7'10-8'00 - 0.4
8'-9'10 0.8
1.2

Corrective Action Plan

Estate of John B. Henry Property
1726 Park Street
Alameda, California

Prepared for

Estate of John B. Henry

March 22, 1995

Send letter for WP addressing soil excav., inject well & DG well install.

Prepared by

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Project 286-001.3A

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P.O. Estate of John Henry

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REFERENCES

PROFESSIONAL CERTIFICATION
Corrective Action Plan
Estate of John B. Henry Property
1726 Park Street
Alameda, California
April 11, 1995

Pacific Environmental Group, Inc. has prepared this corrective action plan (CAP) on behalf of Estate of John B. Henry (Estate) pursuant to California Code of Regulations Title 23, Chapter 16, Article 11. This plan addresses residual petroleum hydrocarbons found on, beneath, and off the site.

On behalf of the Estate, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Lance D. Geselbracht, P. E.
Senior Engineer
RCE 34688

1. Check SS from boring MW-1
2. Is there enough GW elevation data to verify flow direction

EXECUTIVE SUMMARY

This corrective action plan (CAP) serves as the framework for implementing a strategy for remediation and closure of the site. This CAP was accomplished considering all investigative and remedial data generated to date, as well as State Water Control Board Resolutions 68-16, 88-63, 92-49, and California Code of Regulations (CCR), Title 23, Chapter 16, Article 11. Integrated with the requirements of Title 23 for a CAP are the soon to be adopted revisions to State Water Resources Control Board Resolution 92-49 that provides for an area of non-attainment of groundwater quality protection goals. This revision, referred to as "Non-Attainment Zone (NAZ)," was used as guidance to incorporate NAZ with this CAP.

A review of all pertinent data was completed and summarized in a conceptual site model. The model served as a basis for generating remedial objectives and associated response actions. It is assumed that the primary source of petroleum hydrocarbons in soil and groundwater beneath the site was the former product storage and distribution facilities on site. The compounds of concern are the constituents of gasoline, including, benzene, toluene, ethylbenzene, xylenes, and diesel fuel. Detectable concentrations of oil and grease have been found in surficial soils but do not pose a health threat or affect the remedial recommendation made herein.

Subsequent to preparing the site conceptual model, site-specific environmental, public health, and safety goals were developed. Site water quality (environmental) goals were identified for the proposed compliance boundary located in the downgradient, off-site direction (Eagle Avenue). Within the proposed NAZ compliance boundary, public health and safety goals were specified to eliminate the potential for exposure to, or use of, impacted groundwater and soils.

Predicated on the need to achieve the site-specific environmental, public health, and safety goals, groundwater and soil-based remedial objectives are soil based established. Appropriate response actions were identified and associated technologies were combined into remedial alternatives. Two alternatives were evaluated: (1) Dewatering, Soil Excavation, and Soil Disposal (Alternative 1); and (2) Bioreclamation using Soil Vapor Extraction and Air Sparging (Alternative 2).

Technical, institutional, environmental safety, and economic criteria were used to evaluate the alternatives. It was determined that Alternative 1 was the most feasible for long-term application. Elements of Alternative 1 are:

- Off-site plume delineation using Hydropunch® along sewer line in Eagle Avenue.
- Immediate removal of "secondary sources" on site including impacted saturated zone soils.
- Quarterly monitoring with hydrogen peroxide injection
- Institutional controls.

The recommendation herein is based on the probability that implementation of Alternative 2 will provide less incremental benefit when compared to Alternative 1. The increased exposure and substantial resources required ranking Alternative 1 over Alternative 2. Alternative 1 does allow for the NAZ Amendment to be incorporated into an overall site closure strategy.

1.0 INTRODUCTION

As a result of subsurface petroleum hydrocarbon impact beneath the site, the Estate of John B. Henry (Estate) has been engaged in site investigation and preliminary remedial activities. To develop a remedial approach, the Estate has retained Pacific Environmental Group, Inc. (PACIFIC) to prepare this corrective action plan (CAP). The purpose of the plan is to provide a framework for remediation, considering all pertinent regulatory guidance, site conditions, site remediation constraints, and probable future uses of the site.

1.1 Site Background

The information provided by the Estate and documented in the *Preliminary Subsurface Soils and Groundwater Report* dated August 28, 1992 documents the site is the location of a former gasoline service station. The service station opened during the 1920's and closed in the early 1970's. Facilities on the site have included an enclosed service repair bay, three hydraulic lifts, an underground fuel storage tank complex, one product dispenser island, and an underground waste oil storage tank (Figure 1). In the early 1970's, the underground fuel storage tanks were removed from the site. Records indicate that an underground fuel storage tank complex was located in the eastern portion of the site. The position and number of fuel storage tanks removed from the site is unknown.

After the service station closed in the early 1970's and until 1993, the site was operated as an auto repair shop. The site is currently vacant. The aboveground structures currently on site include the service station building and service repair bay, and the product island with canopy. The subsurface hydraulic lift facilities remain on site at present. Additionally, because the concrete slab in the vicinity of the former product island is intact, it is assumed that at least partial underground product piping remains on site.

1.2 Previous Investigations

In 1991, a site investigation was begun on the site by TMC Environmental, Inc. In August 1991 seven soil borings were drilled. In December 1991, a 500-gallon waste oil tank located in the southwest portion of the site was removed. Two samples analyzed from the base of the waste oil tank excavation were non-detect for petroleum hydrocarbons.

In 1992, 11 additional soil borings were drilled and 2 groundwater monitoring wells were installed. During the initial investigation, selected soil and groundwater samples were analyzed for total petroleum hydrocarbons calculated as gasoline (TPH-g), benzene, toluene, ethylbenzene, xylenes (BTEX compounds), TPH calculated as diesel (TPH-d), total oil and grease (TOG), halogenated volatile organic compounds (HVOCs), and volatile organic compounds (VOCs).

Concentrations of TPH-g in soil ranged from non-detectable to 1,300 parts per million (ppm). The maximum concentration of TPH-g in soil was detected in a sample collected at the depth of approximately 5.5 feet below ground surface (bgs) in the vicinity of the former underground fuel storage tank complex. Concentrations of TPH-d in soil ranged from non-detectable to 2,000 ppm. TOG in soil ranged from non-detectable to 1,800 ppm. The maximum concentration of TOG was detected in a sample collected at the depth of approximately 0.5 foot bgs in the area of the former waste oil tank. Concentrations of TPH-d and TOG were found at 2,000 and 1,500 ppm, respectively, in a sample collected at the depth of approximately 7.5 feet bgs near the hydraulic hoist located west of the former waste oil tank. HVOCs in soil were non-detectable in all samples analyzed. VOCs (49 ppm acetone and 11 ppm 2-butanone) were detected in soils at the depth of 6.5 feet bgs near the northeast boundary of the site.

In February 1994, PACIFIC installed 11 soil borings and six groundwater monitoring wells at the site. Figure 2 shows the analytical results of soil samples obtained from the borings and Figure 3 shows the results from the most current groundwater sampling event. Concentrations of all hydrocarbon constituents were within the ranges previously detected at the site. The eight monitoring wells at the site are sampled on a quarterly basis for TPH-g, BTEX compounds, and TPH-d.

1.3 Document Format

Within this document, a conceptual site model is developed (Section 2.0), and site water quality, public health, and safety goals are identified (Section 3.0). The need for remedial action is outlined in Section 4.0. In Section 5.0, remedial objectives are identified, remedial technologies are screened and assembled into remedial alternatives, alternatives are evaluated, and a specific alternative is recommended.

1.4 Non-Attainment Zones (NAZ)

The State Water Resources Control Board (SWRCB) will amend Board Resolution 92-49 on April 20, 1995 to provide for NAZ at groundwater cleanup sites. When source removal is completed per Section 5.0 of this report, a monitoring strategy with institutional controls will be implemented.

2.0 CONCEPTUAL SITE MODEL

2.1 Physical Characteristics

The majority of the site is paved with asphaltic pavement, although the station building service repair bay, product island canopy, and former waste oil tank area are covered by a concrete slab. The surface paving materials are in some areas underlain by baserock fill to a depth of approximately 0.5 foot. The area behind the station building is unpaved and consists of coarse gravel and medium brown to dark brown gravely sand fill material to a depth of approximately 1 foot.

2.2 Sources of Contamination

The primary source of gasoline found in site soils and groundwater is assumed to originate from the storage and dispensing of fuel hydrocarbons when the site was operated as a gasoline service station. The source of diesel fuel is also assumed to be from the same activities that produced gasoline contamination. TOG found in surficial soils are probably a result of activities associated with the service station and the auto repair facility that operated at the site until 1993. Soil samples in the vadose zone near the location of the former underground fuel tanks contain the highest levels of residual hydrocarbons. These soils and the hydrocarbons that may have leaked directly into the shallow groundwater are the source of dissolved gasoline and diesel found in site monitoring wells. No separate-phase hydrocarbons (SPH) or TOG are presently detected in site monitoring wells.

2.3 Geology/Hydrogeology

Native deposits underlying the site consist of dark brown to gray well-sorted fine sand and clayey sand to a depth of 21 feet bgs (the total depth explored). The well-sorted fine sand was encountered to a depth of approximately 20 feet bgs. At approximately 20 feet bgs, clayey sand was encountered in two of the borings. Groundwater occurs at an approximate depth of 6.5 to 7.5 feet bgs. Groundwater flow direction, based on data collected on July 25, 1994, flows to the northeast.

These formations consists of sand, silt, silty and clayey sand, and sandy clay. These formations are underlain by the San Antonio Formation, consisting of silty clay with thin lenses of

fine gravel. The silty clay reportedly extends to 120 feet bgs and serves as a confining layer for the overlying water-bearing zones. The San Antonio Formation overlies the Alameda Formation which is a 10- to 200-feet thick water-bearing unit. The depth of this formation is unknown.

2.4 Exposure Pathway

Since gasoline constituents have been detected in groundwater beneath the site, it is reasonable to expect groundwater flow to be the primary exposure pathway. The most likely exposure point would be a downgradient water-supply well located near the site. RESNA Industries, Inc. on behalf of their client located at 1725 Park Street conducted an off-site groundwater survey contained in a report dated May 21, 1993. The results of that survey indicate there are no known water-supply wells between the site and the Tidal Canal.

3.0 ENVIRONMENTAL, PUBLIC HEALTH, AND SAFETY GOALS

3.1 Site Water Quality Goals

Site-specific water quality goals are necessary to formulate remedial objectives for the site. Since petroleum hydrocarbon impact is limited to soil and groundwater, and migration to nearest surface water (Tidal Canal) is not likely, only groundwater quality is considered. Guidance for developing water quality goals was obtained from the *Water Quality Control Plan, San Francisco Bay Basin Region* (Regional Water Quality Control Board, 1991), *A Compilation of Water Quality Goals* (Marshack, 1993), and Resolutions 68-16, 88-63, and 92-49 (State Water Resources Control Board, 1968/1988/1992).

According to the *Water Quality Control Plan*, existing and potential beneficial uses of groundwater are:

- Municipal supply
- Industrial and service supply
- Agricultural supply
- Fresh water replenishment to surface water

Comprehensive water quality goals are meant to protect the relevant beneficial uses of ground and surface water. To develop water quality goals, it is recognized that protecting the beneficial use with the most stringent numeric water quality goals will protect all other uses.

In general, water quality goals focus on protecting the existing water quality, whenever that water quality is better than that required to protect all present and potential beneficial uses (Resolution 68-16). Numeric water quality goals based on Resolution 68-16 are associated with the background levels, which in turn are subject to the limit of detection for the residual constituent of concern. Reasonable limits of detection for the residual target compounds found beneath the site are shown below.

- Benzene = 0.5 parts per billion (ppb)
- Toluene = 0.5 ppb
- Ethylbenzene = 0.5 ppb

- Xylenes = 0.5 ppb
- TPH-g = 50 ppb
- TPH-d = 50 ppb

Resolution 88-63 specifies that all groundwater is suitable for municipal supply, unless conditions preclude municipal supply use. Since groundwater conditions downgradient of the NAZ barrier may be suitable for municipal supply use, numeric water quality goals associated with restoring municipal supply pertain to the downgradient residual plume. This is because municipal supply is the relevant beneficial use with the most stringent set of water quality goals. Based upon Resolution 88-63, the following water quality protection goals at the NAZ boundary are proposed:

- Benzene = 1.0 ppb (California Primary Maximum Contaminant Levels)
- Toluene = 42 ppb (Taste and Odor Threshold)
- Ethylbenzene = 29 ppb (Taste and Odor Threshold)
- Xylenes = 17 ppb (Taste and Odor Threshold)
- TPH-g = 1,000 ppb (Taste and Odor Threshold)
- TPH-d= 1,000 ppb (Taste and Odor Threshold)

3.2 Soil Cleanup Levels

Soil cleanup levels that protect water quality at the NAZ barrier have not been developed for this site because: (1) institutional controls per NAZ guidance will be proposed that protect human health and safety and (2) the recommended remedial action will serve to remove residual hydrocarbons in soils (vadose and saturated) to a level that eliminates off-site plume migration per NAZ guidance.

3.3 Site Public Health and Safety Goals

According to guidance presented in Title 23, Chapter 16, Article 11 of the California Code of Regulations (CCR), any remediation approach considered must be designed to mitigate nuisance conditions and risk of fire or explosion posed by residual impact. To assure remedial objectives address the requirements of Article 11, site-specific public health and safety goals are necessary. The site-specific goal is to eliminate any threat to public health and safety associated with subsurface impact, including the potential threat posed by nuisance conditions and risk of fire or explosion. Additionally, use of, or exposure to impacted groundwater or soil will be restricted by institutional controls proposed in Section 5.0.

4.0 REMEDIAL ACTION REQUIREMENTS

To identify remedial action requirements and develop remedial objectives, current site conditions are compared to those necessary to achieve the site-specific water quality protection goals outlined in the previous section. Where goals are achieved, remedial action is not required; conversely, where goals are not achieved, action may be required. In this section, remedial action requirements are specified.

The NAZ compliance boundary is proposed for a downgradient, off-site location not located on any other private property. With the sewer line in Eagle Avenue being a potential conduit for plume migration, the NAZ boundary for the site is proposed for the area of Eagle Avenue upgradient of the sewer line. Monitoring Wells MW-7 and MW-8 currently exist in this location.

Alameda County Department of Environmental Health (ACDEH) has requested that the Estate investigate groundwater quality along the sewer line because of the elevated dissolved TPH-g concentrations detected in Well MW-8. Hyropunch borings were installed along the sewer line to determine groundwater quality within the proposed NAZ barrier. The location of these proposed borings are shown on Figure 3. The results of these hydropunches, shown on Figure 3 and with certified analytical reports attached, indicate the dissolved plume has migrated to the sewer line at Eagle Avenue but not beyond. Hydropunch HP-6 indicated non-detectable concentrations on the downgradient side of the sewer line. Also, hydropunch work completed in late 1992 for the nearby Exxon station indicated the dissolved plume has not migrated beyond the Eagle Avenue sewer lateral. but sewer line may act as conduit for migration of contaminants Vertical migration of the dissolved plume does not pose a threat to water quality goals. This assertion is based on the fact that soil samples taken at the maximum depth for each monitoring well boring installed by PACIFIC was non-detect for TPH-g and TPH-d.

A review of soil chemistry data generated as a result of investigation activities indicates that groundwater-based soil cleanup goals may not be achieved. The TPH-g and benzene concentrations in soil, as characterized by boring data generated in 1991, 1992, and 1994 suggest hydrocarbon concentrations in soil may still exceed groundwater-based soil cleanup goals. As such, soil-based action may be required to achieve groundwater-based soil cleanup goals. This condition is addressed with the recommended remedial Alternative selected in Section 5.0.

With respect to the site public health and safety goal, there is no apparent condition that could be construed as a nuisance, and there are no risks of fire or explosion. Existing levels of TOG that exist in surficial soils are addressed under proposed institutional controls discussed in Section 5.0. At this time, the site public health and safety goal is achieved and no associated corrective action is necessary. The public health and safety goal would be compromised if use of, or exposure to, groundwater within the compliance boundary was allowed.

5.0 REMEDIATION

5.1 Remedial Objectives

Remedial objectives are identified to provide direction in developing remedial actions necessary to achieve the aforementioned goals. Remedial objectives also serve as a baseline for measuring achievement. Soil-based and groundwater-based objectives are identified below.

- **Groundwater**. Within technical and economic constraints: (1) prevent the use of, or exposure to, groundwater within the compliance boundary and (2) protect groundwater outside the NAZ compliance boundary.
- **Soil**. Within technical and economic constraints, achieve the groundwater-based soil cleanup goals that protect groundwater and prevent exposure to affected soil.

Achievement of soil-based and groundwater-based remedial objectives will be subject to technical and economic constraints; therefore, modifications to soil and water quality goals (and associated remedial objectives) may be necessary. Remedial objective achievement will be evaluated through analysis of data resulting from implementation of the recommended remedial alternative.

5.2 Technology Identification and Screening

The general response actions necessary to achieve the remedial objectives are:

1. Identify the extent of the dissolved-petroleum hydrocarbon plume.
2. Dissolved-petroleum hydrocarbon plume management.
3. Reduce the mass of petroleum hydrocarbons identified in groundwater and soil.
4. Facilitate intrinsic remediation.

The general response actions are used to focus the transition from remedial objectives to technological applications. Each response action addresses one or more of the remedial objectives.

5.2.1 Technology Screening

Resolution 92-49 was consulted for applicable technologies, as was available literature. Only technologies that would apply to site-specific conditions were considered, and technologies were eliminated from further consideration on the basis of technical implementability. Technologies that passed the screening process and were found suitable for constructing a remedial alternative were:

- Soil Vapor Extraction/Air Sparging
- Bioreclamation
- Well Installation
- Hydropunch
- Excavation
- Institutional Control

Monitoring was chosen in association with all the response actions identified. Monitoring will provide information necessary to manage the impact plume, evaluate remediation progress, and demonstrate intrinsic remediation. Excavation, soil vapor extraction (SVE), air sparging, and bioreclamation were technologies chosen to address Response Actions 2, 3, and 4 (bioreclamation is considered an aspect of SVE and sparging). The aforementioned technologies were chosen because they are established mass removal technologies, and will work to stabilize the dissolved residual plume. Hydropunch was a technology chosen to address Response Action 1. Institutional control was selected as a method to prevent use of, or exposure to, on-site groundwater and soils.

5.3 Recommended Remedial Alternative

According to CCR Title 23, Chapter 16, Article 11, at least two alternatives must be identified and evaluated for restoring or protecting beneficial water uses. In addition, each alternative must be designed to mitigate nuisance conditions and risk of fire or explosion. Two alternatives were considered and are briefly described below beginning with elements common to both alternatives.

5.3.1 Elements Common to Alternatives

Hydropunch Installation. Six hydropunch borings were installed to complete delineation of the dissolved hydrocarbon plume near the sewer line in Eagle Avenue. Boring locations are shown on Figure 3. Based on the results of these borings and hydropunches completed by Exxon, the NAZ compliance boundary is proposed to be the sewer lateral in Eagle Avenue.

Bioreclamation Assessment. Bioreclamation is based on the principal that indigenous bacteria and fungi within the saturated and vadose zones will adapt to the presence of hydrocarbons introduced into their environment, and then use the hydrocarbons as a "food" source. In this process, the microorganisms degrade the hydrocarbons by transforming them to end products such as water, carbon dioxide, and biomes. The goal of the bioreclamation is to enhance the rate and extent of hydrocarbon biodegradation in soil and groundwater. In order to facilitate effective bioreclamation, a bioreclamation assessment will be conducted.

The bioreclamation assessment will consists of measuring several parameters in the saturated and vadose zones. In the saturated zone, the groundwater will be analyzed for concentrations of dissolved oxygen, dissolved anions (nitrate), dissolved actions (ferric iron), dissolved nutrients (nitrogen and phosphorous), and dissolved hydrocarbons. Temperature and pH will also be measured. With regard to the vadose zone, the assessment will consist of analyzing the soil gas for concentrations of oxygen, carbon dioxide, and hydrocarbon vapors.

Institutional Controls. This management technology will be used to reduce the possibility of exposure to petroleum hydrocarbon-affected soils and groundwater at the site. Generally, this is accomplished by restricting access to impacted areas. Since impacted groundwater on site will persist for some time after remediation, use will be restricted by prohibiting installation of drinking water wells at, or near, the site. Additionally, groundwater pumping that may draw affected groundwater away from the site will be restricted. Site use restrictions may be imposed to ensure that the effectiveness of the recommended remedial alternative is not compromised. Institutional controls achieve the remedial objectives by reducing exposure to all areas of concern. Finally, a migration control contingency plan will be prepared when the site applies for closure, for implementation in the event specific triggers are activated (i.e. concentrations of dissolved hydrocarbons that exceed water quality protection goals at the NAZ barrier).

In addition to institutional controls, some minor closure activities should be completed prior to site redevelopment. The following items need to be addressed:

- Remove hydraulic hoists and test soils related thereto.
- Remove or cap product lines that may exist under the island canopies and test soils..

5.3.2 Alternative 1: Dewatering, Soil Excavation, and Soil Disposal

In addition to the common elements mentioned above, this alternative consists of: (1) partial site demolition (canopy and island removal); (2) construction dewatering to approximately 10 feet bgs; and (3) soil excavation, excavated materials would be transported off-site for proper disposal.

In this alternative, the existing product island and canopy would be removed, if necessary, so that construction dewatering and soil excavation could be accomplished. Once complete, injection of hydrogen peroxide through an injection gallery created during backfill will continue restoration of off-site hydrocarbon-affected soils and groundwater via biodegradation.

5.3.3 Alternative 2: In-situ Bioreclamation using Soil Vapor Extraction and Air Sparging

This alternative consists of the following elements: (1) design and installation of SVE and sparge systems, designs would utilize existing wells when possible; and (2) continued operation of the air sparge system to promote biodegradation after SVE has been terminated.

Application of this alternative would require installation of a SVE system and integral air sparge system. Given the relatively shallow vadose zone (7 feet to groundwater), the SVE system can be installed in several different manners. Shallow trenches with slotted piping below and above the water table could be used, or high vacuum extraction that will remove some groundwater can also be utilized. Operation of the sparge system, with respect to active sparge points and sparge duration, would change to optimize volatilization and biodegradation. Additionally, changes could occur to control groundwater flow by air displacement.

5.4 Alternative Evaluation

Technical, institutional, environmental safety, and economic criteria were used to evaluate the alternatives. Because some remedial alternative elements were common to both alternatives, only the characteristic elements (described above) were considered during the evaluation process. It was determined that Alternative 1 was the most feasible for application. Alternative 1 was chosen on the following basis:

Technical. Technical criteria considered included: short- and long-term effectiveness; reduction in the toxicity, mobility, and volume of affected media; and implementability. With regard to implementability, Alternative 1 is favored because implementation is expected to disrupt the site for a short duration. One negative long-term aspect of Alternative 2 is the long-term operation of a treatment system at the site that would interfere with site

redevelopment. Both alternatives allow for a significant reduction in toxicity, mobility, and volume of hydrocarbon-affected media.

Institutional. It is anticipated that implementation of either alternative would be consistent with applicable, relevant, and appropriate requirements; however, community acceptance of the heavy construction associated Alternative 1 may be weak and the complexity of compliance would be higher than for Alternative 2. Additionally, Alternative 2 would require more resource commitment from the regulatory community. Because of these factors, Alternative 1 was ranked above Alternative 2 with respect to institutional criteria.

Economic. Based on economic analysis, alternatives were ranked from most economical to least economical. Alternative 1 is associated with considerable capital outlay in an incrementally shorter operation period. There is more uncertainty associated with the long-term operational costs of Alternative 2. It is estimated that excavation and off-site disposal costs could range between $80,000 and $120,000; in addition to site-specific costs for dewatering, demolition, and construction. Alternative 2 requires some capital outlay with long-term operational costs and total cost is estimated between $120,000 and $200,000 over the next 3 years.

5.5 Summary

Considering the data presented, PACIFIC recommends the implementation of Alternative 1, excavation with monitoring and peroxide injection. A work plan outlining the process for excavating site soils would be prepared and submitted to ACDEH for prior approval. The approximate horizontal limits of excavation are shown on Figure 3. The vertical limits are estimated to be 10 feet bgs. It is proposed the lateral and vertical limits of excavation be the 10 ppm detection for TPH-g. The excavated soil would be removed from the site and disposed at a licensed landfill. During the backfilling operation, drainage rock will be placed in the invert of the excavation near the corner of Park Street and Eagle Avenue so that future peroxide injections would migrate in the direction of the off-site plume, upgradient of the sewer lateral in Eagle Avenue.

5.5.1 Well Abandonment

Since excavation is the proposed alternative, monitoring wells located in the approximate limits of excavation will need to be abandoned during the remedial activities. These are Monitoring Wells MW-1,6, and 7. The four other wells located on site have all been non-detect for all sampling events (TPH-g\BTEX) except for Well MW-5 which indicated non-detectable results for the last monitoring event. It is proposed that all seven wells on-site be abandoned in accordance with the proposed NAZ remedial strategy and to allow site redevelopment to occur. An additional new well would be installed off site near the corner of

Eagle Avenue and Park Street to monitor the off-site plume in conjunction with Well MW-8 and the peroxide injection point to be installed with the backfill. These three points would allow monitoring to continue and can be used with hydropunches along the sewer lateral in Eagle Avenue (the proposed NAZ barrier) to assess site compliance with the closure strategy.

APPENDIX A

CERTIFIED ANALYTICAL REPORTS

HYDROPUNCHES HP-1 THOUGH HP-6

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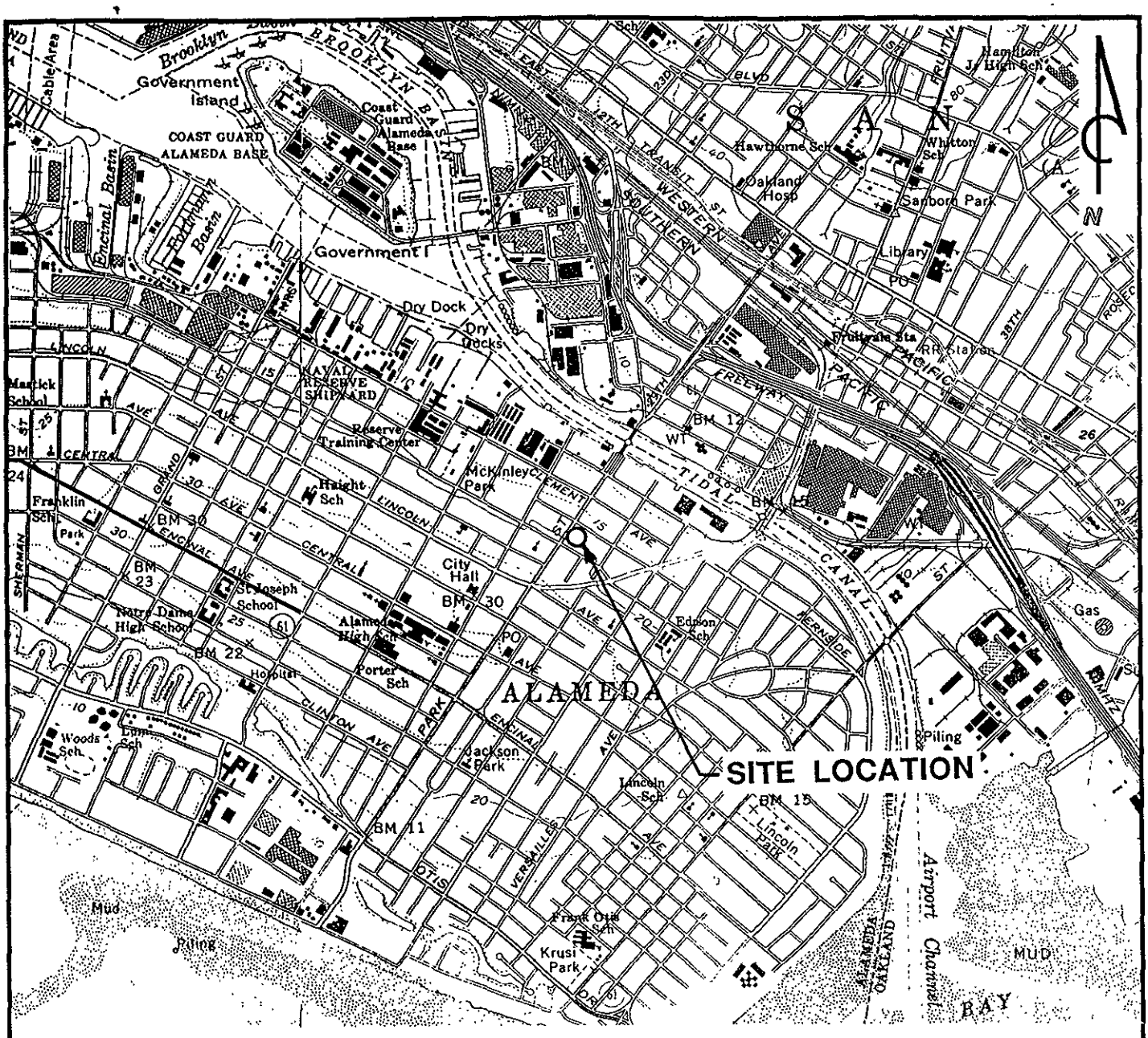
FIGURES

Figures

Figure 1 Site Location Map
Figure 2 Soil Analytical Results Map
Figure 3 Current Groundwater Sampling Results and Proposed Limits of Excavation



REFERENCES:
USGS 7.5 MIN. TOPOGRAPHIC MAP
TITLED: OAKLAND WEST, CALIFORNIA
DATED: 1959 REVISED: 1980
TITLED: OAKLAND EAST, CALIFORNIA
DATED: 1959 REVISED: 1980

SCALE IN FEET
2000 0 2000

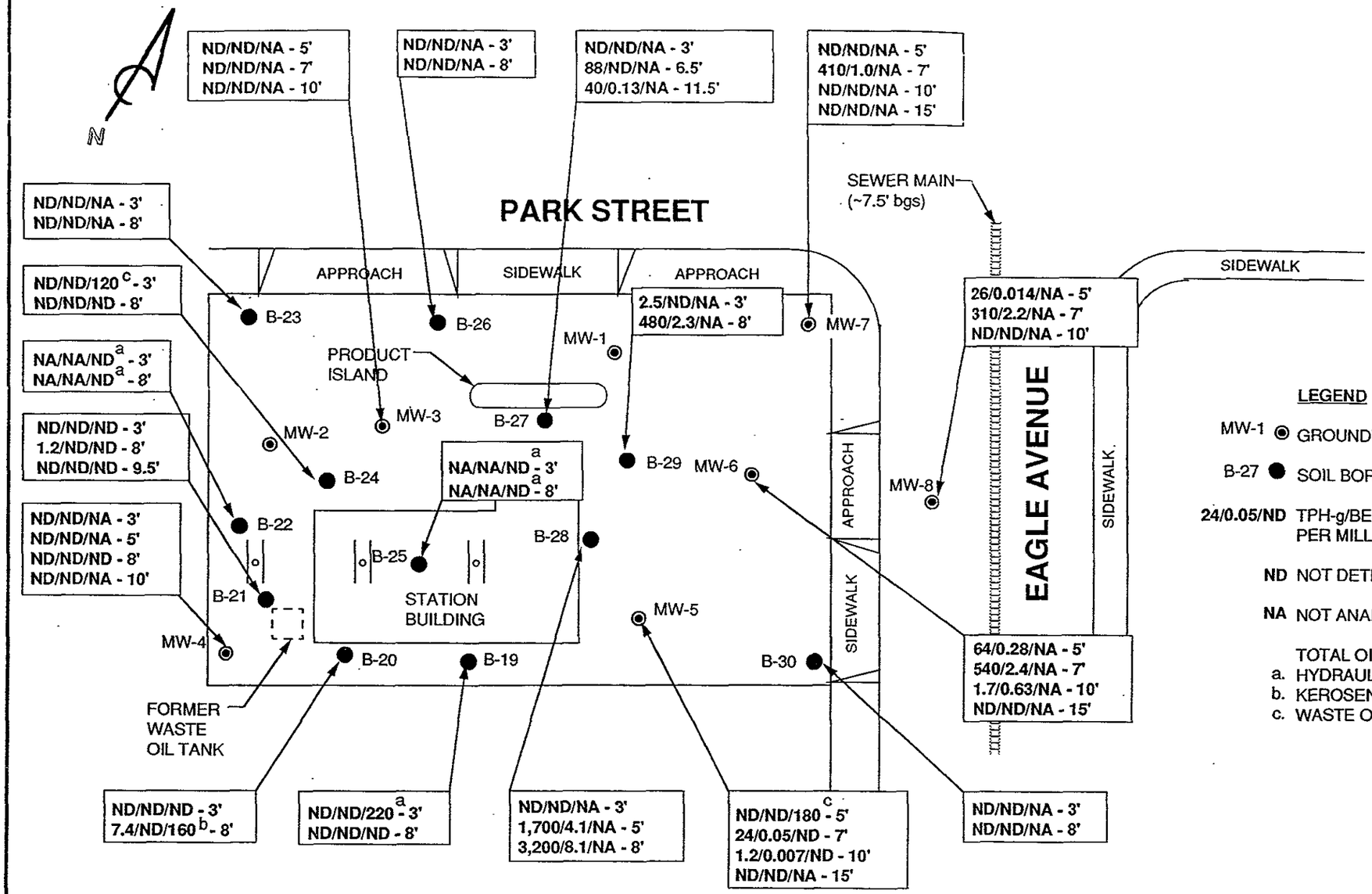
PACIFIC ENVIRONMENTAL GROUP, INC.

ESTATE OF JOHN B. HENRY
1726 Park Street at Eagle Avenue
Alameda, California

SITE LOCATION MAP

FIGURE: 1
PROJECT: 286-001.3A

EXXON - pumping



LEGEND

MW-1 ◉ GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION

B-27 ● SOIL BORING LOCATION AND DESIGNATION

24/0.05/ND TPH-g/BENZENE/OIL and GREASE CONCENTRATION IN SOIL, IN PARTS PER MILLION, AT DEPTH INDICATED IN FEET, 2-9-94 and 2-10-94

ND NOT DETECTED

NA NOT ANALYZED

TOTAL OIL AND GREASE CHARACTERISTICS QUALITATED AS FOLLOWS:

a. HYDRAULIC OIL
b. KEROSENE (ALSO QUANTIFIED AS KEROSENE IN DIESEL RANGE)
c. WASTE OIL

PACIFIC ENVIRONMENTAL GROUP, INC.

SCALE
0 20 40 FEET

ESTATE OF JOHN B. HENRY
1726 Park Street at Eagle Avenue
Alameda, California

SOIL ANALYTICAL RESULTS MAP

FIGURE: 2
PROJECT: 286-001.3A

N

PARK STREET

APPROACH

SIDEWALK

APPROACH

HP-1
19,000/31

HP-2
4,500/30

MW-7
13,000/20

MW-1
1,400/3.4

PRODUCT
ISLAND

HP-3
320/ND

MW-2
ND/ND

MW-3
ND/ND

HP-4
ND/0.7

MW-6
4,100/490

MW-8
820/35

HP-5
ND/ND

APPROACH

STATION
BUILDING

MW-5
ND/ND

SIDEWALK

MW-4
ND/ND

FORMER
WASTE
OIL TANK

EAGLE AVENUE

HP-6
ND/ND

SIDEWALK

SIDEWALK

SEWER MAIN
(~7.5' bgs)

LEGEND

MW-1 GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION

HP-1 HYDROPUNCH LOCATION AND DESIGNATION, 2-13-95

820/35 TPH-g/BENZENE CONCENTRATION IN GROUNDWATER, IN PARTS PER BILLION (ppb), 2-9-95

320/ND TPH-g/BENZENE CONCENTRATION IN GROUNDWATER SAMPLE, IN ppb, 2-13-95

ND DETECTED

APPROXIMATE DIRECTION
OF GROUNDWATER FLOW

PACIFIC
ENVIRONMENTAL
GROUP, INC.

SCALE
0 20 40 FEET

ESTATE OF JOHN B. HENRY
1726 Park Street at Eagle Avenue
Alameda, California

CURRENT GROUNDWATER SAMPLING RESULTS AND PROPOSED LIMITS OF EXCAVATION

FIGURE:
3

PROJECT:
286-001 3A

APPENDIX A

CERTIFIED ANALYTICAL REPORTS

HYDROPUNCHES HP-1 THOUGH HP-6

B C Analytical

801 Western Avenue
Glendale, CA 91201
818/247-5737
Fax: 818/247-9797

ANALYTICAL REPORT

LOG NO: G95-02-243
Received: 14 FEB 95
Mailed: FEB 23 1995

Ms. Maree Doden
Pacific Environmental Group
2025 Gateway Place, #440
San Jose, California 95110

Purchase Order: 28169

Project: 286-001.1B

REPORT OF ANALYTICAL RESULTS

AQUEOUS

SAMPLE DESCRIPTION	DATE SAMPLED	TPH/BTEX (CADHS/8020) Date Analyzed	Dilution Factor Times	TPH-g ug/L	Benzene ug/L	Toluene ug/L	Ethyl-Benzene ug/L	Total Xylenes Isomers ug/L	
RDL			1						
1*HP 1	02/13/95	02/16/95	10	19000	31	50	1100	4100	
2*HP 2	02/13/95	02/16/95	5	4500	30	22	200	680	
3*HP 3	02/13/95	02/16/95	1	320	<0.5	1.3	3.9	5.0	
4*HP 4	02/13/95	02/15/95	1	<50	0.68	0.94	<0.5	<0.5	
5*HP 5	02/13/95	02/15/95	1	<50	<0.5	<0.5	<0.5	<0.5	
6*HP 6	02/13/95	02/16/95	1	<50	<0.5	<0.5	<0.5	<0.5	

Mark A. Valentini, PhD, Laboratory Director

ORDER PLACED FOR CLIENT: PACIFIC ENVIRONMENTAL GP

BC ANALYTICAL : GLEN LAB : 16:03:26 22 FEB 1995 - P. 1 :

AMPLES...	SAMPLE DESCRIPTION..	DETERM.....	DATE..... ANALYZED	METHOD.....	EQUIP.	BATCH..	ID.NO
302243*1	HP 1	GAS.BTX.TESNC	02.16.95	8015M.TX	516-20	958098	8523
302243*2	HP 2	GAS.BTX.TESNC	02.16.95	8015M.TX	516-20	958098	8523
302243*3	HP 3	GAS.BTX.TESNC	02.16.95	8015M.TX	516-20	958098	8523
302243*4	HP 4	GAS.BTX.TESNC	02.15.95	8015M.TX	516-20	958098	8523
302243*5	HP 5	GAS.BTX.TESNC	02.15.95	8015M.TX	516-20	958098	8523
302243*6	HP 6	GAS.BTX.TESNC	02.16.95	8015M.TX	516-20	958098	8523

**

Notes: Equipment = BC Analytical identification number for a particular piece of analytical equipment.

ID.NO = BC Analytical employee identification number of analyst.

BC ANALYTICAL

ORDER QC REPORT FOR G9502243

TE REPORTED : 02/22/95

LABORATORY CONTROL STANDARDS
FOR BATCHES WHICH INCLUDE THIS ORDER

ARAMETER	DATE ANALYZED	BATCH NUMBER	LC RESULT	LT RESULT	UNIT	PERCENT RECOVERY
. TPH gas/BTEX (CADHS/80 C5021936*1						
Date Analyzed	02.16.95	958098	02/16/95	02/16/95	Date	N/A
Benzene	02.16.95	958098	17.5	12.5	ug/L	140 Q
Toluene	02.16.95	958098	64.2	55.5	ug/L	116 Q
Ethylbenzene	02.16.95	958098	15.2	12.5	ug/L	122 Q
Total Xylene Isomers	02.16.95	958098	73.5	66.5	ug/L	111
TPH (as Gasoline)	02.16.95	958098	994	1000	ug/L	99

BC ANALYTICAL

ORDER QC REPORT FOR G9502243

ATE REPORTED : 02/22/95

MATRIX QC PRECISION (DUPLICATE SPIKES)
BATCH QC REPORT

ARAMETER	SAMPLE NUMBER	DATE ANALYZED	BATCH NUMBER	MS RESULT	MSD RESULT	UNIT	RELATIVE % DIFF
. TPH-gas/BTEX (CADHS/80	9502243*4						
Date Analyzed		02.16.95	958098	02/16/95	02/16/95	Date	N/A
Benzene		02.16.95	958098	14.2	17.8	ug/L	23
Toluene		02.16.95	958098	49.2	63.3	ug/L	25
Ethylbenzene		02.16.95	958098	10.7	14.4	ug/L	29
Total Xylene Isomers		02.16.95	958098	56.5	73.0	ug/L	25
TPH (as Gasoline)		02.16.95	958098	630	844	ug/L	29 Q

BC ANALYTICAL

ORDER QC REPORT FOR G9502243

\TE REPORTED : 02/22/95

MATRIX QC ACCURACY (SPIKES)
BATCH QC REPORT

ARAMETER	SAMPLE NUMBER	DATE ANALYZED	BATCH NUMBER	MS %	MSD %	TRUE RESULT	UNIT	
. TPH-gas/BTEX (CADHS/80	9502243*4							
Benzene		02.15.95	958098	108	137 Q	13.2	ug/L	Q
Toluene		02.15.95	958098	87	112	56.4	ug/L	
Ethylbenzene		02.15.95	958098	86	115	12.5	ug/L	
Total Xylene Isomers		02.15.95	958098	85	110	66.5	ug/L	
TPH (as Gasoline)		02.15.95	958098	63	84	1000	ug/L	

BC ANALYTICAL

ORDER QC REPORT FOR G9502243

ATE REPORTED : 02/22/95

METHOD BLANKS AND REPORTING DETECTION LIMIT (RDL)
FOR BATCHES WHICH INCLUDE THIS ORDER

PARAMETER	DATE ANALYZED	BATCH NUMBER	BLANK RESULT	RDL	UNIT	METHOD
1. TPH-gas/BTEX (CADHS/80 B5021018*1						
Date Analyzed	02.15.95	958098	02/15/95	NA	Date	8015M.TX
Benzene	02.15.95	958098	0	0.5	ug/L	8015M.TX
Toluene	02.15.95	958098	0.30	0.5	ug/L	8015M.TX
Ethylbenzene	02.15.95	958098	0	0.5	ug/L	8015M.TX
Total Xylene Isomers	02.15.95	958098	0	0.5	ug/L	8015M.TX
TPH (as Gasoline)	02.15.95	958098	33	50	ug/L	8015M.TX

SURROGATE RECOVERIES :
BC ANALYTICAL : GLEN LAB : 16:03:53 22 FEB 1995 - P. 1 :

ETHOD ANALYTE	BATCH	ANALYZED	REPORTED	TRUE	%REC	FLAG
502243*1						
015M.TXa,a,a-Trifluorotoluene	958098	02/16/95	51.2	50.0	102	
502243*2						
015M TXa,a,a-Trifluorotoluene	958098	02/16/95	54.0	50.0	108	
502243*3						
015M.TXa,a,a-Trifluorotoluene	958098	02/16/95	46.4	50.0	93	
502243*4						
015M.TXa,a,a-Trifluorotoluene	958098	02/15/95	51.0	50.0	102	
502243*5						
015M.TXa,a,a-Trifluorotoluene	958098	02/15/95	34.7	50.0	69	
502243*6						
015M.TXa,a,a-Trifluorotoluene	958098	02/16/95	24.8	50.0	50	

SURROGATE RECOVERIES :
BC ANALYTICAL : GLEN LAB : 16:03:54 22 FEB 1995 - P. 1 :

ETHOD ANALYTE	BATCH	ANALYZED	REPORTED	TRUE	%REC	FLAG
502243*4*R1						
015M.TXa,a,a-Trifluorotoluene	958098	02/15/95	51.0	50.0	102	
502243*4*S1						
3015M.TXa,a,a-Trifluorotoluene	958098	02/16/95	52.6	50.0	105	
)502243*4*S2						
3015M.TXa,a,a-Trifluorotoluene	958098	02/16/95	52.2	50.0	104	
)502243*4*T						
3015M.TXa,a,a-Trifluorotoluene	958098	02/16/95	50.0	50.0	100	
5021018*1*MB						
3015M.TXa,a,a-Trifluorotoluene	958098	02/15/95	31.8	50.0	64	
:5021936*1*LC						
3015M.TXa,a,a-Trifluorotoluene	958098	02/16/95	41.2	50.0	82	
:5021536*1*LT						
3015M.TXa,a,a-Trifluorotoluene	958098	02/16/95	50.0	50.0	100	

ESTATE OF JOHN P. HENRY

Chain of Custody

Pacific Environmental Group, Inc.
2025 Gateway Place #440, San Jose CA 95110
Phone 408 441 7790 Fax 408 441 7539

PROJECT No. 286-001.1B

Facility No. 286-001.1B | Facility Address: 1726 Park St. Alameda CA | Billing Refence Number: 28169

CLIENT engineer: Mendelson & Brown | PACIFIC Point of Contact: Lance G. | Sampler: W Peck | Laboratory Name: BC

Sample I.D.	Cont. No.	Container Size (ml)	Sample Preserv.	Matrix (W=water, S=soil, A=air)	Type (G=grab, D=disc., C=comp.)	Sampling Date	Sampling Time	BTEX/ VPHgas (8015/ 8020)	TPH Diesel (8015)	Oil and Grease (5520)	Total Dislvd. Metals	VOC (EPA 624/ 8240)	SVOC (EPA 627/ 8270)	HVOC (EPA 601/ 8010)				Comments:
																		G9502243
HP1	3	40ml	HCl	(W)		2/13/95	11:40	X									—	1
HP2	3	"	"	"		"	11:30	"									—	2
HP3	3	"	"	"		"	11:50	"									—	3
HP4	3	"	"	"		"	12:45	"									—	4
HP5	3	"	"	"		"	12:50	"									—	5
HP6	3	"	"	"		"	12:15	"									—	6

Condition of Sample:

Temperature Received:

	Date	Time		Date	Time
Relinquished by: Wade Peck	2/13/95	4:00	Received by: [signature]	2/13/95	1600
Relinquished by: [signature]	2/14/95	445	Received by: [signature]	2-14-95	945
Relinquished by: [signature]	2-14-95	425	Received by: [signature]	2/14/95	425
Relinquished by:	Date	Time	Received by laboratory	Date	Time

Mail original Analytical Report to:
Pacific Environmental Group

- 2025 Gateway Place #440, San Jose, CA 95110 ☒
- 620 Contra Costa Blvd. #209, Pleasant Hill, CA 94523 ☐
- 25725 Jeronimo Rd. #576C, Mission Viejo, CA 92622 ☐
- 4020 148th Ave NE #B, Redmond, WA 98052 ☐

Turnaround Time:

- Priority Rush (1 day)
- Rush (2 days) ✓
- Expedited (5 days)
- Standard (10 days)
- As Contracted

ESTATE OF JOHN B. HENRY

Chain of Custody

Pacific Environmental Group, Inc.
2025 Gateway Place #440, San Jose CA 95110
Phone 408 441 7790 Fax 408 441 7539

PROJECT No. 286-001.1B

Facility No. 286-001.1B | Facility Address: 1726 Park St. Alameda CA | PO Billing Refence Number: 28169

CLIENT engineer: Mendelson & Brown | PACIFIC Point of Contact: Lance G. | Sampler: W Peck | Laboratory Name: BC

Sample I.D.	Cont. No.	Container Size (ml)	Sample Preserv.	Matrix (W=water, S=soil, A=air)	Type (G=grab, D=disc., C=comp.)	Sampling Date	Sampling Time	BTEX/ VPHgas (8015/ 8020)	TPH Diesel (8015)	Oil and Grease (5520)	Total Dislvd. Metals	VOC (EPA 624/ 8240)	SVOC (EPA 627/ 8270)	HVOC (EPA 601/ 8010)	Comments:
HP1	3	40ml	HCl	W		2/13/95	11:40	X							
HP2	3	"	"	"		"	11:30	"							
HP3	3	"	"	"		"	11:50	"							
HP4	3	"	"	"		"	12:45	"							
HP5	3	"	"	"		"	12:50	"							
HP6	3	"	"	"		"	12:15	"							

Condition of Sample:

Temperature Received:

	Date	Time		Date	Time
Relinquished by: Wade Peck	2/13/95	4:00	Received by: M Dolan	2/13/95	1600
Relinquished by: M Dolan	2/14/95	945	Received by: Kelly Lyons	2-14-95	945
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by laboratory	Date	Time

Mail original Analytical Report to:

Pacific Environmental Group

- 2025 Gateway Place #440, San Jose, CA 95110 ☒
- 620 Contra Costa Blvd. #209, Pleasant Hill, CA 94523 ☐
- 25725 Jeronimo Rd. #576C, Mission Viejo, CA 92622 ☐
- 4020 148th Ave NE #B, Redmond, WA 98052 ☐

Turnaround Time:

- Priority Rush (1 day) ☐
- Rush (2 days) ☒
- Expedited (5 days) ☐
- Standard (10 days) ☐
- As Contracted ☐