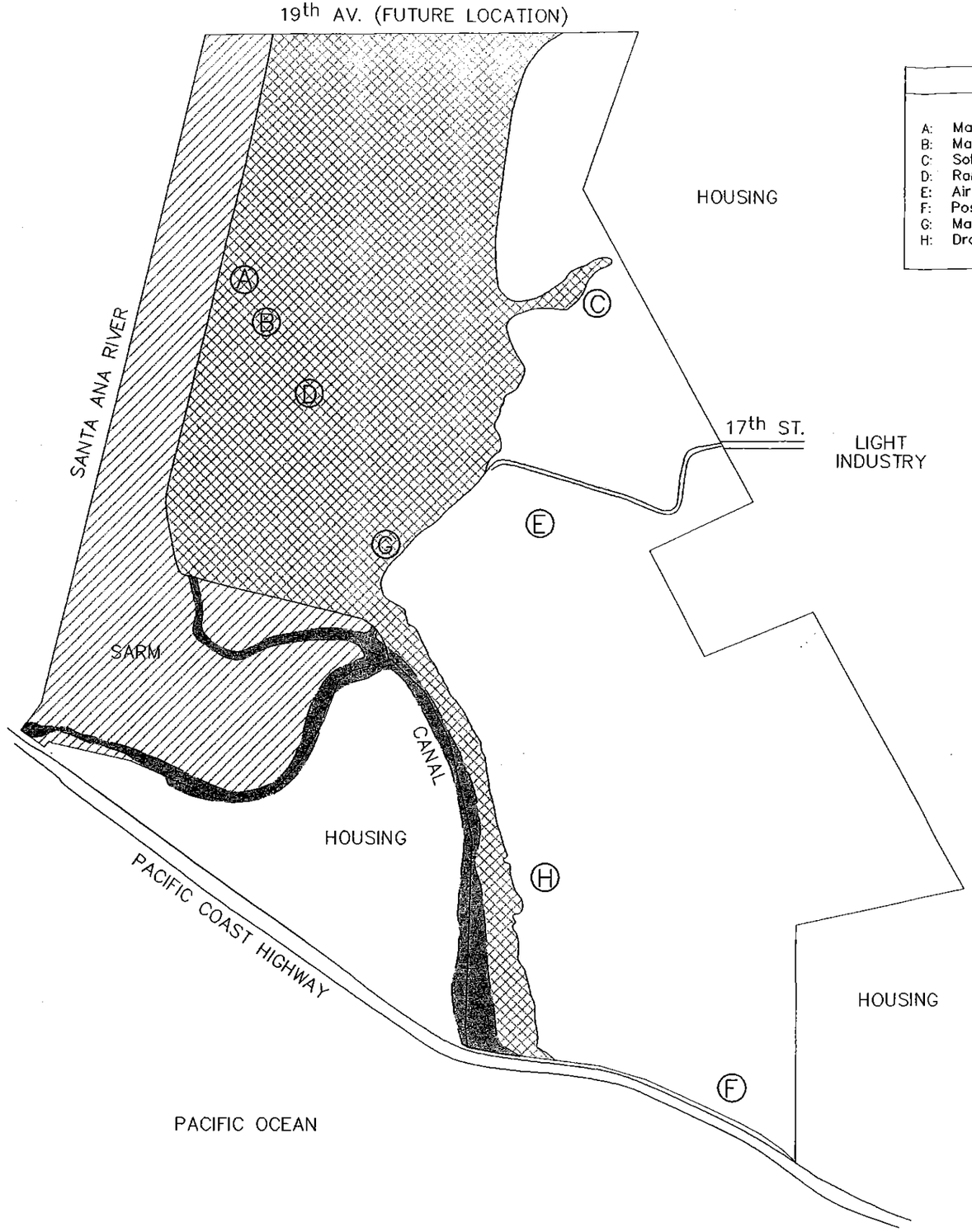
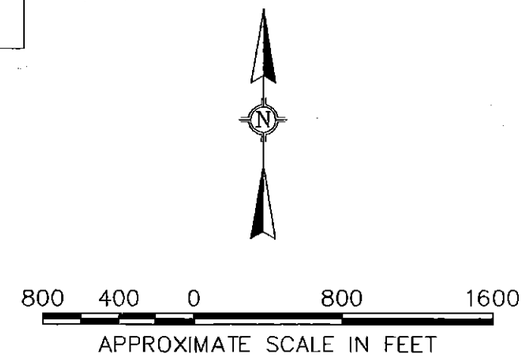
GROUND-WATER SAMPLING LOCATIONS
NEWPORT BANNING RANCH
WEST NEWPORT OIL COMPANY

FIGURE NO.	3-6
PROJECT NO.	CE4057-06
DATE:	DEC-21-94

DWG: 4057F004 199602051010 AB



Soil Sampling Locations	
A:	Maintenance Shop Parts Cleaning Trough
B:	Maintenance Shop Sump
C:	Solid Waste Disposal Area
D:	Random Lowland Location
E:	Air Compression Plant Sump
F:	Possible WWII Solid Waste Disposal
G:	Main Site Tank Farm
H:	Drainage Gully



LEGEND

- SANTA ANA RIVER MARSH
- LOWLAND ZONE
- UPLANDS AND TRANSITION ZONES
- (F) SOIL SAMPLING LOCATION

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SOIL SAMPLING LOCATIONS
NEWPORT BANNING RANCH
WEST NEWPORT OIL COMPANY

FIGURE NO. 3-7
PROJECT NO. CE4057-06
DATE: DEC-21-94

DWG: 4057F005 199602051017 AB

TABLE 3-1

QUANTITIES AND TYPES OF REMOVED PIPELINES
NEWPORT BANNING RANCH
WEST NEWPORT OIL COMPANY
ORANGE COUNTY, CALIFORNIA
(January 1996)

PIPE DIAMETER (in.)	CRUDE OIL (ft)	FIELD GAS (ft)	COMPRESSED AIR (ft)	WATER (ft)	STEAM (ft)	OTHER[1] (ft)	TOTAL
2	0	0	0	1,400	0	0	1,400
$2\ ^{7}/_{8}$	2,050	2,400	6,000	1,250	1,300	400	13,400
3	1,100	0	0	0	0	0	1,100
4	3,000	4,000	0	0	650	0	7,650
5	400	100	0	0	0	0	500
6	0	1,200	0	0	0	0	1,200
7	2,000	200	0	0	0	0	2,200
8	0	150	0	0	0	0	150
Total	8,550	8,050	6,000	2,650	1,950	400	28,400

TABLE 3-2
DRILLING MUD PIT INVESTIGATIONS
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA
(November 1995)

DRILLING MUD PIT/SAMPLE REFERENCE NUMBERS	YEAR WELL INSTALLED
Well 3/Sample No. 3A	1944
Well 3/Sample No. 3B	1944
Well 93/Sample No. 93A	1951
Well 93/Sample No. 93B	1951
Well 96/Sample No. 96A	1967
Well 96/Sample No. 96B	1967
Well 323/Sample No. 323-1	1964
Well 323/Sample No. 323-3	1964

4. CONCLUSION

Pusuant to the completion of the Phase I ESA at the NBR [GeoSyntec, 1993] the ERP was developed to address the environmental concerns at the site [GeoSyntec, 1994]. Implementation of the ERP was divided into phases. Phase 1 of the environmental restoration of the NBR was conducted from 20 July 1994 until 31 January 1996. Phase 1 has included various assessments of the into the environmental condition of site surface features, the vadose zone soils and groundwater at the site. In addition the environmental restoration of oil production related well sites and pipeline locations have been conducted during Phase 1.

Phase 1 of the environmental restoration at the NBR has been conducted in general accordance with the ERP for the NBR [GeoSyntec, 1994] and in accordance with specific procedures and methodologies developed for the environmental restoration of oil wells, pipeline, drilling mud pits, and ALM presented in the SRER [GeoSyntec, 1996].

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APPENDIX A

PRODUCTION AND INJECTION WELLS ABANDONED DURING PHASE 1 NEWPORT BANNING RANCH NEWPORT BEACH, CALIFORNIA

TABLE A-1

RESULTS OF TOTAL RECOVERABLE PETROLEUM HYDROCARBON TESTING NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (January 1995)

WELL NO.	ESTIMATED QUANTITY OF EXCAVATED MATERIAL[2] (yd^3)	DATE OF SOIL SAMPLING	TRPH CONCENTRATION[3] (ppm)
3	30	13 September 1994	24
56	30	03 November 1994	150
56R	30	03 November 1994	550
57A	24	22 November 1994	140
58	24	22 November 1994	< 5
59	43	22 November 1994	< 5
63	53.3	22 November 1994	< 5
63R	30	20 March 1995	16.2
70	43	10 February 1995	< 5
72	30	22 November 1994	< 5
73	30	13 September 1994	420
78	30	03 November 1994	240
81	37	03 November 1994	46
82	24 30	13 September 1994 06 October 1994	1,600 550
83	43	10 February 1995	< 5
84	24	24 August 1994	150
88	30	20 March 1995	< 5
93	43	13 September 1994	310
94	12	13 September 1994	250

TABLE A-1 (continued)

RESULTS OF TOTAL RECOVERABLE PETROLEUM HYDROCARBON TESTING NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (January 1996)

WELL NO.	ESTIMATED QUANTITY OF EXCAVATED MATERIAL[2] (yd^3)	DATE OF SOIL SAMPLING	TRPH CONCENTRATION[3] (ppm)
94R	53	19 July 1994	120
95	53	19 July 1994	23
96	53	20 June 1994	19, 120 [1]
97	30	30 September 1994	700
98	24	24 August 1994	< 5
101	43	30 September 1994	110
102	43	19 July 1994	10
104	30	22 November 1994	< 5
113	53	06 October 1994	55
114	29.6 40.3	28 December 1995[4] 10 January 1996	3,150 <10
115	19	24 August 1994	62
116	66.6	10 May 1995	31
119	37	06 October 1994	< 5
124	27	06 October 1994	440
125	21	03 November 1994	22
125R	26	03 November 1994	120
126	30	24 August 1994	< 5
127	64	13 September 1994	93
128	30	24 August 1994	< 5

TABLE A-1 (continued)

RESULTS OF TOTAL RECOVERABLE PETROLEUM HYDROCARBON TESTING NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (January 1996)

WELL NO.	ESTIMATED QUANTITY OF EXCAVATED MATERIAL[2] (yd^3)	DATE OF SOIL SAMPLING	TRPH CONCENTRATION[3] (ppm)
129	30	24 August 1994	< 5
130	53	02 August 1994	< 5
131	30	03 November 1994	360
132	43	02 August 1994	< 5
133	43	02 August 1994	84
136	24	13 September 1994	68
136R	24	24 August 1994	120
137	30 37	13 September 1994 06 October 1994	1,300 26
137R	30	06 October 1994	390
137R-2	30	13 September 1994	270
138	29.6	28 December 1995	< 10
139A	53	19 July 1994	21
140	43	24 August 1994	< 5
141	43	19 July 1994	6.6
146	30	20 March 1995	340
147	67	24 August 1994	27
150	30	22 November 1994	290
151	30	20 March 1995	< 5
152	30	06 October 1994	410
152R	30	13 September 1994	19

TABLE A-1 (continued)

RESULTS OF TOTAL RECOVERABLE PETROLEUM HYDROCARBON TESTING NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (January 1996)

WELL NO.	ESTIMATED QUANTITY OF EXCAVATED MATERIAL[2] (yd^3)	DATE OF SOIL SAMPLING	TRPH CONCENTRATION[3] (ppm)
153	67	02 August 1994	58
154	53	20 June 1994	22
155	24	13 September 1994	< 5
156	30	03 November 1994	490
158	43	06 October 1994	830
163	43	02 August 1994	130
164	43 54	22 November 1994 10 February 1995	1,400 100
165	30	24 August 1994	22
166	24	03 November 1994	48
166R	30	03 November 1994	95
167	19	24 August 1994	19
168	30	22 November 1994	11
179A	30	22 November 1994	9.3
179R	30	06 October 1994	510
180	30	24 August 1994	180
180R	30	22 November 1994	510
183	24	13 September 1994	50
184	30 37	13 September 1994 06 October 1994	1,600 590
185	43	02 August 1994	470

TABLE A-1 (continued)

RESULTS OF TOTAL RECOVERABLE PETROLEUM HYDROCARBON TESTING NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (January 1996)

WELL NO.	ESTIMATED QUANTITY OF EXCAVATED MATERIAL[2] (yd^3)	DATE OF SOIL SAMPLING	TRPH CONCENTRATION[3] (ppm)
186	30	20 March 1995	< 5
187	32	30 September 1994	540
220	30 36	22 November 1994 10 February 1995	6,900 < 5
223	30	20 March 1995	< 5
224	30	22 November 1994	< 5
225	53	10 February 1995	38
232	30 36	22 November 1994 10 February 1995	1,100 < 5
241	43	22 November 1994	< 5
242	30	22 November 1994	240
303	44 67	20 June 1994 19 July 1994	1,500/11[1] 160
304	43	19 July 1994	100
305	67	20 June 1994	770/12[1]
307	24 33 48	19 July 1994 02 August 1994 24 August 1994	1,700 2,000 5.7
308	53	19 July 1994	76
309	53	19 July 1994	96
313	67	19 July 1994	12
314B	66.6	10 May 1995	356

TABLE A-1 (continued)

RESULTS OF TOTAL RECOVERABLE PETROLEUM HYDROCARBON TESTING NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (January 1996)

WELL NO.	ESTIMATED QUANTITY OF EXCAVATED MATERIAL[2] (yd^3)	DATE OF SOIL SAMPLING	TRPH CONCENTRATION[3] (ppm)
315	43	02 August 1994	74
316	53	20 June 1994	13
320	89	19 July 1994	9.8
321	43	19 July 1994	180
322	53	19 July 1994	380
323	583	7 August 1995	139 800 <10
324	43	19 July 1994	330
327	24	10 May 1995	14
329	30	13 September 1994	6.1
330	64	03 November 1994	48
332	43	02 August 1994	13
333	30	22 November 1994	180
334	35.5	10 May 1995	14
340	53	02 August 1994	11
341	30	22 November 1994	42
417	30	24 August 1994	91
429	30	24 August 1994	< 5
430	43	06 October 1994	7.7
458	37	03 November 1994	6.8

TABLE A-1 (continued)

RESULTS OF TOTAL RECOVERABLE PETROLEUM HYDROCARBON TESTING NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (January 1996)

WELL NO.	ESTIMATED QUANTITY OF EXCAVATED MATERIAL[2] (yd^3)	DATE OF SOIL SAMPLING	TRPH CONCENTRATION[3] (ppm)
MESA-1	29.6	28 December 1995	< 10

Notes: 1) Initially, two soil samples were collected from this excavation

2) For wells with more than one estimated quantity of excavated materials, the quantities are total quantities, not additional quantities.

3) Total Recoverable Petroleum Hydrocarbon concentration as measured using the methodology contained in United States Environmental Protection Agency Method 418.1.