REPORT
SOIL VAPOR SURVEY
at
UNOCAL Station No. 5367
500 Bancroft Avenue
San Leandro, California

AGS Job No. 87091-2V

Report prepared for

UNOCAL Corporation
2175 North California Boulevard
Suite 650
Walnut Creek, California 94596

by
Applied GeoSystems

Burton E. Gilpin
Staff Geologist

Gillian S. Holmes
G.E. 2023

August 12, 1988

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AGS 87091-2V

Mr. Tim Ross
UNOCAL Corporation
2175 North California Boulevard, Suite 650
Walnut Creek, California 94596

Subject: Executive Summary of Report No. 87091-2V, Soil Vapor Survey at UNOCAL Station No. 5367, 500 Bancroft Avenue, San Leandro, California.

Mr. Ross:

This report describes the results of a soil vapor survey that was performed at the above-referenced site on June 17, 1988, by Applied GeoSystems. Data from this type of study are useful in identifying and delineating the subsurface distribution of contamination; however, this type of survey cannot be used to measure absolute levels of soil or gas contamination. Contamination of ground water has been reported to exist beneath the site and there is one monitoring well onsite which contained floating product at the time of this survey.

Field work included use of Applied GeoSystems' Mobile Soil Vapor Laboratory to collect and analyze soil vapor at seven sampling locations, at depths of 15 and 25 feet. Results of the soil vapor analyses revealed that concentrations of contamination, if present in the soil vapor, exist at levels below the detection limits of the analyses employed. Because vapor contamination was not detected around the tank pit and service islands, the survey was abbreviated to include only seven sampling locations. The absence of detectable contaminant concentrations may be due to previous excavation activities on site. Whether or not measurable levels of contamination extend beneath Bancroft Avenue or Dowling Boulevard is unknown.

Please do not hesitate to call if you have any questions regarding the content of this report.

Sincerely,
Applied GeoSystems

Burton E. Gilpin
Staff Geologist

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Attachments: Plate P-1, Site Vicinity Map
Plate P-2, Generalized Site Plan

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at
UNOCAL Service Station No. 5367
500 Bancroft Avenue
San Leandro, California

For UNOCAL Corporation

INTRODUCTION

At the request of UNOCAL Corporation, Applied GeoSystems conducted a [redacted] at the UNOCAL Service Station No. 5367, located at 500 Bancroft Avenue in San Leandro, California. Data from this type of study are useful in identifying and delineating the subsurface distribution of contamination; however, this type of survey cannot be used to measure absolute levels of soil or gas contamination. Contamination of ground water has been reported to exist beneath the site and there is one monitoring well onsite which contained floating product at the time of this survey.

SITE DESCRIPTION AND BACKGROUND

The above-referenced service station is located on the southeast corner of the intersection of Bancroft Avenue and Dowling Boulevard in San Leandro, California, as shown on the Site Vicinity Map (Plate P-1). The location of existing underground storage tanks and other selected site features are shown on the Generalized Site Plan (Plate P-2). The site is bounded to the southeast and northeast by residential properties and to the southwest and northwest by Bancroft Avenue and Dowling Boulevard, respectively.

SOIL VAPOR SURVEY

Background and Purpose

A geologist from Applied GeoSystems was present at the subject site on June 17, 1988, to conduct a soil vapor survey to evaluate the extent of subsurface hydrocarbon contamination. Field work included use of Applied GeoSystems' Mobile Soil Vapor Laboratory to collect and analyze soil vapor at seven sampling locations. The purpose of the soil vapor survey was to evaluate the extent of detectable hydrocarbon vapor in the soil. The relative

concentrations and the lateral extent of hydrocarbon contamination as vapor in soil have been found to correlate to those in ground water (Devitt et al., 1987); therefore, a soil vapor survey can be used to evaluate the lateral extent of hydrocarbon contamination in both the soil and ground water.

Application of the soil vapor survey is based on the tendency of hydrocarbons with low molecular weights to volatilize and migrate through the pore spaces of soil. Hydrocarbon product can migrate through the subsurface as free product or as dissolved product in water and act as a source of hydrocarbon vapor in the soil pores. Residual product trapped or bound within pore spaces also acts as a source of hydrocarbon vapor. Variables that influence hydrocarbon movement in the soil include the physical and chemical properties of the organic contaminants, properties of the unsaturated zone, and hydrogeologic properties of the site. Site-specific parameters may include the vapor pressure, water solubility, and concentration of the chemical; the porosity, moisture content, and organic content of the site soil; and the flow direction and velocity of the ground water.

Vapor Survey Equipment and Sampling Procedure

Equipment used to sample soil vapor included a hardened steel drive-tip, a downhole sampling assembly with vacuum vials, steel probe rods with an outside diameter of 1.75 inches, and a driving unit. The probe rod and drive-tip were hydraulically pushed to a predetermined depth, at which point the drive-tip was opened. The sampling assembly was then lowered through the hollow center of the probe rod to collect the vapor sample. Contamination by atmospheric gas was thus eliminated, giving a reliable and reproducible reading of the concentration of the hydrocarbon vapor in the soil at the sample depth. Because each sample vial is the same size (i.e., constant volume of gas) and is evacuated to the same degree (measured in inches of mercury), the number of variables associated with vapor sampling are reduced. Reducing variation in the vapor sampling procedure provides consistency in sampling at different depths and locations. If additional samples were necessary at greater depths, the probe was closed and pushed or driven to the deeper sampling point.

Selection of Sample Locations and Depths

Sample locations were based on the locations of the underground storage tanks and service islands. Additional sampling locations were considered unnecessary east of the tank pit because of the low levels measured around the tank pit. The soil probe locations are shown on Plate P-2. Because of overhead lines, probing was not possible west of well MW-1. Additional probing in Bancroft Avenue would have been beneficial but required appropriate permitting. The maximum sample depth was based primarily on the ability to penetrate the soil and the depth to ground saturation because vapor transport will not occur in saturated materials. Saturated zones may occur vertically throughout the vadose zone and quite often include a capillary fringe extending upward from the water table. The capillary fringe generally varies in thickness depending on soil type, but we have assumed that it extends upward from the water table a few feet. The depth to ground water was measured at approximately 32 feet below the ground surface in monitoring well MW-1. Samples were retrieved from depths of both 15 and 25 feet to acquire vertical coverage, to lessen the possibility of sampling in a wet or saturated zone, and to remain above the inferred capillary fringe.

After the samples were collected, the probe holes were backfilled with bentonite pellets to within a few inches of the ground surface and then topped off with asphalt to the surface. A Wild NA-24 auto level was used to survey probe-hole locations relative to other facilities at the site.

Description of Chromatograph and Method of Analysis

A 0.10-milliliter vapor sample was withdrawn from the sample vial using a 0.10-milliliter syringe and injected into a Photovac 10S70 portable gas chromatograph for analysis. The instrument is a dual-column, manual-injection chromatograph with a photo-ionization detector that is sensitive to concentrations of hydrocarbon constituents in the range of parts per billion. The analytical equipment used in this survey is housed in Applied GeoSystems' Mobile Soil Vapor Laboratory, which provides a clean, temperature-controlled environment. The detection limit for the chromatograph was set by verifying linearity and peak resolution with standard gas containing equal concentrations (1 part per million) benzene, toluene, and total xylene isomers, which are associated with the higher volatile phase of gasoline. Before analyzing the vapor samples, the chromatograph was calibrated with a standard gas containing equal concentrations (20 ppm) of

benzene, toluene, and total xylene isomers.

RESULTS OF SOIL VAPOR ANALYSES

Results of the soil vapor analyses revealed that concentrations of contamination, if present in the soil vapor, exist at levels below the detection limits of the analyses employed. The absence of detectable contaminant concentrations may be due to previous excavation activities on site. Whether or not measurable levels of contamination extend beneath the Bancroft Avenue or Dowling Boulevard is unknown. Subsurface facilities, such as trenches for product lines; telephone, gas, and electric lines; and sewer and storm drains often act as flow barriers or conduits. The effect of subsurface structures on ground-water flow patterns should be investigated further.

RECOMMENDATIONS

We recommend that the relative contaminant concentrations obtained in this study be cross-referenced with concentrations obtained by analyzing soil and ground water using methods approved by the Environmental Protection Agency.

REFERENCE CITED

Devitt, D. A., R. B. Evans, W. A. Jury, and T. H. Starks, 1987, Soil Gas Sensing and Mapping of Volatile Organics, National Water Well Association, Dublin, Ohio.

LIMITATIONS

This report was prepared in accordance with generally accepted standards of environmental geological practice in California at the time this investigation was performed. This investigation was conducted solely as a tool in evaluating environmental conditions of the soil and ground water with respect to relative hydrocarbon-product contamination in the immediate vicinity of the subject service station. No soil engineering or geotechnical references are implied or should be inferred. Evaluation of the geologic conditions at the site for the purpose of this investigation is made from a limited number of observation points. Subsurface conditions may vary away from the data points available. Additional work, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of investigation.

Source: U.S. Geological Survey
7.5-Minute Quadrangle
San Leandro, California
Oakland West, California
Photorevised 1980

N

Approximate Scale

2000 1000 0 2000 4000

feet

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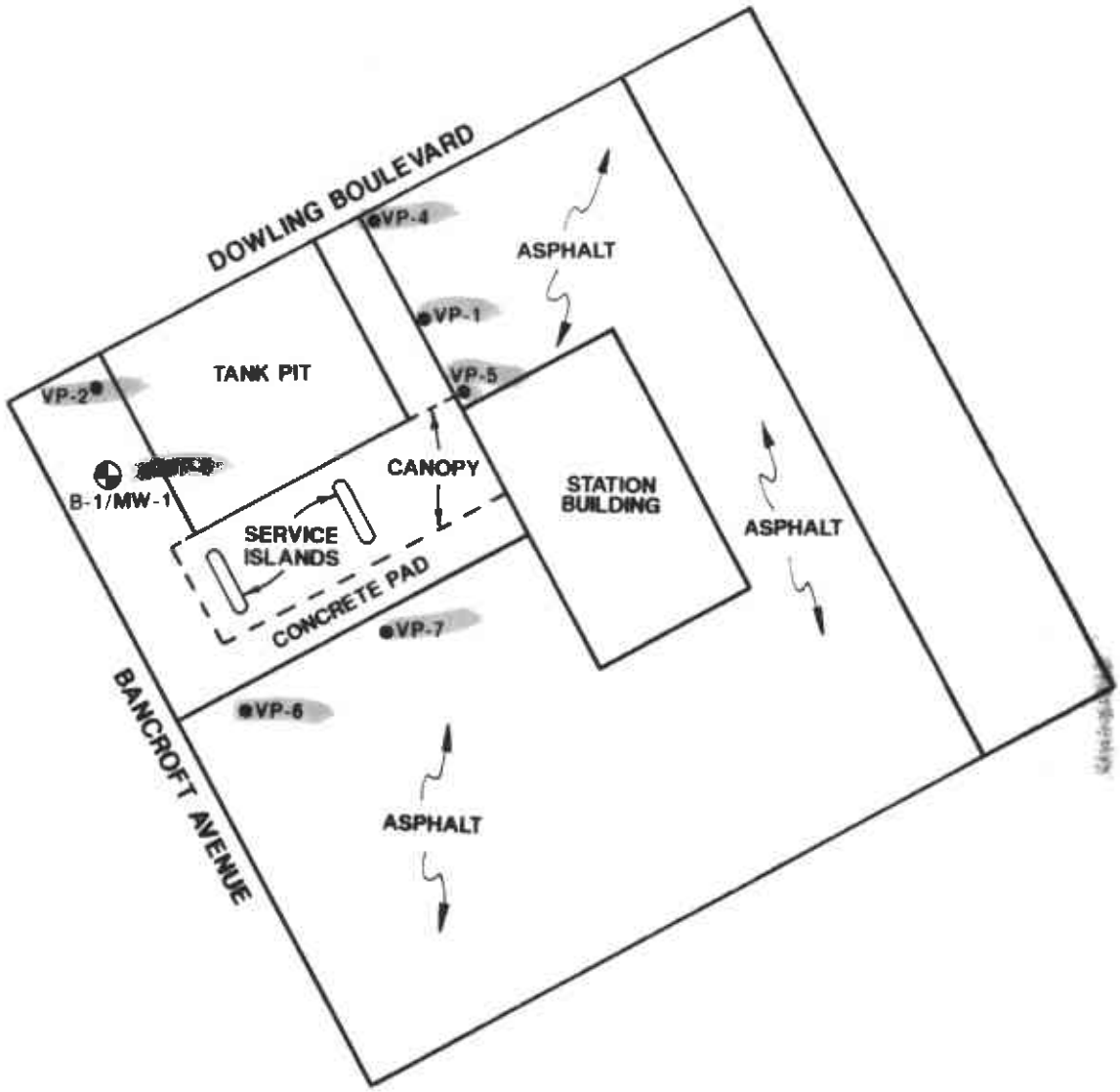
PROJECT NO. 87091-2V

SITE VICINITY MAP
UNOCAL Station No. 5367
500 Bancroft Avenue
San Leandro, California

PLATE
P - 1



VP-7 ● = Soil vapor probe locations

MW-1 ◔ = Monitoring well location

N

Approximate Scale

30 15 0 30 60

feet

Source: Measured by tape and compass

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PROJECT NO. 87091-2V

GENERALIZED SITE PLAN
UNOCAL Station No. 5367
500 Bancroft Avenue
San Leandro, California

PLATE
P - 2