Alc Co.

CORRECTIVE / INTERIM REMEDIAL ACTION PLAN
FOR
STID 553 -
FORMER GRIMIT AUTO AND REPAIR
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

February 15, 1997

Prepared by

HOEXTER CONSULTING, INC.
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Geology / Engineering Geology / Environmental Studies

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February 15, 1997

E-10-1B-192B
HC CAP/RAP/ClosPlan: Seminary2/97CAP/RAP

Mr. Doyle Grimit
14366 Lark Street
San Leandro, California 94578

RE: **CORRECTIVE / INTERIM REMEDIAL ACTION PLAN**
STID 553 - FORMER GRIMIT AUTO AND REPAIR
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

Dear Mr. Grimit:

As authorized, we have prepared the attached Corrective / Interim Remedial Action Plan, to address the existing site conditions and remedial action objectives, and to establish a cost-effective remedial action plan. The goal of the plan is to achieve continued source removal and reduction of health and environmental risks associated with the project site, with the ultimate goal of achieving site closure.

We appreciate the opportunity to provide services to you on this project and trust this report meets your needs at this time. If you have any questions, or require additional information, please do not hesitate to call.

Very truly yours,

HOEXTER CONSULTING, INC.

David F. Hoexter, RG/CEG/REA
Principal Geologist

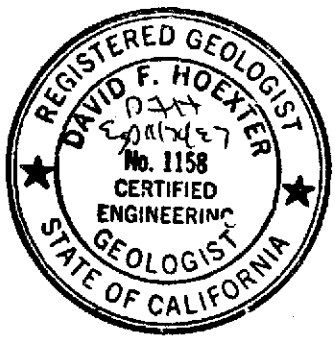
CORRECTIVE / INTERIM REMEDIAL ACTION PLAN

For

STID 553 - Former Grimit Auto and Repair
1970 Seminary Avenue
Oakland, California

To

Mr. Doyle Grimit
14366 Lark Street
San Leandro, California 94578



Prepared by:

Hoexter Consulting, Inc.
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February 15, 1997

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(OVER)

8T1D553

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TRANSMITTAL

TO Alameda County Health - LOP
1131 Harbor Bay Pkwy # 250
Alameda CA 94502-6577

DATE 2/18/97
VIA Hand Del.
FAX NO. _____

ATTENTION Deb Kletke

PROJECT 1970 Seminary
Oakland CA

JOB NO. E-10-18-1923

DESCRIPTION 2/15/97 CAP / Interim RAP

Number of pages, including cover page, if FAX _____

COMMENTS _____

ACTION

_____ As requested
X For your use
_____ Please return when finished
X Please review and comment
_____ Other _____

COPY TO D. Grint

BY DJ F. HC
David F. Hoexter

If enclosures are not as noted, kindly notify us at once

Rev. 7/6/93

do tier 2

ORC pilot pump - also collect water sample
start ORC in low concentrated / near edge of plume
do well search (any nearby migration wells, etc)
(No. undocumented well across seminary - was ND.) in rpt w/ install. of MW 2 and 3
Analyze for MTBE
Site plan down building / house at adjacent properties

Analyze for PAH in well shown
where are residential buildings

EXECUTIVE SUMMARY

Ground water contamination extends off-site to a residential area. ASTM RBCA analysis has shown that risk based screening levels (RBSLs) are exceeded by as much as four orders of magnitude. Corrective action is proposed which emphasizes remediation of the site's "source area". Results of an SVE pilot study suggest that SVE would be effective for remediation of gasoline [redacted] the site, but would not successfully remediate waste oil and [redacted] and would require a significant capital investment due to the required density of extraction wells and associated equipment operation and maintenance costs. The proposed remediation plan would consist of:

* Installation of additional down gradient monitoring wells.

* Installation of oxygen releasing compounds (ORCs) in soil borings throughout the "source area". An initial small scale calibration test is proposed. The ORCs would be installed as a slurry directly into the calibration test soil borings, and would be pressure injected into the "full scale" remediation program.

* Installation of a low volume in-situ bioventing vacuum system in existing and proposed monitoring wells.

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CORRECTIVE / INTERIM REMEDIAL ACTION PLAN
STID #553
FORMER GRIMIT AUTO AND REPAIR
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

1.0 INTRODUCTION

This report presents the results of an evaluation of remediation alternatives and provides a preliminary corrective/remedial action plan for the former Grimit Auto and Repair site, located at 1970 Seminary Avenue, Oakland, California. The project location is shown on the Location Map, Figure 1, and the site is shown on the Site Plan, Figure 2. The report was required by the Alameda County Health Care Services Agency, Local Oversight Program, specifically a letter from Mr. Dale Klettke, Hazardous Materials Specialist, to the property owner, Doyle Grimit, dated September 24, 1996.

This investigation supplements a preliminary evaluation of remedial alternatives, prepared by our firm in July, 1996. The preliminary evaluation was conducted in response to a request by Alameda County Health Care Services Agency, dated May 15, 1996. Mr. Klettke's letter requested *"a report which evaluates whether remedial action, interim remedial action, or further tier evaluation is warranted for your site"*.

In the current evaluation, a field test of the effectiveness of soil vapor/ground water extraction was conducted, and a recommendation for interim remedial action was prepared.

A scope of investigation was presented in our proposal dated November 5, 1996. The proposed cost for this evaluation was pre-approved for reimbursement by the State of California Underground Storage Tank Cleanup Fund Program in a letter dated November 21, 1996, and received by our firm on December 14, 1996.

2.0 BACKGROUND

2.1 Introduction

The project site is located at 1970 Seminary Avenue, at the southern corner of the Seminary Avenue - Harmon Avenue intersection, in Oakland, Alameda County, California. The immediate site vicinity is primarily residential. The site is currently utilized as an automotive repair facility. The property is owned by Mr. Doyle Grimit, and is leased to the repair facility.

The site is approximately 50 by 100 feet in plan dimension. Three former gasoline and one former waste oil tank were removed in 1989. Fuel has not been dispensed since that time. One inactive hydraulic lift remains at the the site within the service building.

A detailed background description is included in our April 22, 1996 report.

2.2 Investigation History

Three exploratory borings and one monitoring well (MW-1) were installed by Kaldveer Associates in August, 1990 (report dated September 28, 1990). The well was sampled once by Kaldveer. Limited soil excavation was subsequently conducted at the location of the former waste oil tank. Hoexter Consulting subsequently sampled the well three times. In January and February, 1994, Hoexter Consulting conducted further subsurface investigation, including installation of two additional wells. Additional monitoring was followed by a supplemental investigation conducted in March, 1996, which included four soil borings and three additional monitoring wells. The resulting April 22, 1996 report included a preliminary ASTM RBCA Tier One evaluation of the data.

The referenced May 15, 1996 Alameda County letter followed and commented upon the April, 1996 subsurface investigation report. More recently, a preliminary evaluation of remedial action alternatives was conducted, and a report issued July 28, 1996. The evaluation report recommended supplemental ground water contaminant plume definition and further soil source delineation, followed by preparation of a remedial action feasibility study, development of a corrective action plan, and initiation of soil / ground water remediation. Finally, two additional quarterly ground water sampling events occurred, reported on October 21, 1996 and January 28, 1997.

2.3 Subsurface Conditions and Contaminant Source

The subsurface investigations indicated complex soil and ground water conditions consisting of interbedded discontinuous relatively thin lenses of silty and clayey sediments, with relatively limited deposits of "clean" sand or gravel. Based on the investigation, there are two separate ground water contamination zones, a "perched" or shallow zone ranging from 7 to 13 feet, and a deeper zone of from 20 to 30 feet. The two zones are probably interconnected. Based on well development and purging data, the strata yield relatively low volumes of water, and there is poor conductivity between strata. There are also two depth zones of soil contamination: "shallower" soils, to approximately 15 feet depth, and "deeper" soils, from 15 feet to the depth explored (35 feet). The "shallower" soils are generally more highly contaminated than the "deeper" soils.

Based on measured ground water levels, which are as shallow as 5-1/2 feet below the ground surface, it is likely that contaminants were discharged from the former gasoline and waste oil USTs and associated piping directly into saturated sediments. Although the USTs have been removed, and some overexcavation conducted in the former waste oil tank

cavity, contaminated soil remains in the "source area" of the former USTs and beneath the service building.

Previous Hoexter Consulting reports (particularly Hoexter Consulting April 22, 1996) discuss subsurface conditions in more detail, and include cross sections portraying our interpretation of the site stratigraphy.

2.4 Contaminant Description

Based on our investigations, contamination consists of oil and grease, gasoline (TPH-G), purgeable aromatic compounds (BTEX), MTBE, and halogenated volatile compounds (HVOC), particularly PCE, TCE, and DCE. These compounds have been detected in soil samples from various locations and in water samples from all six monitoring wells. The greatest soil and ground water contaminant levels have been observed in the general vicinity of the service building, particularly in the vicinity of well MW-1. The data are summarized in Appendix A of this report.

Ground water contaminant levels during the past two years (December, 1994 through January, 1997) have been as follows:

Maximum Water Column Values, **8/90 - 9/94** (see discussion below)

Compound	Values (**ppb***) (ground water)
Gasoline	23,000,000
Oil & Grease	880,000

"Average" Water Column Values, **12/94 - present** (see discussion below)

Compound	Range of Values (**ppb***) (ground water)
Gasoline	44,000 - 55,000
Oil & Grease	11,000 - 110,000

Note that more elevated levels (Appendix A, Table 3A) were initially observed (August, 1990 through September, 1994). This may have been related to the sampling method, which consisted of decanting the sample bailer from the top. This method probably incorporated "floating product", and is representative of the upper two feet of the saturated sediments. Subsequent samples (from December, 1994) were obtained from the approximate middle of the water column, and slowly drained from the bailer bottom using a constricted flow tube. These samples are more representative of an "average" value for the water column.

Typical and maximum levels of individual contaminants in ground water have been as follows:

Compound	Typical/Max. Values (ppb*) (ground water)
Benzene	4000/56,000
Toluene	4100/61,000
Ethylbenzene	1600/28,000
Xylenes	6800/137,000
MTBE	490
PCE (Tetrachloroethene/perchloroethene)	130
TCE (Trichloroethene)	340
VCL (Vinyl chloride)	60
DCE (cis 1,2 Dichloroethene)	320
DCA (1,2 Dichloroethane)	15

* Results in ug/l, equivalent to parts per billion, or ppb

Soil contaminant levels are generally relatively low, with the exception of oil & grease. TPH-G levels are on the order of 900 mg/kg (equivalent to parts per million, ppm), and generally less than 100 ppm. BTEX compounds are non-detect or depressed, with exceptions. Oil and grease levels are variable, with a maximum of 15,000 ppm detected in the former waste oil tank excavation. Maximum soil contaminant values are as follows:

Compound	Maximum Value (ppm*) (soil)
Gasoline	910
Oil\ & Grease	15,000

Maximum levels of individual contaminants in soil have been as follows:

Compound	Maximum Value (ppm*) (soil)
Benzene	2.4
Toluene	3.5
Ethylbenzene	4.2
Xylenes	8.3
MTBE	---
PCE (Tetrachloroethene/perchloroethene)	1.8
TCE (Trichloroethene)	0.82
VCL (Vinyl chloride)	---
DCE (cis 1,2 Dichloroethene)	---
DCA (1,2 Dichloroethane)	---
DCB (1,2-Dichlorobenzene)	1.7

* Results in mg/kg, equivalent to parts per million, or ppm

BTEX and individual HVOC levels exceed California MCLs. MTBE currently exceeds the proposed San Francisco Bay Region Water Quality Control Board standard of 35 ug/l in four of the six wells. The ASTM RBCA Tier 1 analysis (Section 4 and Appendix B) indicates that screening levels are exceeded for leaching potential of subsurface soils to ground water, soil volatilization to the air, soil and ground water vapor intrusion to

buildings, and ground water ingestion (see discussion in Hoexter Consulting report dated July 28, 1996). The July 28, 1996 report concluded, based on the Tier 1 results and the contaminant levels observed at the site, that Tier 2 evaluation would not produce substantially different conclusions.

3.0 PREVIOUS REMEDIAL ACTION EVALUATION

The following options were considered in the July 28, 1996 preliminary remedial action evaluation:

1 No Remedial Action

- 1a Natural Attenuation (no further work).
- 1b Natural Attenuation (plume definition and quarterly monitoring).
- 1c ASTM Tier 2 RBCA Evaluation (including plume definition and quarterly monitoring).

2 Interim Remediation (additional source delineation and removal).

3 Ground Water Extraction.

4 Vapor / Ground Water Co-Extraction.

5 Vapor / Ground Water Co-Extraction with Air Sparging or ORC.

The July 28, 1996 evaluation concluded that :

1a,b The natural attenuation alternatives do not meet current Alameda County remedial criteria.

1c Tier 2 evaluation would not be likely to result in acceptable levels of residual contamination in the ground water.

2 Interim remediation, while beneficial, would not be sufficient due to constraints imposed by the existing building and adjacent property line.

3 Due to complex stratigraphy and hydrogeology, and relatively low permeability materials, ground water extraction would not be cost effective and is not a current remedial solution.

4 Vapor / ground water co-extraction could be beneficial for timely remediation.

5 Vapor / ground water co-extraction with air sparging or ORC is recommended.

Detailed discussions of these alternatives are included in the July 28, 1996 study. The reader is referred to the original document for the detailed evaluations. The study recommended supplemental ground water contaminant plume definition and further soil source delineation, followed by preparation of a remedial action feasibility study, development of a corrective action plan, and initiation of soil / ground water remediation.

The recommended plume definition, to be primarily located off-site, has been postponed. Further soil source delineation, although beneficial, would result in additional delays, and due to the complex nature of the site, might not provide cost-effective information. A dual soil vapor ground water extraction feasibility study was conducted by a specialty soil vapor extraction (SVE) contractor/consultant. The results have been incorporated into this evaluation. Following approval of the recommendations contained in this report, a detailed corrective action plan will be prepared, and soil/ground water remediation will commence.

The RBCA evaluations conducted for the site indicate that there are elevated health risks for both commercial and residential land uses. Based on the July 28, 1996 study and requirements of the Alameda County Health Department, it was concluded that site remediation be conducted. Based on these findings, Alameda County has required preparation of this document. The following sections discuss remedial objectives, considerations, and the proposed interim remedial action plan.

4.0 RISK EVALUATION

The exposure pathways included for human health risks for the project site include:

* Dermal contact/ingestion of soil.
* Soil leaching potential to ground water.
* Soil gas volatilization to indoor/outdoor air.
* Gas volatilization from water to indoor/outdoor air.
* Ground water ingestion.

Each of these pathways were considered for both commercial and residential land use.

In 1994, the American Society for Testing and Materials (ASTM) issued a **risk based** guidance document for evaluation of the need for **corrective action** ("RBCA") applied primarily to petroleum release sites. The RBCA study (Appendix B) indicated that risk-based screening levels (RBSLs) were exceeded by up to four orders of magnitude. Based on the Alameda County recommended (Alameda County, May 15, 1996 letter) cancer risk of 10^{-4} for residential areas, the maximum allowable concentrations of benzene (**ppm**), the most critical compound (corrected by the Regional Water Quality Control Board factor of 0.29), would be as follows:

Exposure Pathway -Residential	Soil *	Ground Water *
* Dermal contact/ingestion of soil.	60.9	--
* Soil leaching potential to ground water.	1.36	--
* Soil gas volatilization to indoor air.	0.04	--
* Soil gas volatilization to outdoor air.	34.8	--
* Gas volatilization from water to indoor air.	--	0.28
* Gas volatilization from water to outdoor air.	--	174
* Ground water ingestion.	--	0.08

Exposure Pathway -Commercial	Soil *	Ground Water *
* Dermal contact/ingestion of soil.	>res	--
* Soil leaching potential to ground water.	4.64	--
* Soil gas volatilization to indoor air.	0.09	--
* Soil gas volatilization to outdoor air.	37.7	--
* Gas volatilization from water to indoor air.	--	0.72
* Gas volatilization from water to outdoor air.	--	243.6
* Ground water ingestion.	--	0.29

* Results in mg/kg or mg/l, equivalent to parts per million, or **ppm**

5.0 REMEDIAL OBJECTIVES

The general ground water clean up objective used by the State of California Regional Water Quality Control Board and Alameda County Health Department has been the Federal and California drinking water standards. It is our opinion that these clean up objectives are not justified for the contaminants of concern for the project site. Use of the ASTM-RBCA guideline values for soil and ground water (Section 4.0) represent appropriate clean up objectives.

Most of the contamination appears to originate from the "source area" (former USTs and service building area), particularly the "smear zone' within the highly variable ground water table fluctuation zone. Complete delineation of the ground water contaminant plume emanating from the "source area" has not been conducted, as the plume extends off-site under adjacent residences. It is our opinion that remediation of the off-site contamination is not economically feasible or practical, due to the presence of residences and related improvements on the adjoining properties. In our opinion, reduction of the "source area" contamination within the site is feasible, and the rational alternative to extensive and impractical off-site remediation.

Thus, the principal objective of the proposed remediation will be soil and ground water remediation within the on-site "source area". It is not the objective of the remedial action to achieve non-detectable concentrations of all petroleum or HVOC compounds in the soil or in the ground water; however, it is the objective to further abate the continued leaching of these compounds from the "smear" zone and to reduce the concentrations of these compounds in the ground water to below the ASTM-RBCA Tier 1 evaluation concentration values.

6.0 REMEDIAL SYSTEM DESIGN CONSIDERATIONS

6.1 Site Characteristics

The site is underlain by a complex series of relatively thinly lensed sediments of limited lateral extent. Silty and clayey deposits predominate, with minor deposits of "clean" sand or gravel. The overall permeability of the sediments is low. For example, the wells require as much as 48 hours to equilibrate when initially uncapped, and have dewatered with removal of as little as three (3) well volumes when purged. Due to the stratigraphic complexity, ground water and air flow (within unsaturated sediments) are most likely irregular.

Ground water levels and gradient flow direction also vary. The two [redacted] are completed to a depth of 20 feet, and are characterized by ground water elevations which are from four (4) to 10 feet higher in elevation than the "deeper" wells, completed to 35 feet depth. The "shallow" zone gradient flow direction has not been characterized, as there are only two wells, but appears to be to the west or north, as opposed to the "deeper" zone, which exhibits gradient flow direction to the south.

6.2 Soil Vapor Extraction (SVE) Pilot Study (January, 1997)

Terra Vac Corporation, of San Leandro, California, was retained to perform a [redacted] extraction pilot study of the site. Terra Vac's February 5, 1997 report is included in this report as Appendix C. The Terra Vac study was conducted to assess the feasibility of vapor extraction at the site.

The study consisted of utilizing the existing monitoring well MW-1 as the [redacted] MW-1 is located near the "source" area, and exhibits the highest levels of contamination of the six on-site wells. A 35 foot long "slurp tube" was extended into the well, to extract ground water simultaneously with vapor.

The test's radius of influence was monitored with two observation points, consisting of driven screened casing located approximately 14 and 25 feet from the extraction well. Approximately 11 cubic feet of air per minute were extracted from the well with an applied vacuum of 12 inches of mercury column. The test ran for approximately three hours. Vacuums of 0.2 and 0.1 inches of water column were observed in observation wells 1 and 2, respectively, at the conclusion of the test.

Total petroleum hydrocarbons were monitored twice during the test. The initial vapor sample, obtained after approximately 20 minutes, indicated a concentration of 39.7 ppm TPH. This decreased to 12.6 ppm TPH at 170 minutes.

The test was conducted at a time of relatively elevated ground water elevation. A total of 130 gallons of water was extracted during the test, corresponding to an average extraction rate of approximately 0.7 gallons per minute.

6.3 Evaluation of SVE Effectiveness

Terra Vac (February 5, 1997) concludes that "The amount of vacuum observed in OB-1 is significant and is indicative of some degree of connectivity between MW-1 and OB-1. There appeared to be some connectivity between MW-1 and OB-2, however the amount of induced vacuum was not as significant." A [redacted] during the three hour test can be inferred. However, it is likely that much of the pressure drop in the observation wells was due to a ground water level decline in the wells. Thus,

the degree of airflow between points, as represented by the measured 0.2 and 0.1 inches of water column decline in the observations wells at the three hour conclusion of the test, does not appear to be significant.

In our opinion, SVE could be effective for remediation of gasoline/BTEX and HVOCs at the site, but would require a significant capital investment due to the required density of extraction wells and associated equipment operation and maintenance cost. In addition, SVE, while effective at the site, would not remediate the down-gradient portions of the contaminant plume. Finally, SVE, while effective for the gasoline compounds, would be less effective for the oil and grease and HVOCs incorporated into the waste oil present at the site. Although SVE would induce oxygenation of the soil, and thus would increase natural, passive biodegradation processes of the HVOC and waste oil, the process is anticipated to be slow and of minimal overall value.

7.0 PROPOSED PLAN

7.1 Introduction and Rationale

It is our opinion that SVE and/or dual ground water/soil vapor extraction, although ultimately effective, would not be economically feasible due to the relatively limited area of influence, and thus the need for densely placed vapor extraction points and long-term operating costs. In addition, SVE would be only moderately successful in reducing the concentrations of oil and grease and associated HVOC.

Oxygenation of subsurface soils and ground water have been proven technologies for promoting volatilization and degradation of petroleum hydrocarbon compounds and providing effective site remediation. Based on the subsurface soil and ground water conditions, it is our opinion that application of direct oxygenation of the "shallow" (5 to 20 feet) and the deeper (20 to 35 feet) water bearing zones would result in direct beneficial remediation of the gasoline as well as oil and grease and HVOC compounds present in these zones. This would also provide a positive barrier for potential migration of these contaminants and further promote the bacterial degradation. Oxygen releasing compounds (ORCs), manufactured by Regenesis Bioremediation Products and composed of magnesium peroxide, are recommended for this project application. The principal benefits of this product are the oxygen release combined with the non-hazardous nature of the resulting (oxygen-depleted) compound (magnesium hydroxide).

A passive system of oxygenation, consisting of installation of oxygen releasing compounds (ORCs) to the soil and ground water in conjunction with in-situ bioventing is determined to be the most efficient and cost effective method of source reduction and site remediation.

7.2 General Remediation Plan

The proposed remediation emphasis cleanup of the source area in the vicinity of the former USTs and service area. Complete site cleanup would not be immediately achieved. However, with the mitigation of the "source area", further transport of contaminants from the site would be minimized, and naturally occurring processes would then complete the remediation.

The proposed remediation plan would consist of:

* Installation of additional down gradient monitoring wells.*
* Installation of oxygen releasing compounds (ORCs) in soil borings throughout the "source area". An initial small scale calibration test is proposed. The ORCs would be installed as a slurry directly into the calibration test soil borings, and would be placed into pre-drilled borings or pressure injected into the soils in the "full scale" remediation program.
* Installation of a low volume in-situ bioventing vacuum system in existing and proposed monitoring wells.

may not be necessary

As discussed in Section 6.3, SVE would be relatively ineffective in remediating waste oil and the accompanying HVOC compounds. The proposed ORC bioremediation system would, in our opinion, be more effective in remediating the waste oil and HVOC, by directly providing oxygen for the microbial cultures to degrade these more complex hydrocarbons.

The following ORC procedures have been developed with the assistance of Mr. Jack Peabody, manager of Regenesis Bioremediation Products Pleasant Hill, California office. Procedures and volumes of material are recommended by Mr. Peabody based on Regenesis' experience and proprietary software.

7.2.1 Small Scale ORC Calibration Test

A small scale calibration test would be initially conducted. This test would consist of installing four soil borings approximately three (3) feet each from the existing monitoring well MW-1 (Figure 2). The test would provide information which would be used for final design of the larger-scale remediation. In addition, it would provide "immediate" remediation of the most heavily impacted area of the site.

Two-inch diameter borings would be installed by direct push methods, thus eliminating the need to treat or dispose of contaminated soil. A 65 per cent ORC slurry would be tremied to the borings, which would be capped with five (5) feet of neat bentonite cement at the ground surface. Each boring would receive approximately 43 pounds of the ORC compound.

Effectiveness of the test would be monitored with monthly dissolved oxygen (DO) measurements of MW-1, and quarterly sampling of contaminants. Details of the monitoring are provided in Section 10.0 of this report. Note that a decline in TPH and BTEX would be anticipated prior to an increase of DO in the well. This is due to utilization of all available oxygen by the in-situ bacteria during the initial stages of remediation, particularly at highly contaminated areas.

7.2.2 Additional Monitoring Wells

Three additional monitoring wells are proposed. The proposed well locations are shown on Figure 2. The wells are required for plume definition and to monitor remediation progress. One 35 foot "deep" well and one 20 foot "shallow" well would be located on the down-gradient side of the source area along the property line; one 20 foot "shallow" well would be located on the site up-gradient area adjacent to Seminary Avenue. Well reference elevations would be surveyed, and groundwater data from the wells incorporated into evaluations of ground water gradient flow direction.

7.2.3 Full Scale ORC Remediation

The results of the calibration test will be used to complete a final design of the ORC remediation system. The current plan is to install a grid of six to nine additional borings approximately spaced at 8 to 10 foot centers within the "source area" (Figure 2). ? where?
Additional, more widely spread borings, would be placed within the balance of the site, where contamination levels are less elevated. The final plan may slightly increase the number of borings and decrease the spacing. The ORC slurry would be placed in the same manner as described in Section 7.2.1, or pressure grouted, whichever is less costly.

As discussed above, the purpose of the proposed full scale remediation would be to reduce concentrations of contaminants in the "source area". Peripheral and off-site areas would not be directly addressed; natural biodegradation processes would be allowed to work in these areas.

7.2.4 In-Situ Bioventing

The in-situ bioventing would consist of installing a low-volume vacuum system (one to three inches of mercury) applied to the two existing and the two proposed additional "source area" wells. The system would provide positive control of off-gassing to reduce off-site migration of vapors and help promote air flow through the soil column and "smear" zone", resulting in more efficient site remediation. An activated carbon filtration system would be employed to treat produced vapors.

8.0 ADDITIONAL INVESTIGATION

Off site definition of the plume, as previously proposed, is in our opinion, still warranted. This investigation would consist of obtaining representative grab ground water samples from public rights of way along adjacent and nearby streets (Harmon Avenue, Seminary Avenue, and Holway Street.

9.0 SCHEDULE/DURATION OF TREATMENT

The proposed "hot spot" pilot test will be initiated following approval of costs by the State UST Fund. Approval by the Fund will require approximately two (2) to four (4) weeks. Permitting, ordering of materials, and installation are anticipated to require approximately three weeks. The pilot test will require an estimated six (6) to nine (9) months of monitoring. A progress reporting will be included with each regularly scheduled "Quarterly" ground water monitoring.

A brief work plan for the installation of the proposed monitoring wells will be prepared following acceptance of this corrective/interim remedial action plan. The wells will be installed in conjunction with the "hot spot" pilot test, pending State UST Fund approval of costs.

10.0 ANALYTICAL TESTING AND REPORTING

Analytical testing of the six current and three recommended wells (including the "hot spot" pilot test well, MW-1) will consist of a continuation of the currently scheduled "Quarterly" monitoring, which includes TPH-G/BTEX/MTBE, oil/grease, halogenated volatile organics (HVOC) (alternate sampling events); and dissolved oxygen (DO), nitrate, sulfate, and ferrous iron. also PNA in MW-1

In addition, well MW-1 will be monitored monthly for dissolved oxygen (DO) and TPH-G/BTEX/MTBE. The MW-1 sample will be obtained as a grab water sample from the top of the water column, as opposed to purging, which could disrupt the ORC oxygenation process.

A sampling plan for the period following installation of the full-scale ORC and bioventing remediation will be included in the final remedial action plan.

11.0 FINAL REMEDIAL ACTION PLAN

A final remedial action plan (RAP) will be prepared following completion of the pilot test. The RAP will include a detailed plan for installation of the ORC and bioventing systems.

12.0 LIMITATIONS

This report has been prepared according to generally accepted geologic and environmental practices. No other warranty, either expressed or implied as to the methods, results, conclusions or professional advice provided is made. It should be recognized that certain limitations are inherent in the evaluation of subsurface conditions, and that certain conditions may not be detected during an investigation of this type. If you wish to reduce the level of uncertainty associated with this study, we should be contacted for additional consultation.

The analysis, conclusions and recommendations contained in this report are based on site conditions as they existed at the time of our investigation; review of previous reports relevant to the site conditions; and laboratory results from an outside analytical laboratory. Changes in the information or data gained from any of these sources could result in changes in our conclusions or recommendations. If such changes do occur, we should be advised so that we can review our report in light of those changes.

* * * * * * * * * * * * * * * * * * * *

REFERENCES

Alameda County Health Care Services Agency, letters dated October 14, 1992, April 4, 1995, November 8, 1995; January 19, 1996; May 15, 1996, and September 24, 1996.

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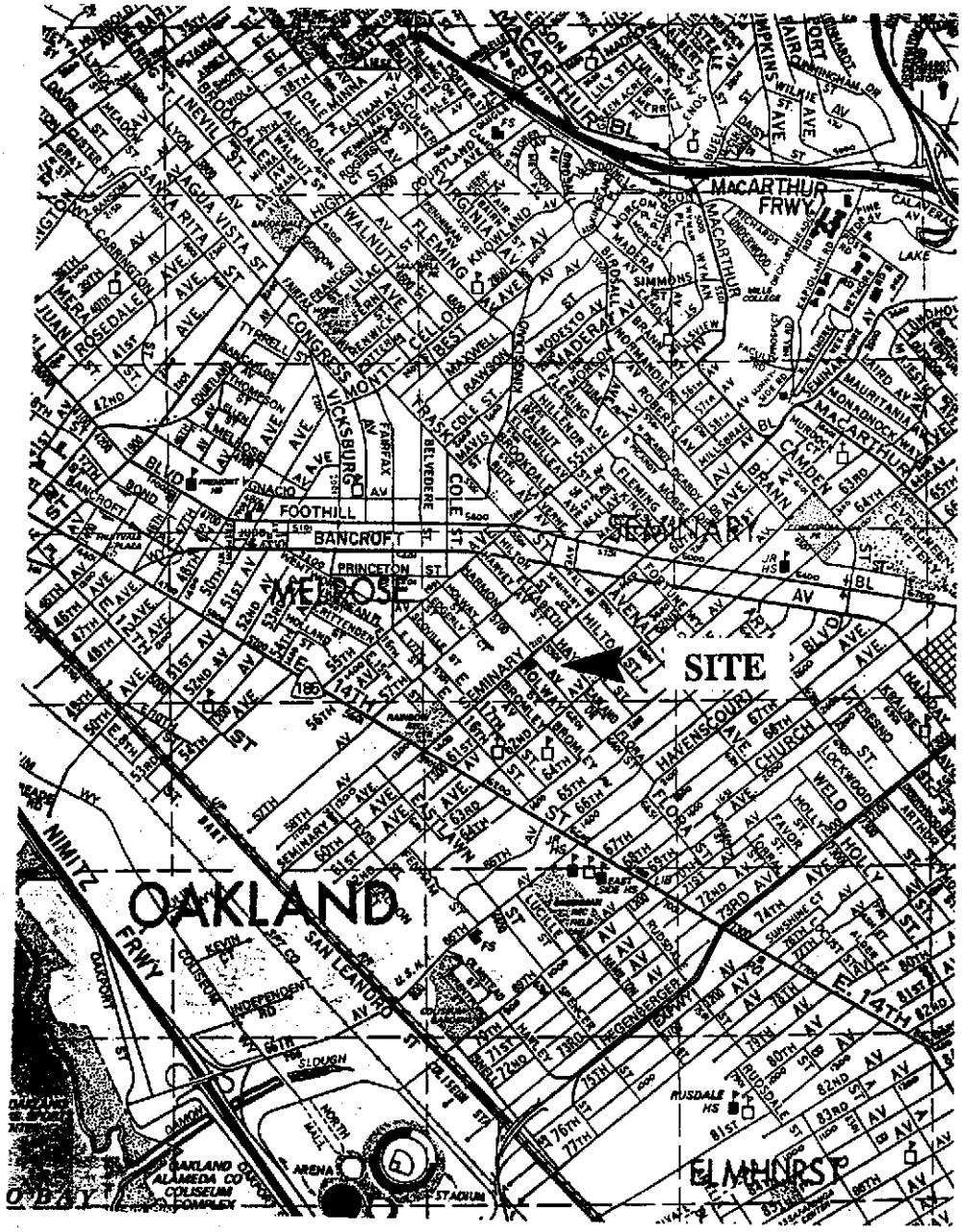

ALAMEDA COUNTY

1991 *Thomas Guide*

0 ¼ ½ ¾ 1 MILES
0 1 2 5 KILOMETERS

HOEXTER CONSULTING
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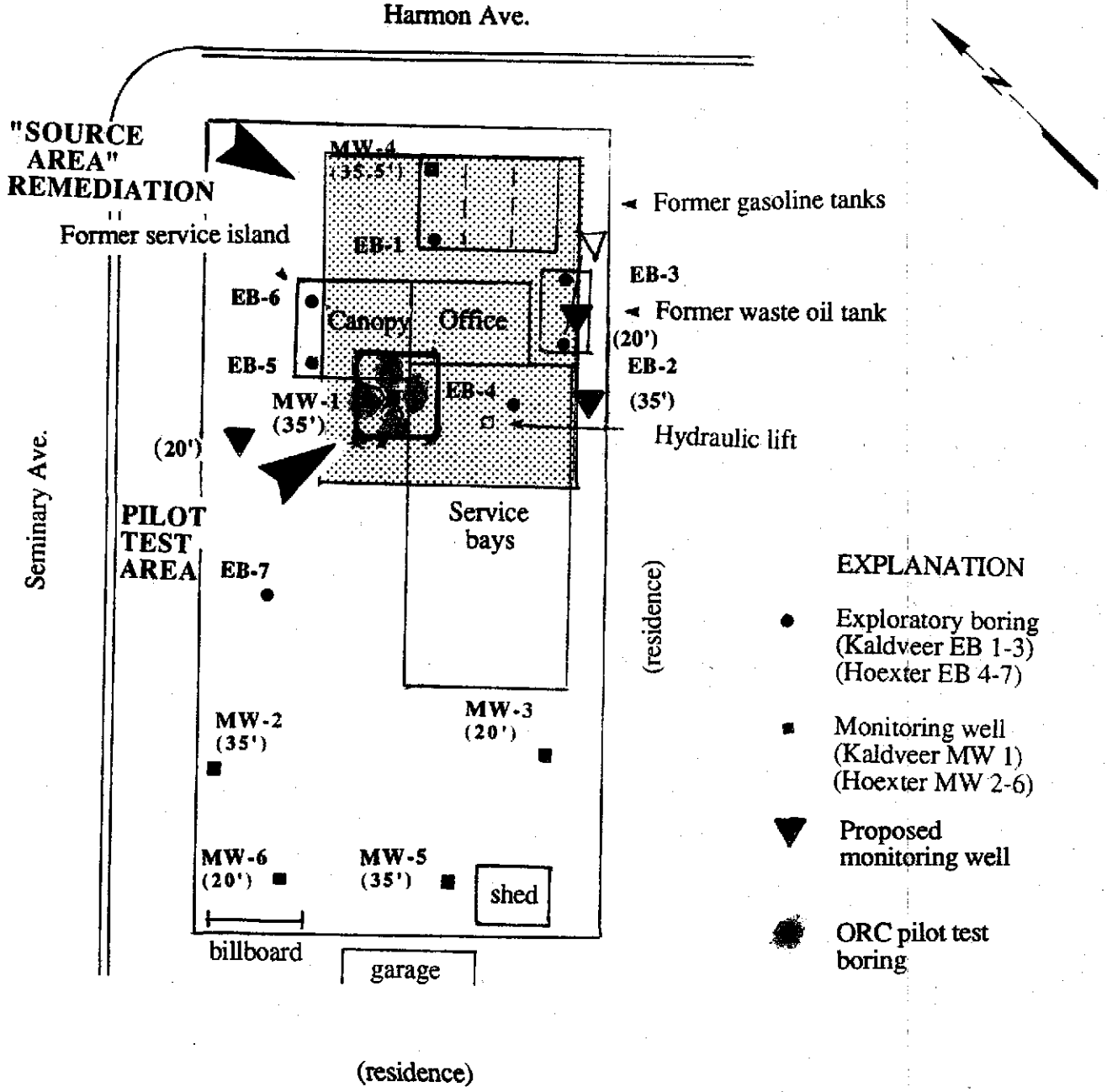
LOCATION MAP

1970 Seminary Ave.
Oakland, California

Project No.	Date	Figure 1
E-10-1B-192B	February, 1997	



Base: A. Deak, Licensed Land Surveyor, 3/21/96 (wells, streets & property line); Hoexter field sketch, 10/25/93 (explor. borings, other features)

20 0 20 40

Approximate Scale in Feet

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SITE PLAN / PROPOSED REMEDIATION

1970 Seminary Ave.
Oakland, California

Project No.	Date	Figure 2
E-10-1B-192B	February, 1997	

APPENDIX A

Analytical Data Summary Tables

TABLE 1

GROUND WATER ELEVATION DATA

(All Measurements in Feet)

Well Number and Date of Measurement	Reference Elevation (2)	Depth to Water	Relative Ground Water Elevation (2)
MW-1 ("deep")			
8/6/90	37.0	21.5	15.5
1/28/92		21.0	16.0
4/27/92		20.95	16.05
8/10/92		22.20	14.8
2/11/94		15.93 (3)	21.07 (3)
2/28/94		13.85 (4)	23.15 (4)
9/9/94		20.19	16.81
12/28/94		14.91	22.09
4/13/95		14.18	22.82
11/1/95		20.90	16.10
3/8/96		11.82	25.18
3/25-26/96	36.97	13.54	23.43
10/7/96		21.41	15.59
1/15/97		13.34	23.63
MW-2 ("deep")			
2/11/94	36.40	14.16 (3)	22.24 (3)
2/28/94		16.01 (4)	20.39 (4)
9/9/94		18.96	17.44
12/28/94		21.42	14.98
4/13/95		19.69	16.71
11/1/95		21.91	14.49
3/8/96		14.56 (6)	21.84 (6)
3/25-26/96	36.39	10.84	25.55
10/7/96		18.41	17.98
1/15/97		10.07	26.32
MW-3 ("shallow")			
2/11/94	36.94	6.97 (3)	29.97 (3)
2/28/94		7.74 (4)	29.20 (4)
9/9/94		9.68	27.26
12/28/94		8.15	28.79
4/13/95		8.05	28.89
11/1/95		7.82	29.12
3/8/96		5.69	31.25
3/25-26/96	36.94	6.91	30.03
10/7/96		9.51	27.43
1/15/97		6.23	30.71

Table 1 continued

Well Number and Date of Measurement	Reference Elevation (2)	Depth to Water	Relative Ground Water Elevation (2)
MW-4 ("deep")			
3/25-26/96	36.46	14.14	22.32
10/7/96		22.31	14.15
1/15/97		13.78	22.68
MW-5 ("deep")			
3/25-26/96	36.77	15.63	21.14
10/7/96		22.86	13.91
1/15/97		17.33	19.44
MW-6 ("shallow")			
3/25-26/96	36.42	8.52	27.90
10/7/96		12.82	23.60
1/15/97		7.72	28.70

Notes

(1) N/A = not applicable.
(2) Elevations from a survey conducted by Andreas Deak, California Licensed Land Surveyor, March 21, 1996, City of Oakland datum.
(3) Well under pressure when locking cap removed; water level may not have been stabilized.
(4) Depth to water was measured over a 120 minute period; indicated depths appear to be stabilized readings.
(5) Surveyed elevations of wells MW 1 and MW-2 varied to 0.02 foot on March 21, 1996 survey as compared to February 11, 1994 survey; previously calculated measurements of elevation have **not** been modified to reflect the new survey data.
(6) Well not stabilized (water level rising).

TABLE 2

SOIL

SUMMARY OF ANALYTICAL TEST RESULTS - PETROLEUM HYDROCARBONS

(Results reported in parts per million, mg/kg) (1) (2)

Sample	TPH-Gasoline	Benzene	Toluene	Ethyl-Benzene	Xylenes	Oil and Grease	HVOC
Initial UST Removal Confirmation Testing							
Gasoline USTs							
South tank	22	ND	ND	ND	ND	NA	NA
South tank	ND	ND	ND	ND	ND	NA	NA
Center tank	20	ND	0.031	ND	0.200	NA	NA
North tank	ND	0.068	ND	ND	ND	NA	NA
	21	2.4	2.9	0.320	1.7	NA	NA
Waste Oil UST							
1	NA	0.093	0.510	0.480	1.7	5500/760 (6)	ND
2	NA	0.160	0.400	0.810	2.4	7200/460 (6)	ND
Previous Kaldveer Investigation							
EB-1							
16.0	4	NA	NA	NA	NA	NA	NA
21.0	0.5	NA	NA	NA	NA	NA	NA
26.0	50	NA	NA	NA	NA	NA	NA
EB-2							
10.0	NA	NA	NA	NA	NA	4,200	NA
16.0	NA	NA	NA	NA	NA	ND	NA
EB-3							
10.0	NA	NA	NA	NA	NA	2,800	NA
16.0	NA	NA	NA	NA	NA	150	NA

Waste Oil Tank Overexcavation Confirmation Testing

1 (south side)	190	ND	ND	0.58	1.3	15,000/2700 9,800	NA
2 (west side)	ND	ND	ND	ND	ND	1,200/61 890	NA
3 (east side)	4.4	ND	ND	0.0083	0.021	11,000/4400 7,500	NA
4 (north side)	12	0.0042	ND	0.0091	0.021	410/250 230	NA
5 (west floor)	270	ND	3.5	1.3	ND	5,500/670 3,700	NA
6 (east floor)	260	ND	ND	1.2	2.5	3,500/680 2,200	NA
Stockpile	11	0.0031	ND	0.044	0.094 1,000	1,500/710	

Initial Hoexter Investigation

MW-2

10.5-11.0	910	ND	0.76	4.2	6.1	38	NA
16.0-16.5	ND	ND	0.022	ND	ND	ND	NA
20.5-21.0 25.5-26.0 (3)	ND	ND	ND	ND	ND	ND	NA

MW-3

10.5-11.0	ND	ND	0.020	ND	ND	ND	NA
20.5-21.0	1.2	0.17	0.047	ND	0.085	NA	NA

April, 1996 Hoexter Investigation

EB-4

7.5-8.0	300	ND	ND	3.3	8.3	820	**ND**
14.5-15.0	63	ND	ND	ND	0.82	3600	**Det** (5)

EB-5

3.5-4.0	ND	ND	ND	ND	ND	NA	NA
7.5-8.0	130	ND	ND	0.55	1.3	NA	NA
12.5-13.0	120	ND	ND	0.84	1.4	NA	NA
18.0-18.5 19.5-20.0 (3)	4.5	0.025	0.015	0.028	0.078	240	**Det** (5)

EB-7

9.0-9.5	ND	ND	ND	ND	ND	ND	NA
14.0-14.5	ND	ND	ND	ND	ND	NA	NA
20.0-20.5 23.0-23.5 (3)	130	ND	0.38	1.9	2.9	620	**ND**

MW-4

16.0-16.5	13	0.038	0.015	ND	0.023	NA	NA
26.0-26.5							
31.0-31.5 (3)	68	0.21	0.092	0.15	0.39	190	NA
36.0-36.5	5.4	ND	0.008	0.015	0.011	NA	NA

MW-5

11.0-11.5	9.7	ND	0.019	ND	0.038	NA	NA
21.0-21.5	ND	ND	ND	ND	ND	NA	NA
21.0-21.5							
35.5-36.0 (3)	NA	NA	NA	NA	NA	ND	NA

MW-6

11.0-11.5							
16.0-16.5 (3)	10	0.037	0.033	0.18	0.46	ND	NA

Notes

(1) ND = non-detect
(2) NA = not applicable
(3) Composite
(4) Chromatogram patterns/comments
    G - gas
    WG - weathered gas
    NGM - non-gas mix, > C9
    NDM - non-diesel mix, generally C7 - C12/13
(5) Detected: see Table 2B
(6) TOG/Motor Oil

TABLE 2B

SOIL

SUMMARY OF ANALYTICAL TEST RESULTS - HALOGENATED VOLATILE ORGANIC COMPOUNDS

(Results reported in parts per **million**, mg/kg) (1) (2)

Sample	CA	1,2 DCB	1,2 DCA	cis 1,2 DCE	trns 1,2 DCE	1,2 DCP	PCE	TCE	VCL
EB-4									
7.5-8.0	ND	ND	ND	ND	ND	ND	ND	ND	ND
14.5-15.0	ND	1.7	ND	ND	ND	ND	1.8	0.82	ND
EB-5									
18.0-18.5									
19.5-20.0 (3)	ND	ND	ND	ND	ND	ND	0.52	ND	ND
EB-7									
20.0-20.5									
23.0-23.5 (3)	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes on following page

Table 2B Notes

(1) ND = non-detect
(2) NA = not applicable
(3) Composite
(4) Abbreviations as follows:

CA	Chloroethane
1,2 DCB	1,2 Dichlorobenzene
1,2 DCA	1,2 Dichloroethane
cis 1,2 DCE	cis 1,2 Dichloroethene
trans 1,2 DCE	trans 1,2 Dichloroethene
1,2 DCP	1,2 Dichloropropane
PCE	Tetrachloroethene (perchloroethene)
TCE	Trichloroethene
VCL	Vinyl chloride

TABLE 3A

GROUND WATER

SUMMARY OF ANALYTICAL TEST RESULTS - PETROLEUM HYDROCARBONS (8)

(Results reported in parts per ***billion***, ug/l) (1)

Well and Date	TPH Gasoline (8)	Benzene	Toluene	Ethyl-benzene	Xylenes	Oil & Grease HVOC (7)
MW-1	("deep")					
8/6/90 (2)	54,000	3,500	3,200	1,900	9,400	7,600
1/28/92	2,000,000	7,400	17,000	28,000	120,000	75,000 (5)
4/27/92 (3)	500,000	3,400	6,400	10,000	45,000	440,000 (6)
4/27/92 (4)	175,000	4,200	4,400	3,200	14,600	N/A
8/10/92	170,000	4,200	4,200	3,300	15,900	120,000 (6)
2/11/94	1,800,000	ND	5,100	5,200	23,900	16,000 (6)
9/9/94	23,000,000	56,000	61,000	9,100	137,000	880,000 (6)
12/28/94	55,000	3,700	5,300	1,400	5,800	83,000 (6)
4/13/95	45,000	2,800	3,400	1,200	5,100	50,000 (5)
11/1/95	44,000	2,600	3,400	1,400	5,900	52,000 (5)
3/25/96	45,000	3,000	4,100	1,600	6,800	46,000 (5) (7)
10/8/96	55,000	3,300	4,500	1,700	7,100	11,000 (5) (7)
1/16/97	48,000	2,600	3,200	1,300	5,300	110,000 (5)
MW-2	("deep")					
2/11/94	130	22	1.1	5.2	7.3	ND (6)
9/9/94	1,000	89	ND	ND	6.9	ND (6)
12/28/94	330	100	3.8	5.4	4.7	5100 (6)
4/13/95	1300	280	6.9	33	23	ND 5)
11/1/95	100	9.9	ND	ND	ND	ND (5)
3/25/96	4500	470	57	220	280	ND (5) (7)
10/8/96	710	1.9	0.54	1.0	1.0	ND (5) (7)
1/16/97	330	41	2.4	1.3	9.9	ND (5)
MW-3	("shallow")					
2/11/94	ND	ND	ND	ND	ND	ND (6)
9/9/94	710	10	ND	ND	3.5	ND (6)
12/28/94	2,300	7.8	ND	130	73	ND (6)
4/13/95	1,700	2.9	ND	61	24	ND (5)
11/1/95	1,100	4.4	ND	27	22	ND (5)
3/25/96	2,300	4.0	0.96	120	65	ND (5) (7)
10/8/96	160	ND	0.5	1.2	0.77	ND (5) (7)
1/16/97	1,800	2.8	0.68	48	66	ND (5)

Table 3A continued

Well and Date	TPH Gasoline (8)	Benzene	Toluene	Ethyl-benzene	Xylenes	Oil & Grease HVOC (7)	
MW-4	("deep")						
3/26/96	9,900	4,000	40	71	100	ND	(5) (7)
10/8/96	7,800	3,900	33	31	40	ND	(5) (7)
1/16/97	4,800	1,900	21	2.5	27	5,200	(5)
MW-5	("deep")						
3/26/96	1,200	43	8.2	83	95	ND	(5) (7)
10/8/96	6,700	260	92	410	370	ND	(5) (7)
1/16/97	3,000	150	68	190	180	ND	(5)
MW-6	("shallow")						
3/26/96	9,900	1,000	150	470	720	ND	(5) (7)
10/8/96	1,300	120	2.3	1.4	4.0	ND	(5) (7)
1/15/97	6,500	570	65	170	630	ND	(5)
EB-4							
3/8/96	15,000	780	840	1,300	590	7,500	(5) (7)
MCL	NA	1	150	700	1750	NA	

Notes

(1) ND - non-detect; N/A - not applicable
(2) Kaldveer Associates report, September, 1990
(3) Sequoia Analytical Laboratory
(4) Applied Remediation Laboratory
(5) Gravimetric Method
(6) Infrared Method
(7) **HVOC detected**: see Table 2C
(8) **MTBE** see Table 2B

TABLE 3B

GROUND WATER

SUMMARY OF ANALYTICAL TEST RESULTS - MTBE

(Results reported in parts per ***billion***, ug/l)

Well and Date	MTBE
MW-1("deep")	
10/8/96	490
1/16/96	310
MW-2 ("deep")	
10/8/96	41
1/16/96	12
MW-3 ("shallow")	
10/8/96	ND
1/16/96	7.1
MW-4 ("deep")	
10/8/96	140
1/16/96	84
MW-5 ("deep")	
10/8/96	190
1/16/96	90
MW-6 ("shallow")	
10/8/96	57
1/16/96	220

TABLE 3C

GROUND WATER

SUMMARY OF ANALYTICAL TEST RESULTS - HALOGENATED VOLATILE ORGANIC COMPOUNDS

(Results reported in parts per **billion**, ug/l) (1) (2)

Well and Date	CA	1,2 DCB	1,2 DCA	cis 1,2 DCE	trns 1,2 DCE	1,2 DCP	PCE	TCE	VCL
MW-1 ("deep")									
3/25/96	ND<5	7.2	5.3	82	ND<5	ND<5	ND<5	7.8	25
10/8/96	ND<20	ND<20	ND<20	45	ND<20	ND<20	ND<20	ND<20	26
1/16/97	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2 ("deep")									
3/25/96	ND<0.5	ND<0.5	8.7	11	ND<0.5	1.0	ND<0.5	3.2	0.92
10/8/96	ND<0.5	ND<0.5	15	9.6	ND<0.5	1.1	ND<0.5	6.6	ND<0.5
1/16/97	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3 ("shallow")									
3/25/96	ND<0.5	ND<0.5	0.56	1.2	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
10/8/96	ND<0.5	ND<0.5	1.1	0.87	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
1/16/97	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-4 ("deep")									
3/26/96	ND<8	22	ND<8	300	9.2	ND<8	38	150	44
10/8/96	ND<15	22	4.9	320	ND<15	ND<15	52	130	60
1/16/97	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5 ("deep")									
3/26/96	1.4	ND<0.5	2.1	6.2	ND<0.5	ND<0.5	ND<0.5	ND<0.5	10
10/8/96	ND<2.5	ND<2.5	4.9	4.4	ND<2.5	ND<2.5	ND<2.5	ND<2.5	9.4
1/16/97	NA	NA	NA	NA	NA	NA	NA	NA	NA

Continued following page

Table 3C continued

MW-6 ("shallow")									
3/26/96	ND<0.5	ND<0.5	3.9	15	ND<0.5	1.9	0.77	2	ND<0.5
10/8/96	ND<0.5	ND<0.5	2.3	9.9	ND<0.5	ND<0.5	ND<0.5	0.57	ND<0.5
1/16/97	NA	NA	NA	NA	NA	NA	NA	NA	NA
EB-4									
3/8/96 (grab)	ND	ND	ND	42	ND	ND	130	340	ND
MCL	NA	600	0.5	6	10	5	7	5	0.5

Notes

(1) ND = non-detect
(2) NA = not applicable
(3) Composite
(4) Abbreviations as follows:

CA	Chloroethane	1,2 DCP	1,2 Dichloropropane
1,2 DCB	1,2 Dichlorobenzene	PCE	Tetrachloroethene (perchloroethene)
1,2 DCA	1,2 Dichloroethane	TCE	trichloroethene
cis 1,2 DCE	cis 1,2 Dichloroethene	VCL	vinyl chloride
trans 1,2 DCE	trans 1,2 Dichloroethene		

TABLE 3D

GROUND WATER

SUMMARY OF ANALYTICAL TEST RESULTS - ADDITIONAL PARAMETERS

(Results reported in parts per ***million***, mg/l) (1)

Well and Date	Dissolved Oxygen	Ferrous Iron	Nitrate	Sulfate
MW-1 ("deep")				
10/8/96	1.5	ND	ND	ND
1/16/97	1.4	3.6	ND	ND
MW-2 ("deep")				
10/8/96	3.7	ND	3	25
1/16/97	5.4	0.28	3	25
MW-3 ("shallow")				
10/8/96	3.8	ND	ND	5
1/16/97	5.2	ND	ND	5
MW-4 ("deep")				
10/8/96	3.0	ND	ND	ND
1/16/97	4.7	0.75	ND	5
MW-5 ("deep")				
10/8/96	2.8	ND	ND	8
1/16/97	3.4	0.38	ND	9
MW-6 ("shallow")				
10/8/96	2.7	ND	ND	6
1/16/97	2.7	0.28	ND	8

Notes

(1) ND - non-detect; N/A - not applicable

APPENDIX B

RBCA Analysis Summary Tables

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: 1970 Seminary
Site Location: Oakland, C

Job Identification: E-10-1B-192B
Date Completed: 10/3/96
Completed By: David Hoexter

Software: GSI RBCA Spreadsheet
Version: v 1 0

NOTE: values which differ from Tier 1 default values are shown in bold italics and underlined.

DEFAULT PARAMETERS

Exposure Parameter	Definition (Units)	Residential Adult	Residential (1-6yrs)	Residential (1-16 yrs)	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
ATc	Averaging time for carcinogens (yr)	70				
ATn	Averaging time for non-carcinogens (yr)	30	6	16	25	1
BW	Body Weight (kg)	70	15	35	70	
ED	Exposure Duration (yr)	30	6	16	25	1
EF	Exposure Frequency (days/yr)	350			250	180
EF.Derm	Exposure Frequency for dermal exposure	350			250	
IRgw	Ingestion Rate of Water (l/day)	2			1	
IRs	Ingestion Rate of Soil (mg/day)	100	200		50	100
IRadj	Adjusted soil ing. rate (mg•yr/kg•d)	1.1E+02			9.4E+01	
IRa.in	Inhalation rate indoor (m^3/day)	15			20	
IRa.out	Inhalation rate outdoor (m^3/day)	20			20	10
SA	Skin surface area (dermal) (cm^2)	5.8E+03		2.0E+03	5.8E+03	5.8E+03
SAadj	Adjusted dermal area (cm^2•yr/kg)	2.1E+03			1.7E+03	
M	Soil to Skin adherence factor	1				
AAFs	Age adjustment on soil ingestion	***TRUE***			***TRUE***	
AAFd	Age adjustment on skin surface area	***TRUE***			***TRUE***	
tox	Use EPA tox data for air (or PEL based)	TRUE				
gwMCL?	Use MCL as exposure limit in groundwater?	FALSE				

Matrix of Exposed Persons to Complete Exposure Pathways		Residential	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
Groundwater Pathways:				
GW.i	Groundwater Ingestion	TRUE	FALSE	
GW.v	Volatilization to Outdoor Air	TRUE	FALSE	
GW.b	Vapor Intrusion to Buildings	TRUE	FALSE	
Soil Pathways				
S.v	Volatiles from Subsurface Soils	TRUE	FALSE	
SS.v	Volatiles and Particulate Inhalation	TRUE	FALSE	TRUE
SS.d	Direct Ingestion and Dermal Contact	TRUE	FALSE	TRUE
S.l	Leaching to Groundwater from all Soils	TRUE	FALSE	
S.b	Intrusion to Buildings - Subsurface Soils	TRUE	FALSE	

Matrix of Receptor Distance and Location on- or off-site		Residential Distance	Residential On-Site	Commercial/Industrial Distance	Commercial/Industrial On-Site
GW	Groundwater receptor (cm)		TRUE		TRUE
S	Inhalation receptor (cm)		TRUE		TRUE

Matrix of Target Risks		Individual	Cumulative
TRab	Target Risk (class A&B carcinogens)	***1.0E-04***	
TRc	Target Risk (class C carcinogens)	***1.0E-04***	
THQ	Target Hazard Quotient	1.0E+00	
Opt	Calculation Option (1, 2, or 3)	1	
Tier	RBCA Tier	1	

Surface Parameters	Definition (Units)	Residential	Commercial/Industrial Chronic	Commercial/Industrial Construction
t	Exposure duration (yr)	30	25	1
A	Contaminated soil area (cm^2)	***1.9E+06***		1.0E+06
W	Length of affected soil parallel to wind (cm)	***1.5E+03***		1.0E+03
W.gw	Length of affected soil parallel to groundwater (c	***1.5E+03***		
Uair	Ambient air velocity in mixing zone (cm/s)	2.3E+02		
delta	Air mixing zone height (cm)	2.0E+02		
Lss	Definition of surficial soils (cm)	1.0E+02		
Pe	Particulate areal emission rate (g/cm^2/s)	2.2E-10		

Groundwater	Definition (Units)	Value
delta.gw	Groundwater mixing zone depth (cm)	***6.1E+02***
I	Groundwater infiltration rate (cm/yr)	***1.5E+01***
Ugw	Groundwater Darcy velocity (cm/yr)	***1.2E+03***
Ugw.tr	Groundwater Transport velocity (cm/yr)	6.6E+03
Ks	Saturated Hydraulic Conductivity(cm/s)	
grad	Groundwater Gradient (cm/cm)	
Sw	Width of groundwater source zone (cm)	
Sd	Depth of groundwater source zone (cm)	
BC	Biodegradation Capacity (mg/L)	
BIO?	Is Bioattenuation Considered	FALSE
phi.eff	Effective Porosity in Water-Bearing Unit	3.8E-01
foc sat	Fraction organic carbon in water-bearing unit	1.0E-03

Soil	Definition (Units)	Value	capillary	vadose	foundation
hc	Capillary zone thickness (cm)	***1.5E+01***			
hv	Vadose zone thickness (cm)	***1.6E+02***			
rho	Soil density (g/cm^3)	1.7			
foc	Fraction of organic carbon in vadose zone	0.01			
phi	Soil porosity in vadose zone	0.38			
Lgw	Depth to groundwater (cm)	***1.7E+02***			
Ls	Depth to top of affected soil (cm)	***2.1E+02***			
Lsubs	Thickness of affected subsurface soils (cm)	***8.8E+02***			
pH	Soil/groundwater pH	6.5			
phi.w	Volumetric water content		0.342	0.12	0.12
phi.a	Volumetric air content		0.038	0.26	0.26

Building	Definition (Units)	Residential	Commercial
Lb	Building volume/area ratio (cm)	2.0E+02	3.0E+02
ER	Building air exchange rate (s^-1)	1.4E-04	2.3E-04
Lcrk	Foundation crack thickness (cm)	1.5E+01	
eta	Foundation crack fraction	0.01	

Dispersive Transport Parameters	Definition (Units)	Residential	Commercial
Groundwater			
ax	Longitudinal dispersion coefficient (cm)		
ay	Transverse dispersion coefficient (cm)		
az	Vertical dispersion coefficient (cm)		
Vapor			
dcy	Transverse dispersion coefficient (cm)		
dcz	Vertical dispersion coefficient (cm)		

RBCA SITE ASSESSMENT

Tier 1 Worksheet 6.1

Site Name: 1970 Seminary
Site Location: Oakland, C

Completed By: David Hoexter
Date Completed: 10/3/1996

Target Risk (Class A & B) 1.0E-4
Target Risk (Class C) 1.0E-4
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 1

SURFACE SOIL RBSL VALUES (< 3 FT BGS)

RBSL Results For Complete Exposure Pathways ("x" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X Soil Leaching to Groundwater			X Ingestion, Inhalation and Dermal Contact		X Construction Worker	RBSL		
CAS No.	Name	(mg/kg)	Residential (on-site)	Commercial (on-site)	Regulatory(MCL) (on-site)	Residential (on-site)	Commercial (on-site)	Commercial (on-site)	Applicable RBSL (mg/kg)	Exceeded ? "■" If yes	Required CRF Only if "yes" left
83-32-9	Acenaphthene	0.0E+0	>Res	NA	NA	>Res	NA	>Res	>Res	☐	<1
120-12-7	Anthracene	0.0E+0	>Res	NA	NA	>Res	NA	>Res	>Res	☐	<1
71-43-2	Benzene	0.0E+0	4.7E+0	NA	NA	2.1E+2	NA	>Res	4.7E+0	☐	<1
75-00-3	Chloroethane	0.0E+0	1.4E+2	NA	NA	>Res	NA	>Res	1.4E+2	☐	<1
95-50-1	Dichlorobenzene (1,2) (-o)	0.0E+0	2.3E+3	NA	NA	2.2E+3	NA	>Res	2.2E+3	☐	<1
106-46-7	Dichlorobenzene, (1,4) (-p)	0.0E+0	2.5E+2	NA	NA	2.5E+2	NA	>Res	2.5E+2	☐	<1
75-34-3	Dichloroethane, 1,1-	0.0E+0	9.0E+1	NA	NA	2.6E+3	NA	3.7E+3	9.0E+1	☐	<1
107-06-2	Dichloroethane, 1,2-	0.0E+0	2.0E+0	NA	NA	6.6E+1	NA	2.6E+3	2.0E+0	☐	<1
156-59-2	Dichloroethene, cis-1,2-	0.0E+0	6.2E+0	NA	NA	2.6E+2	NA	3.4E+2	6.2E+0	☐	<1
156-60-5	Dichloroethene,1,2-trans-	0.0E+0	9.5E+0	NA	NA	>Res	NA	>Res	9.5E+0	☐	<1
100-41-4	Ethylbenzene	0.0E+0	1.3E+2	NA	NA	>Res	NA	>Res	1.3E+2	☐	<1
206-44-0	Fluoranthene	0.0E+0	>Res	NA	NA	>Res	NA	>Res	>Res	☐	<1
91-20-3	Naphthalene	0.0E+0	6.2E+1	NA	NA	>Res	NA	>Res	6.2E+1	☐	<1
85-01-8	Phenanthrene	0.0E+0	>Res	NA	NA	>Res	NA	>Res	>Res	☐	<1
129-00-0	Pyrene	0.0E+0	>Res	NA	NA	>Res	NA	>Res	>Res	☐	<1
127-18-4	Tetrachloroethene	0.0E+0	7.1E+3	NA	NA	1.2E+2	NA	6.4E+3	1.2E+2	☐	<1
108-88-3	Toluene	0.0E+0	3.5E+2	NA	NA	>Res	NA	>Res	3.5E+2	☐	<1
71-55-6	Trichloroethane, 1,1,1-	0.0E+0	3.3E+2	NA	NA	2.4E+3	NA	>Res	3.3E+2	☐	<1
79-00-5	Trichloroethane, 1,1,2-	0.0E+0	4.1E-1	NA	NA	1.1E+2	NA	>Res	4.1E-1	☐	<1
79-01-6	Trichloroethene	0.0E+0	2.3E+0	NA	NA	>Res	NA	>Res	2.3E+0	☐	<1
75-01-4	Vinyl chloride	0.0E+0	9.3E-2	NA	NA	3.3E+0	NA	1.6E+2	9.3E-2	☐	<1
1330-20-7	Xylene (mixed isomers)	0.0E+0	>Res	NA	NA	>Res	NA	>Res	>Res	☐	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: g-265-vhx-686

RBCA SITE ASSESSMENT

Tier 1 Worksheet 6.2

Site Name: 1970 Seminary
Site Location: Oakland, C

Completed By: David Hoexter
Date Completed: 10/3/1996

Target Risk (Class A & B) 1.0E-4 ☐ MCL exposure limit?
Target Risk (Class C) 1.0E-4 ☐ PEL exposure limit?
Target Hazard Quotient 1.0E+0

Calculation Option: 1

SUBSURFACE SOIL RBSL VALUES (> 3 FT BGS)

RBSL Results For Complete Exposure Pathways ("x" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X Soil Leaching to Groundwater			X Soil Volatilization to Indoor Air		X Soil Volatilization to Outdoor Air		Applicable RBSL	RBSL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)	Residential: (on-site)	Commercial: (on-site)	Residential: (on-site)	Commercial: (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
83-32-9	Acenaphthene	0.0E+0	>Res	NA	NA	>Res	NA	>Res	NA	>Res	☐	<1
120-12-7	Anthracene	0.0E+0	>Res	NA	NA	>Res	NA	>Res	NA	>Res	☐	<1
71-43-2	**Benzene**	2.4E+0	4.7E+0	NA	NA	1.5E-1	NA	1.2E+2	NA	1.5E-1	■	1.6E+01
75-00-3	Chloroethane	0.0E+0	1.4E+2	NA	NA	2.5E+2	NA	>Res	NA	1.4E+2	☐	<1
95-50-1	Dichlorobenzene (1,2) (-o)	1.7E+0	2.3E+3	NA	NA	4.5E+2	NA	>Res	NA	4.5E+2	☐	<1
106-46-7	Dichlorobenzene, (1,4) (-p)	0.0E+0	2.5E+2	NA	NA	1.4E+2	NA	>Res	NA	1.4E+2	☐	<1
75-34-3	Dichloroethane, 1,1-	0.0E+0	9.0E+1	NA	NA	1.2E+1	NA	>Res	NA	1.2E+1	☐	<1
107-06-2	Dichloroethane, 1,2-	0.0E+0	2.0E+0	NA	NA	9.7E-1	NA	1.7E+2	NA	9.7E-1	☐	<1
156-59-2	Dichloroethene, cis-1,2-	0.0E+0	6.2E+0	NA	NA	8.6E-1	NA	>Res	NA	8.6E-1	☐	<1
156-60-5	Dichloroethene,1,2-trans-	0.0E+0	9.5E+0	NA	NA	1.7E+0	NA	>Res	NA	1.7E+0	☐	<1
100-41-4	Ethylbenzene	4.2E+0	1.3E+2	NA	NA	3.8E+1	NA	>Res	NA	3.8E+1	☐	<1
206-44-0	Fluoranthene	0.0E+0	>Res	NA	NA	>Res	NA	>Res	NA	>Res	☐	<1
91-20-3	Naphthalene	0.0E+0	6.2E+1	NA	NA	4.4E+1	NA	>Res	NA	4.4E+1	☐	<1
85-01-8	Phenanthrene	0.0E+0	>Res	NA	NA	2.0E+2	NA	>Res	NA	2.0E+2	☐	<1
129-00-0	Pyrene	0.0E+0	>Res	NA	NA	>Res	NA	>Res	NA	>Res	☐	<1
127-18-4	Tetrachloroethene	1.8E+0	7.1E+3	NA	NA	5.2E+3	NA	>Res	NA	5.2E+3	☐	<1
108-88-3	Toluene	3.5E+0	3.5E+2	NA	NA	2.3E+1	NA	>Res	NA	2.3E+1	☐	<1
71-55-6	Trichloroethane, 1,1,1-	0.0E+0	3.3E+2	NA	NA	4.6E+1	NA	>Res	NA	4.6E+1	☐	<1
79-00-5	Trichloroethane, 1,1,2-	0.0E+0	4.1E-1	NA	NA	4.4E-1	NA	2.8E+2	NA	4.1E-1	☐	<1
79-01-6	Trichloroethene	8.2E-1	2.3E+0	NA	NA	3.3E+0	NA	>Res	NA	2.3E+0	☐	<1
75-01-4	Vinyl chloride	0.0E+0	9.3E-2	NA	NA	6.7E-2	NA	5.3E+1	NA	6.7E-2	☐	<1
1330-20-7	Xylene (mixed isomers)	8.3E+0	>Res	NA	NA	>Res	NA	>Res	NA	>Res	☐	<1

Software: GSI RBCA Spreadsheet Serial: g-265-vhx-686
Version v1.0

RBCA SITE ASSESSMENT

Tier 1 Worksheet 6.3

Site Name: 1970 Seminary
Site Location: Oakland, C

Completed By: David Hoexter
Date Completed: 10/3/1996

GROUNDWATER RBSL VALUES

Target Risk (Class A & B) 1.0E-4 ☐ MCL exposure limit?
Target Risk (Class C) 1.0E-4 ☐ PEL exposure limit?
Target Hazard Quotient 1.0E+0

Calculation Option: 1

RBSL Results For Complete Exposure Pathways ("x" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X Groundwater Ingestion			X Groundwater Volatilization to Indoor Air		X Groundwater Volatilization to Outdoor Air		Applicable RBSL	RBSL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential (on-site)	Commercial (on-site)	Regulatory(MCL) (on-site)	Residential (on-site)	Commercial (on-site)	Residential (on-site)	Commercial (on-site)	(mg/L	"■" If yes	Only if "yes" left
83-32-9	Acenaphthene	0.0E+0	>Sol	NA	NA	>Sol	NA	>Sol	NA	>Sol	☐	<1
120-12-7	Anthracene	0.0E+0	>Sol	NA	NA	>Sol	NA	>Sol	NA	>Sol	☐	<1
71-43-2	Benzene	5.6E+1	2.9E-1	NA	NA	9.8E-1	NA	6.0E+2	NA	2.9E-1	■	1.9E+02
75-00-3	Chloroethane	1.4E-3	1.5E+1	NA	NA	1.2E+3	NA	>Sol	NA	1.5E+1	☐	<1
95-50-1	Dichlorobenzene (1,2) (-o)	2.2E-2	3.3E+0	NA	NA	5.8E+1	NA	>Sol	NA	3.3E+0	☐	<1
106-46-7	Dichlorobenzene, (1,4) (-p)	0.0E+0	3.5E-1	NA	NA	1.6E+1	NA	>Sol	NA	3.5E-1	☐	<1
75-34-3	Dichloroethane, 1,1-	0.0E+0	3.7E+0	NA	NA	4.5E+1	NA	>Sol	NA	3.7E+0	☐	<1
107-06-2	Dichloroethane, 1,2-	1.5E-2	9.4E-2	NA	NA	3.5E+0	NA	1.7E+3	NA	9.4E-2	☐	<1
156-59-2	Dichloroethene, cis-1,2-	3.2E-1	3.7E-1	NA	NA	1.7E+0	NA	>Sol	NA	3.7E-1	☐	<1
156-60-5	Dichloroethene,1,2-trans-	9.2E-3	7.3E-1	NA	NA	1.3E+1	NA	>Sol	NA	7.3E-1	☐	<1
100-41-4	Ethylbenzene	2.8E+1	3.7E+0	NA	NA	>Sol	NA	>Sol	NA	3.7E+0	■	8.0E+00
206-44-0	Fluoranthene	0.0E+0	>Sol	NA	NA	>Sol	NA	>Sol	NA	>Sol	☐	<1
91-20-3	Naphthalene	0.0E+0	1.5E-1	NA	NA	6.9E+0	NA	>Sol	NA	1.5E-1	☐	<1
85-01-8	Phenanthrene	0.0E+0	1.5E-1	NA	NA	>Sol	NA	>Sol	NA	1.5E-1	☐	<1
129-00-0	Pyrene	0.0E+0	>Sol	NA	NA	>Sol	NA	>Sol	NA	>Sol	☐	<1
127-18-4	Tetrachloroethene	1.3E-1	1.6E-1	NA	NA	2.2E+1	NA	>Sol	NA	1.6E-1	☐	<1
108-88-3	Toluene	6.1E+1	7.3E+0	NA	NA	6.6E+1	NA	>Sol	NA	7.3E+0	■	8.0E+00
71-55-6	Trichloroethane, 1,1,1-	0.0E+0	3.3E+0	NA	NA	8.1E+1	NA	>Sol	NA	3.3E+0	☐	<1
79-00-5	Trichloroethane, 1,1,2-	0.0E+0	1.5E-1	NA	NA	9.1E+0	NA	3.7E+3	NA	1.5E-1	☐	<1
79-01-6	Trichloroethene	3.4E-1	2.2E-1	NA	NA	6.6E+0	NA	>Sol	NA	2.2E-1	■	2.0E+00
75-01-4	Vinyl chloride	6.0E-2	4.5E-3	NA	NA	3.7E-2	NA	2.5E+1	NA	4.5E-3	■	1.3E+01
1330-20-7	Xylene (mixed isomers)	1.4E+2	7.3E+1	NA	NA	>Sol	NA	>Sol	NA	7.3E+1	■	2.0E+00

Software: GSI RBCA Spreadsheet Serial: g-265-vhx-686
Version: v 1.0

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: 1970 Seminary
Site Location: Oakland, C

Job Identification: E-10-1B-192B
Date Completed: 10/3/96
Completed By: David Hoexter

Software: GSI RBCA Spreadsheet
Version: v 1.0

NOTE: values which differ from Tier 1 default values are shown in bold italics and underlined.

DEFAULT PARAMETERS

Exposure Parameter	Definition (Units)	Residential Adult	Residential (1-6yrs)	Residential (1-16 yrs)	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
ATc	Averaging time for carcinogens (yr)	70				
ATn	Averaging time for non-carcinogens (yr)	30	6	16	25	1
BW	Body Weight (kg)	70	15	35	70	
ED	Exposure Duration (yr)	30	6	16	25	1
EF	Exposure Frequency (days/yr)	350			250	180
EF.Derm	Exposure Frequency for dermal exposure	350			250	
IRgw	Ingestion Rate of Water (l/day)	2			1	
IRs	Ingestion Rate of Soil (mg/day)	100	200		50	100
IRadj	Adjusted soil ing rate (mg*yr/kg*d)	1.1E+02			9.4E+01	
IRa.in	Inhalation rate indoor (m^3/day)	15			20	
IRa.out	Inhalation rate outdoor (m^3/day)	20			20	10
SA	Skin surface area (dermal) (cm^2)	5.8E+03		2.0E+03	5.8E+03	5.8E+03
SAadj	Adjusted dermal area (cm^2*yr/kg)	2.1E+03			1.7E+03	
M	Soil to Skin adherence factor	1				
AAFs	Age adjustment on soil ingestion	***TRUE***			***TRUE***	
AAFd	Age adjustment on skin surface area	***TRUE***			***TRUE***	
tox	Use EPA tox data for air (or PEL based)	TRUE				
gwMCL?	Use MCL as exposure limit in groundwater?	FALSE				

Surface Parameters	Definition (Units)	Residential	Commercial/Industrial Chronic	Commercial/Industrial Construction
t	Exposure duration (yr)	30	25	1
A	Contaminated soil area (cm^2)	***1.9E+06***		1.0E+06
W	Length of affected soil parallel to wind (cm)	***1.5E+03***		1.0E+03
W.gw	Length of affected soil parallel to groundwater (c	***1.5E+03***		
Uair	Ambient air velocity in mixing zone (cm/s)	2.3E+02		
delta	Air mixing zone height (cm)	2.0E+02		
Lss	Definition of surficial soils (cm)	1.0E+02		
Pe	Particulate areal emission rate (g/cm^2/s)	2.2E-10		

Groundwater	Definition (Units)	Value
delta.gw	Groundwater mixing zone depth (cm)	***6.1E+02***
I	Groundwater infiltration rate (cm/yr)	***1.5E+01***
Ugw	Groundwater Darcy velocity (cm/yr)	***1.2E+03***
Ugw tr	Groundwater Transport velocity (cm/yr)	8.6E+03
Ks	Saturated Hydraulic Conductivity(cm/s)	
grad	Groundwater Gradient (cm/cm)	
Sw	Width of groundwater source zone (cm)	
Sd	Depth of groundwater source zone (cm)	
BC	Biodegradation Capacity (mg/L)	
BIO?	Is Bioattenuation Considered	FALSE
phi.eff	Effective Porosity in Water-Bearing Unit	3.8E-01
foc.sat	Fraction organic carbon in water-bearing unit	1.0E-03

Matrix of Exposed Persons to Complete Exposure Pathways		Residential	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
Groundwater Pathways:				
GW.i	Groundwater Ingestion	FALSE	TRUE	
GW.v	Volatilization to Outdoor Air	FALSE	TRUE	
GW.b	Vapor Intrusion to Buildings	FALSE	TRUE	
Soil Pathways				
S.v	Volatiles from Subsurface Soils	FALSE	TRUE	
SS.v	Volatiles and Particulate Inhalation	FALSE	TRUE	TRUE
SS.d	Direct Ingestion and Dermal Contact	FALSE	TRUE	TRUE
S.l	Leaching to Groundwater from all Soils	FALSE	TRUE	
S.b	Intrusion to Buildings - Subsurface Soils	FALSE	TRUE	

Soil	Definition (Units)	Value		
hc	Capillary zone thickness (cm)	***1.5E+01***		
hv	Vadose zone thickness (cm)	***1.6E+02***		
rho	Soil density (g/cm^3)	1.7		
foc	Fraction of organic carbon in vadose zone	0.01		
phi	Soil porosity in vadose zone	0.38		
Lgw	Depth to groundwater (cm)	***1.7E+02***		
Ls	Depth to top of affected soil (cm)	***2.1E+02***		
Lsubs	Thickness of affected subsurface soils (cm)	***8.8E+02***		
pH	Soil/groundwater pH	6.5		
		capillary	vadose	foundation
phi.w	Volumetric water content	0.342	0.12	0.12
phi.a	Volumetric air content	0.038	0.26	0.26

Matrix of Receptor Distance and Location on- or off-site		Residential Distance	Residential On-Site	Commercial/Industrial Distance	Commercial/Industrial On-Site
GW	Groundwater receptor (cm)		TRUE		TRUE
S	Inhalation receptor (cm)		TRUE		TRUE

Building	Definition (Units)	Residential	Commercial
Lb	Building volume/area ratio (cm)	2.0E+02	3.0E+02
ER	Building air exchange rate (s^-1)	1.4E-04	2.3E-04
Lcrk	Foundation crack thickness (cm)	1.5E+01	
eta	Foundation crack fraction	0.01	

Matrix of Target Risks		Individual	Cumulative
TRab	Target Risk (class A&B carcinogens)	***1.0E-04***	
TRc	Target Risk (class C carcinogens)	***1.0E-04***	
THQ	Target Hazard Quotient	1.0E+00	
Opt	Calculation Option (1, 2, or 3)	1	
Tier	RBCA Tier	1	

Dispersive Transport Parameters	Definition (Units)	Residential	Commercial
Groundwater			
ax	Longitudinal dispersion coefficient (cm)		
ay	Transverse dispersion coefficient (cm)		
az	Vertical dispersion coefficient (cm)		
Vapor			
dcy	Transverse dispersion coefficient (cm)		
dcz	Vertical dispersion coefficient (cm)		

RBCA SITE ASSESSMENT

Tier 1 Worksheet 6.1

Site Name: 1970 Seminary
Site Location: Oakland, C

Completed By: David Hoexter
Date Completed: 10/3/1996

Target Risk (Class A & B) 1.0E-4
Target Risk (Class C) 1.0E-4
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 1

SURFACE SOIL RBSL VALUES (< 3 FT BGS)

RBSL Results For Complete Exposure Pathways ("x" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X Soil Leaching to Groundwater			X Ingestion, Inhalation and Dermal Contact		X Construction Worker	RBSL		
CAS No.	Name	(mg/kg)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)	Residential: (on-site)	Commercial: (on-site)	Commercial: (on-site)	Applicable RBSL (mg/kg)	Exceeded ? "■" If yes	Required CRF Only if "yes" left
83-32-9	Acenaphthene	0.0E+0	NA	>Res	NA	NA	>Res	>Res	>Res	☐	<1
120-12-7	Anthracene	0.0E+0	NA	>Res	NA	NA	>Res	>Res	>Res	☐	<1
71-43-2	Benzene	0.0E+0	NA	1.6E+1	NA	NA	3.6E+2	>Res	1.6E+1	☐	<1
75-00-3	Chloroethane	0.0E+0	NA	3.8E+2	NA	NA	>Res	>Res	3.8E+2	☐	<1
95-50-1	Dichlorobenzene (1,2) (-o)	0.0E+0	NA	>Res	NA	NA	>Res	>Res	>Res	☐	<1
106-46-7	Dichlorobenzene, (1,4) (-p)	0.0E+0	NA	8.4E+2	NA	NA	4.3E+2	>Res	4.3E+2	☐	<1
75-34-3	Dichloroethane, 1,1-	0.0E+0	NA	2.5E+2	NA	NA	3.8E+3	3.7E+3	2.5E+2	☐	<1
107-06-2	Dichloroethane, 1,2-	0.0E+0	NA	6.8E+0	NA	NA	1.1E+2	2.6E+3	6.8E+0	☐	<1
156-59-2	Dichloroethene, cis-1,2-	0.0E+0	NA	1.7E+1	NA	NA	3.7E+2	3.4E+2	1.7E+1	☐	<1
156-60-5	Dichloroethene,1,2-trans-	0.0E+0	NA	2.6E+1	NA	NA	>Res	>Res	2.6E+1	☐	<1
100-41-4	Ethylbenzene	0.0E+0	NA	>Res	NA	NA	>Res	>Res	>Res	☐	<1
206-44-0	Fluoranthene	0.0E+0	NA	>Res	NA	NA	>Res	>Res	>Res	☐	<1
91-20-3	Naphthalene	0.0E+0	NA	1.7E+2	NA	NA	>Res	>Res	1.7E+2	☐	<1
85-01-8	Phenanthrene	0.0E+0	NA	>Res	NA	NA	>Res	>Res	>Res	☐	<1
129-00-0	Pyrene	0.0E+0	NA	>Res	NA	NA	>Res	>Res	>Res	☐	<1
127-18-4	Tetrachloroethene	0.0E+0	NA	2.4E+4	NA	NA	2.1E+2	6.4E+3	2.1E+2	☐	<1
108-88-3	Toluene	0.0E+0	NA	>Res	NA	NA	>Res	>Res	>Res	☐	<1
71-55-6	Trichloroethane, 1,1,1-	0.0E+0	NA	9.1E+2	NA	NA	3.5E+3	>Res	9.1E+2	☐	<1
79-00-5	Trichloroethane, 1,1,2-	0.0E+0	NA	1.2E+0	NA	NA	1.8E+2	>Res	1.2E+0	☐	<1
79-01-6	Trichloroethene	0.0E+0	NA	6.4E+0	NA	NA	>Res	>Res	6.4E+0	☐	<1
75-01-4	Vinyl chloride	0.0E+0	NA	3.1E-1	NA	NA	5.7E+0	1.6E+2	3.1E-1	☐	<1
1330-20-7	Xylene (mixed isomers)	0.0E+0	NA	>Res	NA	NA	>Res	>Res	>Res	☐	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: g-265-vhx-686

RBCA SITE ASSESSMENT

Tier 1 Worksheet 6.2

Site Name: 1970 Seminary
Site Location: Oakland, C

Completed By: David Hoexter
Date Completed: 10/3/1996

Target Risk (Class A & B) 1.0E-4 ☐ MCL exposure limit?
Target Risk (Class C) 1.0E-4 ☐ PEL exposure limit?
Target Hazard Quotient 1.0E+0

Calculation Option: 1

SUBSURFACE SOIL RBSL VALUES (> 3 FT BGS)

RBSL Results For Complete Exposure Pathways ("x" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X Soil Leaching to Groundwater			X Soil Volatilization to Indoor Air		X Soil Volatilization to Outdoor Air		Applicable RBSL	RBSL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)	Residential: (on-site)	Commercial: (on-site)	Residential: (on-site)	Commercial (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
83-32-9	Acenaphthene	0.0E+0	NA	>Res	NA	NA	>Res	NA	>Res	>Res	☐	<1
120-12-7	Anthracene	0.0E+0	NA	>Res	NA	NA	>Res	NA	>Res	>Res	☐	<1
71-43-2	Benzene	2.4E+0	NA	1.6E+1	NA	NA	3.1E-1	NA	1.3E+2	3.1E-1	■	8.0E+00
75-00-3	Chloroethane	0.0E+0	NA	3.8E+2	NA	NA	5.3E+2	NA	>Res	3.8E+2	☐	<1
95-50-1	Dichlorobenzene (1,2) (-o)	1.7E+0	NA	>Res	NA	NA	1.2E+3	NA	>Res	1.2E+3	☐	<1
106-46-7	Dichlorobenzene, (1,4) (-p)	0.0E+0	NA	8.4E+2	NA	NA	4.2E+2	NA	>Res	4.2E+2	☐	<1
75-34-3	Dichloroethane, 1,1-	0.0E+0	NA	2.5E+2	NA	NA	2.6E+1	NA	>Res	2.6E+1	☐	<1
107-06-2	Dichloroethane, 1,2-	0.0E+0	NA	6.8E+0	NA	NA	2.8E+0	NA	2.3E+2	2.8E+0	☐	<1
156-59-2	Dichloroethene, cis-1,2-	0.0E+0	NA	1.7E+1	NA	NA	1.8E+0	NA	>Res	1.8E+0	☐	<1
156-60-5	Dichloroethene,1,2-trans-	0.0E+0	NA	2.6E+1	NA	NA	3.9E+0	NA	>Res	3.9E+0	☐	<1
100-41-4	Ethylbenzene	4.2E+0	NA	>Res	NA	NA	9.8E+1	NA	>Res	9.8E+1	☐	<1
206-44-0	Fluoranthene	0.0E+0	NA	>Res	NA	NA	>Res	NA	>Res	>Res	☐	<1
91-20-3	Naphthalene	0.0E+0	NA	1.7E+2	NA	NA	1.1E+2	NA	>Res	1.1E+2	☐	<1
85-01-8	Phenanthrene	0.0E+0	NA	>Res	NA	NA	>Res	NA	>Res	>Res	☐	<1
129-00-0	Pyrene	0.0E+0	NA	>Res	NA	NA	>Res	NA	>Res	>Res	☐	<1
127-18-4	Tetrachloroethene	1.8E+0	NA	2.4E+4	NA	NA	1.6E+4	NA	>Res	1.6E+4	☐	<1
108-88-3	Toluene	3.5E+0	NA	>Res	NA	NA	5.8E+1	NA	>Res	5.8E+1	☐	<1
71-55-6	Trichloroethane, 1,1,1-	0.0E+0	NA	9.1E+2	NA	NA	1.2E+2	NA	>Res	1.2E+2	☐	<1
79-00-5	Trichloroethane, 1,1,2-	0.0E+0	NA	1.2E+0	NA	NA	1.4E+0	NA	3.9E+2	1.2E+0	☐	<1
79-01-6	Trichloroethene	8.2E-1	NA	6.4E+0	NA	NA	8.6E+0	NA	>Res	6.4E+0	☐	<1
75-01-4	Vinyl chloride	0.0E+0	NA	3.1E-1	NA	NA	1.7E-1	NA	7.4E+1	1.7E-1	☐	<1
1330-20-7	Xylene (mixed isomers)	8.3E+0	NA	>Res	NA	NA	>Res	NA	>Res	>Res	☐	<1

Software: GSI RBCA Spreadsheet Serial: g-265-vhx-686
Version: v 1.0

RBCA SITE ASSESSMENT

Tier 1 Worksheet 6.3

Site Name: 1970 Seminary
Site Location: Oakland, C

Completed By: David Hoexter
Date Completed: 10/3/1996

GROUNDWATER RBSL VALUES

Target Risk (Class A & B) 1.0E-4
Target Risk (Class C) 1.0E-4
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 1

RBSL Results For Complete Exposure Pathways ("x" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X Groundwater Ingestion			X Groundwater Volatilization to Indoor Air		X Groundwater Volatilization to Outdoor Air		Applicable RBSL	RBSL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential (on-site)	Commercial (on-site)	Regulatory(MCL) (on-site)	Residential (on-site)	Commercial (on-site)	Residential (on-site)	Commercial (on-site)	(mg/L	"■" If yes	Only if "yes" left
83-32-9	Acenaphthene	0.0E+0	NA	>Sol	NA	NA	>Sol	NA	>Sol	>Sol	☐	<1
120-12-7	Anthracene	0.0E+0	NA	>Sol	NA	NA	>Sol	NA	>Sol	>Sol	☐	<1
71-43-2	Benzene	5.6E+1	NA	9.9E-1	NA	NA	2.5E+0	NA	8.4E+2	9.9E-1	■	5.7E+01
75-00-3	Chloroethane	1.4E-3	NA	4.1E+1	NA	NA	3.1E+3	NA	>Sol	4.1E+1	☐	<1
95-50-1	Dichlorobenzene (1,2) (-o)	2.2E-2	NA	9.2E+0	NA	NA	1.5E+2	NA	>Sol	9.2E+0	☐	<1
106-46-7	Dichlorobenzene, (1,4) (-p)	0.0E+0	NA	1.2E+0	NA	NA	4.8E+1	NA	>Sol	1.2E+0	☐	<1
75-34-3	Dichloroethane, 1,1-	0.0E+0	NA	1.0E+1	NA	NA	1.2E+2	NA	>Sol	1.0E+1	☐	<1
107-06-2	Dichloroethane, 1,2-	1.5E-2	NA	3.1E-1	NA	NA	1.0E+1	NA	2.7E+3	3.1E-1	☐	<1
156-59-2	Dichloroethene, cis-1,2-	3.2E-1	NA	1.0E+0	NA	NA	4.4E+0	NA	>Sol	1.0E+0	☐	<1
156-60-5	Dichloroethene,1,2-trans-	9.2E-3	NA	2.0E+0	NA	NA	3.4E+1	NA	>Sol	2.0E+0	☐	<1
100-41-4	Ethylbenzene	2.8E+1	NA	1.0E+1	NA	NA	>Sol	NA	>Sol	1.0E+1	■	3.0E+00
206-44-0	Fluoranthene	0.0E+0	NA	>Sol	NA	NA	>Sol	NA	>Sol	>Sol	☐	<1
91-20-3	Naphthalene	0.0E+0	NA	4.1E-1	NA	NA	1.8E+1	NA	>Sol	4.1E-1	☐	<1
85-01-8	Phenanthrene	0.0E+0	NA	4.1E-1	NA	NA	>Sol	NA	>Sol	4.1E-1	☐	<1
129-00-0	Pyrene	0.0E+0	NA	>Sol	NA	NA	>Sol	NA	>Sol	>Sol	☐	<1
127-18-4	Tetrachloroethene	1.3E-1	NA	5.5E-1	NA	NA	7.0E+1	NA	>Sol	5.5E-1	☐	<1
108-88-3	Toluene	6.1E+1	NA	2.0E+1	NA	NA	1.7E+2	NA	>Sol	2.0E+1	■	3.0E+00
71-55-6	Trichloroethane, 1,1,1-	0.0E+0	NA	9.2E+0	NA	NA	2.1E+2	NA	>Sol	9.2E+0	☐	<1
79-00-5	Trichloroethane, 1,1,2-	0.0E+0	NA	4.1E-1	NA	NA	2.8E+1	NA	>Sol	4.1E-1	☐	<1
79-01-6	Trichloroethene	3.4E-1	NA	6.1E-1	NA	NA	2.0E+1	NA	>Sol	6.1E-1	☐	<1
75-01-4	Vinyl chloride	6.0E-2	NA	1.5E-2	NA	NA	1.2E-1	NA	4.3E+1	1.5E-2	■	4.0E+00
1330-20-7	Xylene (mixed isomers)	1.4E+2	NA	>Sol	NA	NA	>Sol	NA	>Sol	>Sol	☐	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: g-265-vhx-686

APPENDIX C

Terra Vac Corporation
February 5, 1997 Report

TERRA VAC

DUAL VAPOR EXTRACTION PILOT STUDY
GRIMIT AUTO AND REPAIR
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

PROJECT 30-0195

TERRA VAC

DUAL VAPOR EXTRACTION PILOT STUDY
GRIMIT AUTO AND REPAIR
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

Prepared For:

Doyle Grimit
14366 Lark Street
San Leandro, California 94578

Prepared By:

Terra Vac Corporation
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San Leandro, California 94577

Robert Tarr
Staff Engineer

Mark P. Frye
Project Engineer

February 5,1997

DUAL VAPOR EXTRACTION PILOT STUDY
GRIMIT AUTO AND REPAIR
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

1.0 Introduction

At the request of Doyle Grimit, Terra Vac performed a dual vapor extraction pilot study at the Grimit Auto and Repair site. The purpose of the study was to collect data on the performance of dual vapor extraction technology when applied at the site. Terra Vac understands that this report will be used to evaluate remedial options for addressing hydrocarbon impacted soil and groundwater beneath the site.

2.0 Site Description

The project site is located at 1970 Seminary Avenue in Oakland, California. The neighborhood generally consists of residential houses with nearby one, two, or three-story apartment buildings. The property is bordered by Seminary Avenue on the northwest and Harmon Avenue on the northeast. The site comprises an automobile service building with an office, an attached canopy, and a small detached storage building.

The site is paved throughout with the exception of an approximate 900 square foot area where the former underground storage tanks (UST) were located. The UST area was over-excavated and clean soil was used as backfill.

3.0 Pilot Study Summary

The pilot study was conducted to determine; (a) the radius of influence of an applied vacuum to an existing well on-site, and (b) the resultant groundwater flow rate from that well. To complete this, Terra Vac mobilized a system which comprised of:

- 10HP blower;
- Generator;
- Carbon canister;
- Well head adapting equipment;
- Knock out pot; and
- other miscellaneous equipment.

An existing on-site well was used as the extraction well for this pilot study. The extraction well was adapted with fittings for the 10HP blower to induce a vacuum of approximately 12" Hg. The fittings included a slurp tube that extended down the well that was used to extract

groundwater. The groundwater removed from the extraction well is separated from the knock out pot. Monitoring well MW-1 was selected because the screened interval allowed soil vapors to be drawn from the surrounding subsurface area.

The radius of influence was monitored from two 1-inch black iron pipes driven into the subsurface. The driven pipes are hereinafter, referred to as observation points. Vacuum gauges connected to the observation points were used to measure the amount of vacuum produced in the soil at different distances from the extraction well.

Monitoring well MW-1 has a two-inch casing and is screened across the interval extending approximately 15 to 35 feet below grade. Prior to the start of the study, groundwater was encountered at a depth of approximately 14 feet below grade. The observation points, OB-1 and OB-2, were driven approximately six feet into the subsurface. The locations of MW-1, OB-1, and OB-2 are shown on Figure 1.

Terra Vac mobilized test equipment to the site on January 28, 1997. A 34 foot-long slurp tube was set in MW-1 and the dual vapor extraction system was operated for slightly over three hours. Throughout the duration of the study, Terra Vac monitored the vacuum applied to the slurp tube, induced air flow rates out of the extraction well, the amount of vacuum applied to the well casing and formation, and the resultant vacuum at the observation points. The rate at which groundwater was extracted from MW-1 was also noted. Two samples of the extracted soil vapors were collected and analyzed by Terra Vac for total petroleum hydrocarbons and benzene, toluene, ethylbenzene, and xylenes. Tabulated field data is presented in Table 1.

4.0 Pilot Study Results

An evaluation of the monitoring data indicates the following:

- The induced air flow rate from the extraction well was approximately 11 standard cubic feet per minute with an applied vacuum of 12 inches of mercury column.

- A significant amount of bleed air was required to maintain air flow and groundwater removal within the extraction well casing. Extraction flow rates are expected to increase significantly with continuous application of vacuum to the low permeable materials as a result of dewatering. Wells screened exclusively for dual vacuum extraction will also enhance flow rates.

- The vacuum effectively applied to the well casing and formation was approximately 4 inches of mercury column.

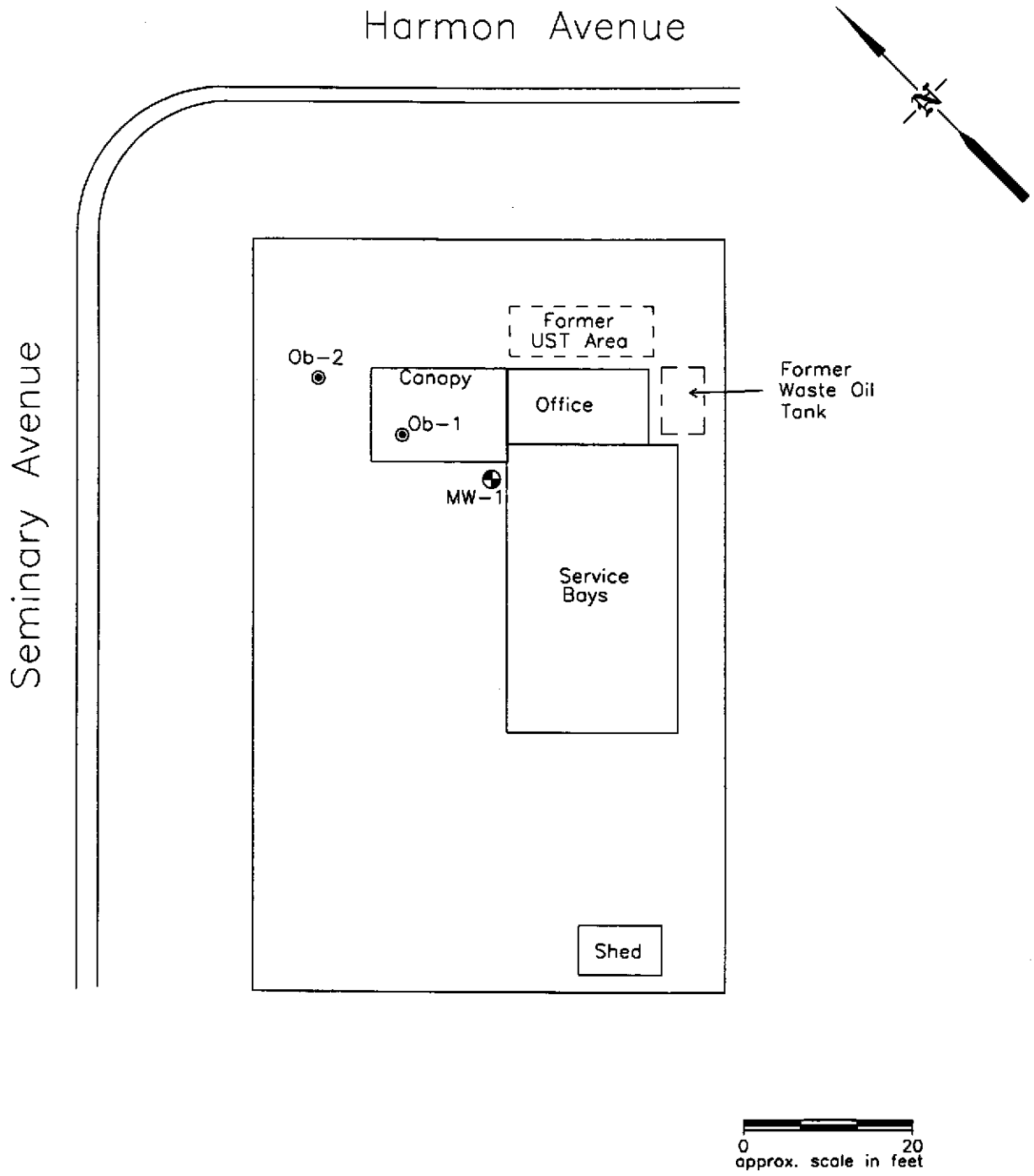
- A vacuum of approximately 0.2 inches of water column was observed in OB-1 at the end of three hours of test operation. OB-1 was located at a distance of approximately 14 feet from MW-1. At the same time, a vacuum of approximately 0.1 inches of water column

was observed in OB-2 which was located at a distance of approximately 25 feet from MW-1. The amount of vacuum observed in OB-1 is significant and is indicative of some degree of connectivity between MW-1 and OB-1. There appeared to be some connectively between MW-1 and OB-2, however the amount of induced vacuum was not as significant.

- A total of 130 gallons of groundwater were extracted during three hours of testing corresponding to an overall groundwater extraction rate of approximately 0.7 gallons per minute.

5.0 Conclusion

The radius of influence of operating the dual vapor extraction system extended to at least 14 feet, with a trace influence at approximately 25 feet from MW-1. The initial TPH-g concentrations decreased from 39.7 mg/L to to 12.6 mg/L during this study. Based on these facts, Terra Vac believes Dual Vapor Extraction, the process of extracting vapor and groundwater simultaneously, is a viable alternative to effectively and rapidly remove the subsurface contaminants at the Grimit Auto and Repair site.



LEGEND

◓ = Dual Vapor Extraction Well

Ob-1
◉ = Observation Well

Site Map
Grimit Auto and Repair
1970 Seminary Ave.
Oakland, CA

Project	30-0195	Drawn	RJT
Date	1/31/97	Revision	2/10/97
Scale	1"= 20'	Checked	

TERRA VAC 1651 Alvarado Street
San Leandro, CA 94577
(510) 351-8900 Fax: -0221

Figure 1

Table 1
Grimit Auto and Repair
Pilot Test Field Data
28 January 1997

Time	Vacuum ("Hg)	MW-1("Hg)	Ob-1 ("H2O)	Ob-2 ("H2O)	Bleed	Pitot	Remarks
1213	13.0	0.0	0.00	0.03	Open	0	Drawing H2O down
1214	(--)	0.0	0.00	(--)	Open	(--)	Stop system
1217	12.0	0.0	0.00	0.03	Open	0	Start system
1220	12.8	4.0	0.00	0.03	1/4 Open	0.8	Moderate water flow
1223	12.0	3.5	0.00	0.02	1/2 Open	0.3	**Took vapor sample 1**
1227	12.0	3.5	0.06	0.02	3/4 Open	0.2	Low water flow
1232	12.0	3.5	0.00	0.02	3/4 Open	0.6	Moderate water flow
1242	12.0	3.8	0.00	0.02	3/4 Open	0.2	Moderate water flow
1257	12.0	4.0	0.00	0.02	3/4 Open	0.2	Moderate water flow
1304	12.0	4.0	0.18	0.04	3/4 Open	0.2	Moderate water flow
1325	12.0	4.0	0.15	0.04	3/4 Open	0.4	Moderate water flow
1348	12.0	4.0	0.00	0.01	3/4 Open	0.3	Low water flow
1412	12.0	4.0	0.00	0.05	3/4 Open	3.6	Low water flow
1430	12.0	4.0	0.00	0.00	3/4 Open	5.6	Moderate water flow
1445	12.0	4.0	0.00	0.00	3/4 Open	5	Moderate water flow
1500	12.0	4.0	0.04	0.10	3/4 Open	5	Moderate water flow
1503	(--)	(--)	(--)	(--)	(--)	(--)	**Took vapor sample 2**
1504	12.0	4.0	0.10	0.10	3/4 Open	0.3	Moderate water flow
1510	12.0	4.0	0.20	0.09	3/4 Open	0.5	Moderate water flow
1515	12.0	4.0	0.18	0.08	3/4 Open	0.5	Moderate water flow
1520	12.0	4.0	0.18	0.08	3/4 Open	0.5	Moderate water flow