STELLAR ENVIRONMENTAL SOLUTIONS
2198 SIXTH STREET, BERKELEY, CA 94710
TEL: 510.644.3123 FAX: 510.644.3859

TRANSMITTAL MEMORANDUM

TO: ALAMEDA COUNTY HEALTH CARE SERVICES AGENCY DEPT. OF ENVIRONMENTAL HEALTH HAZARDOUS MATERIALS DIVISION 1131 HARBOR BAY PKWY, SUITE 250 ALAMEDA, CA 94502	DATE: JANUARY 20, 2004
ATTENTION: MR. SCOTT SEERY	FILE: SES-2003-02
SUBJECT: REDWOOD REGIONAL PARK FUEL LEAK SITE	
WE ARE SENDING: ☒ HEREWITH	☐ UNDER SEPARATE COVER
☒ VIA MAIL	☐ VIA
THE FOLLOWING: YEAR 2003 ANNUAL SUMMARY REPORT FOR REDWOOD REGIONAL PARK SERVICE YARD SITE – OAKLAND, CALIFORNIA (JANUARY 2004)	
☐ AS REQUESTED	☐ FOR YOUR APPROVAL
☐ FOR REVIEW	☒ FOR YOUR USE
☐ FOR SIGNATURE	☐ FOR YOUR FILES
COPIES TO: N. FUJITA (EBRPD) M. RUGG (FISH & GAME) R. BREWER (REGIONAL BOARD)	BY: Bruce Rucker (BMR)

★ **Stellar Environmental Solutions**

2198 Sixth Street, Suite 201. Berkeley, CA 94710
Tel: (510) 644-3123 • Fax: (510) 644-3859
Geoscience & Engineering Consulting

January 15, 2004

Mr. Scott O. Seery
Hazardous Materials Specialist
Alameda County Health Care Services Agency
Department of Environmental Health, Hazardous Materials Division
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502

Subject: Year 2003 Annual Summary Report
Redwood Regional Park Service Yard Site – Oakland, California

Dear Mr. Seery:

Attached is the Stellar Environmental Solutions, Inc. (SES) Year 2003 Annual Summary Report for the underground fuel storage tank (UFST) site at the Redwood Regional Park Service Yard, located at 7867 Redwood Road, Oakland, California. This project is being conducted for the East Bay Regional Park District, and follows previous site investigation and remediation activities associated with former leaking underground fuel storage tanks, conducted since 1993. The key regulatory agencies for this investigation are the Alameda County Health Care Services Agency, the California Regional Water Quality Control Board, and the California Department of Fish and Game.

This report summarizes activities conducted from October through December 2003, including groundwater monitoring and sampling of site wells and surface water sampling. This report also summarizes an exploratory borehole program conducted in late September 2003 to address data gaps for evaluation of potential further corrective action, evaluates hydrochemical trends and the efficacy of previous corrective actions, and proposes additional corrective actions (installing and operating a bioventing system). If you have any questions regarding this report, please contact Mr. Neal Fujita of the East Bay Regional Park District, or contact us directly at (510) 644-3123.

Sincerely,

Bruce M. Rucker

Bruce M. Rucker, R.G., R.E.A.
Project Manager

REGISTERED GEOLOGIST
BRUCE M. RUCKER
No. 6814
Exp. Sept 2004
STATE OF CALIFORNIA

Richard S. Makdisi

Richard S. Makdisi, R.G., R.E.A.
Principal

cc: Michael Rugg, California Department of Fish and Game
Roger Brewer, California Regional Water Quality Control Board
Neal Fujita, East Bay Regional Park District

YEAR 2003 ANNUAL SUMMARY REPORT

REDWOOD REGIONAL PARK SERVICE YARD OAKLAND, CALIFORNIA

Prepared for:

EAST BAY REGIONAL PARK DISTRICT
OAKLAND, CALIFORNIA

Prepared by:

STELLAR ENVIRONMENTAL SOLUTIONS, INC.
2198 SIXTH STREET
BERKELEY, CALIFORNIA 94710

January 15, 2004

Project No. 2003-02

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

Section **Page**

Appendices

TABLES AND FIGURES

Tables **Page**

Figures **Page**

1.0 INTRODUCTION

PROJECT BACKGROUND

The subject property is the East Bay Regional Park District (EBRPD) Redwood Regional Park Service Yard located at 7867 Redwood Road in Oakland, Alameda County, California. The site has undergone site investigations and remediation since 1993 to address subsurface contamination caused by leakage from one or both of two former underground fuel storage tanks (UFSTs) that contained gasoline and diesel fuel. The Alameda County Health Care Services Agency (ACHCSA) has provided regulatory oversight of the investigation since its inception. Other regulatory agencies with historical involvement in site review include the California Regional Water Quality Control Board (RWQCB) and the California Department of Fish and Game (CDFG).

OBJECTIVES AND SCOPE OF WORK

This report discusses the following activities conducted/coordinated by Stellar Environmental Solutions, Inc. (SES) between October 1 and December 31, 2003:

- Collecting water levels in site wells to determine shallow groundwater flow direction;
- Sampling site wells for contaminant analysis and natural attenuation indicators;
- Collecting surface water samples for contaminant analysis;
- An exploratory borehole program conducted in late September 2003 to address data gaps for evaluation of the ORC™ corrective action program and potential further corrective action;
- An evaluation of hydrochemical and groundwater elevation trends; and
- An evaluation of the effectiveness of the ORC™ corrective action to date.

Based on the above evaluation, EBRPD and SES are proposing herein to conduct additional corrective action via installation and operation of a bioventing system (discussed in detail in Section 7.0 of this report).

Previous SES reports (see References and Bibliography section of this report) have provided a full discussion of prior site remediation and investigations; site geology and hydrogeology; residual site contamination; conceptual model for contaminant fate and transport; and evaluation of hydrochemical trends and plume stability. An October 2000 Feasibility Study report for the site,

submitted to ACHCSA, provided detailed analyses of the regulatory implications of the site contamination and an assessment of viable corrective actions (SES, 2000d). Additional monitoring well installations and corrective action by ORC™ injection proposed by SES were approved by the ACHCSA in its January 8, 2001 letter to the EBRPD. Two phases of ORC™ injection have been conducted: September 2001 and July 2002 (discussed in Section 6.0 of this report). A total of 28 groundwater monitoring events have been conducted on a quarterly basis since inception (November 1994), and a total of 11 groundwater monitoring wells are currently available for monitoring.

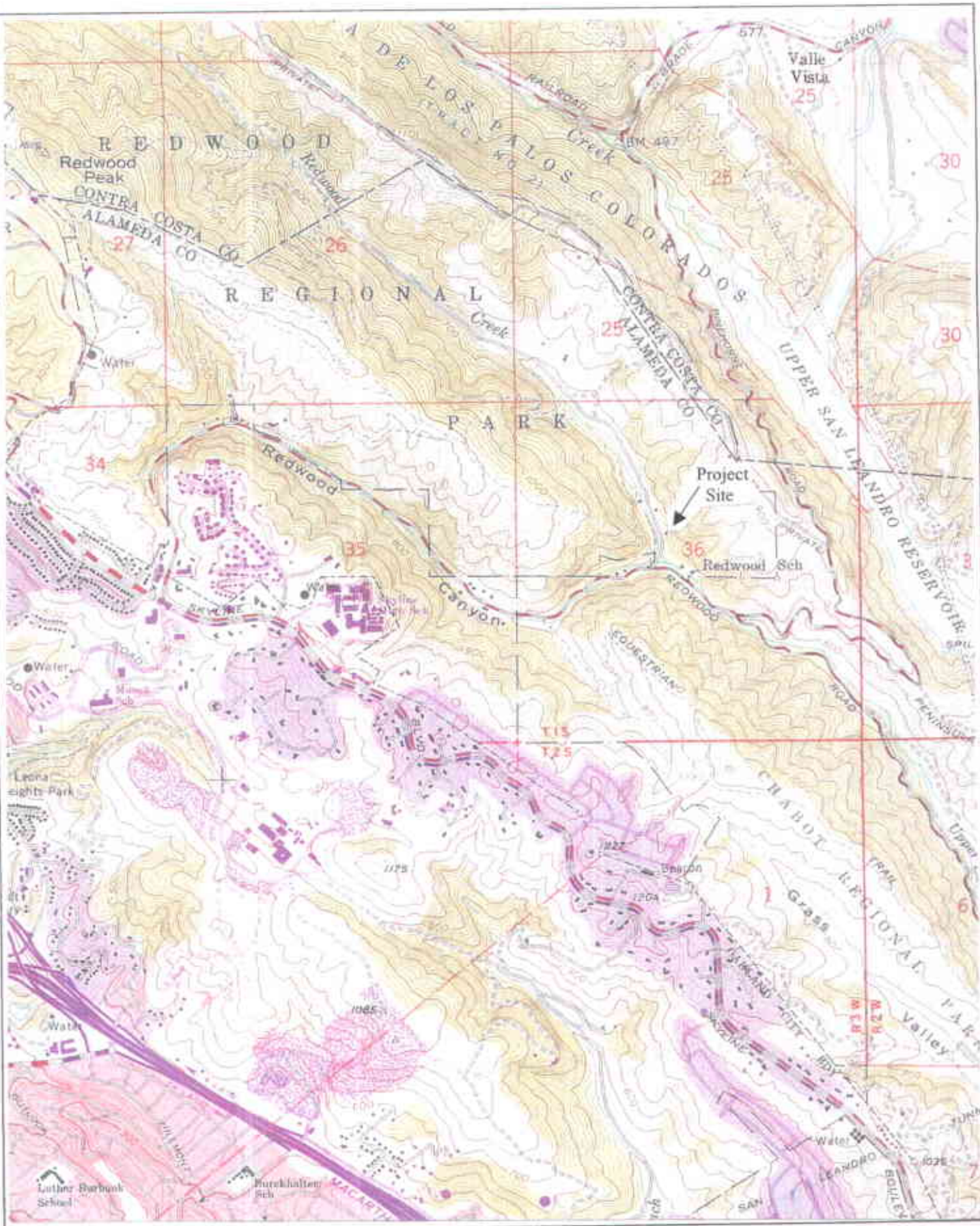
SITE DESCRIPTION

Figure 1 shows the location of the project site. The site slopes to the southwest, from an elevation of approximately 564 feet above mean sea level (amsl) at the eastern edge of the service yard to approximately 545 feet amsl at Redwood Creek. Figure 2 shows the site plan.

REGULATORY OVERSIGHT

The lead regulatory agency for the site investigation and remediation is ACHCSA, with oversight provided by the RWQCB. The CDFG is also involved with regard to water quality impacts to Redwood Creek. All workplans and reports are submitted to these agencies. The most recent ACHCSA directive regarding the site (letter dated January 8, 2001) approved the ORC™ injection corrective action and requested continued quarterly groundwater monitoring and sampling. Historical ACHCSA-approved revisions to the groundwater sampling program have included: 1) discontinuing hydrochemical sampling and analysis in wells MW-1, MW-3, MW-5, and MW-6; 2) discontinuing creek surface water sampling at upstream location SW-1; and 3) reducing the frequency of creek surface water sampling from quarterly to semi-annually (ACHCSA, 1996). The latter recommendation has not yet been implemented due to continued concern over potential impacts to Redwood Creek.

Electronic Data Format (EDF) groundwater analytical results from the groundwater monitoring events beginning in the third quarter of 2001 have been successfully uploaded to the State of California Water Resources Control Board's GeoTracker database, in accordance with that agency's requirements for EDF submittals. Historical site groundwater and surface water analytical results are presented in Appendix A.



N

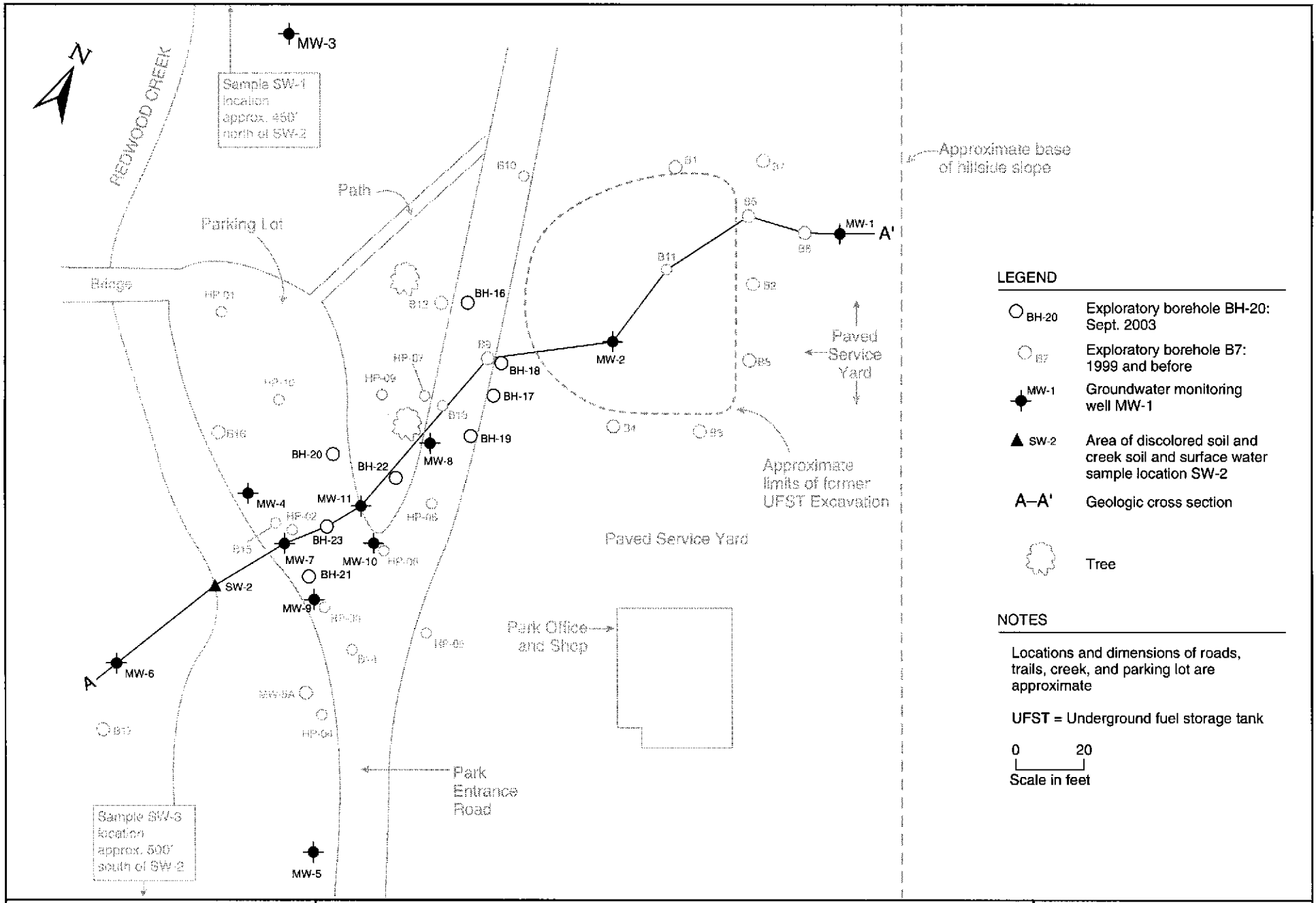
U.S.G.S. TOPOGRAPHIC MAP SHOWING SITE LOCATION

Redwood Regional Park Service Yard
Oakland, Alameda County, California

By: MJC | NOVEMBER 1997

Figure 1

Stellar Environmental Solutions
Geoscience & Engineering Consulting



Stellar Environmental Solutions, Inc.
Geoscience & Engineering Consulting

SITE PLAN AND HISTORICAL SAMPLING LOCATIONS
Redwood Regional Park Service Yard, Oakland, CA

Figure 2

by: MJC | NOVEMBER 2003

2003-02-30

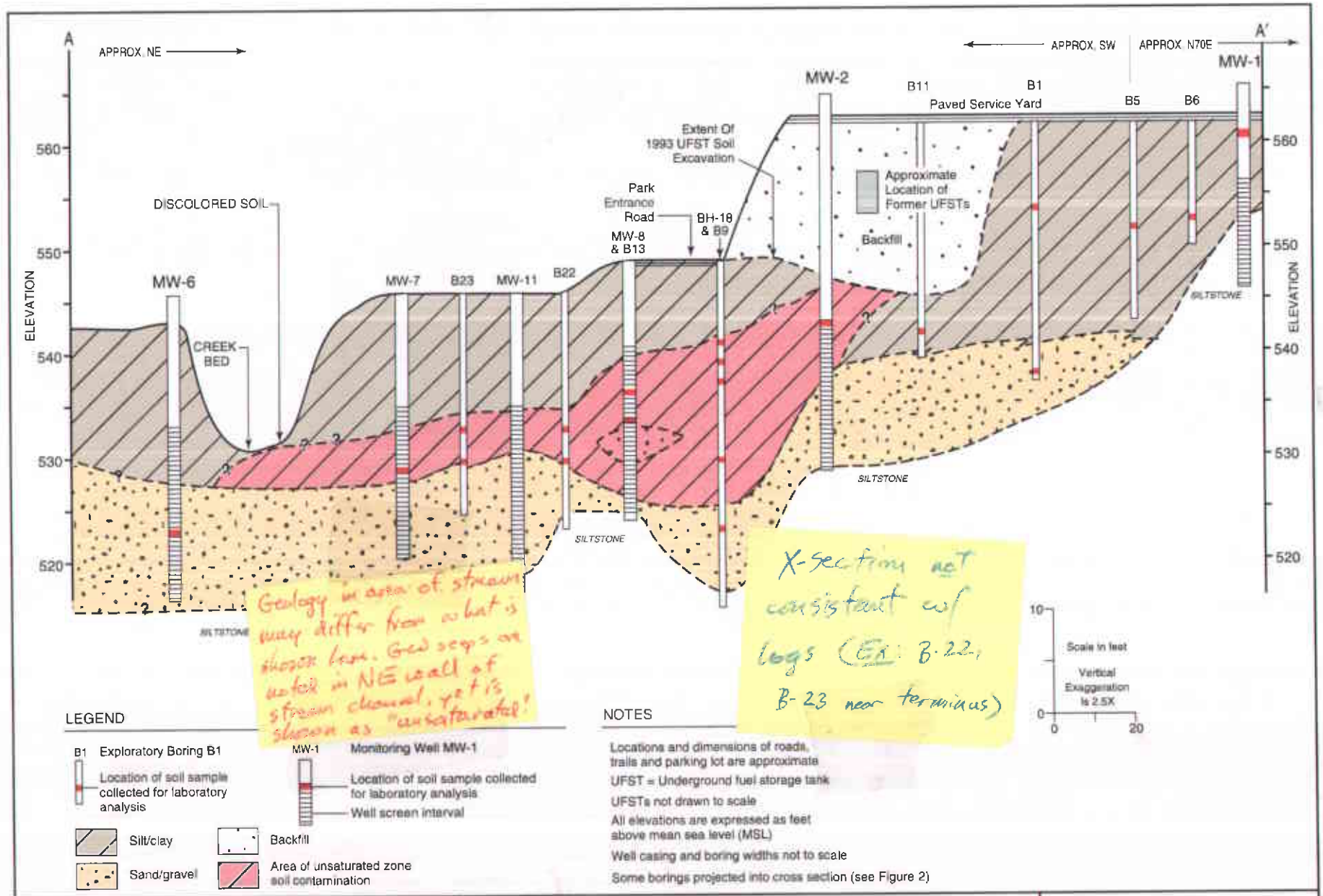
2.0 PHYSICAL SETTING

Following is a brief summary of the site hydrogeologic conditions based on geologic logging and water level measurements collected at the site since September 1993.

Shallow soil stratigraphy consists of a surficial 3- to 10-foot-thick clayey silt unit underlain by a 5- to 15-foot-thick silty clay unit. In the majority of boreholes, a 5- to 10-foot-thick clayey coarse-grained sand and clayey gravel unit that laterally grades to a clay or silty clay was encountered. This unit overlies a weathered siltstone at the base of the observed soil profile. Soils in the vicinity of MW-1 are inferred to be landslide debris. Figure 3 is a geologic cross-section along the longitudinal axis of the groundwater contaminant plume, updated with lithologic information obtained in the September 2003 exploratory borehole program.

Groundwater at the site occurs under unconfined and semi-confined conditions, generally within the clayey, silty sand-gravel zone. The top of this zone varies between approximately 12 and 19 feet below ground surface (bgs), and the bottom of the water-bearing zone (approximately 25 to 28 feet bgs) corresponds to the top of the siltstone bedrock unit. Seasonal fluctuations in groundwater depth create a capillary fringe of several feet that is saturated in the rainy period (late fall through early spring) and unsaturated during the remainder of the year. **The thickness of the saturated zone plus the capillary fringe varies between approximately 10 and 15 feet in the area of contamination.** Local perched water zones have been observed above the top of the capillary fringe.

Figure 4 is a groundwater elevation map constructed from the current event monitoring well static water levels, and Table 1 (in Section 3.0) summarizes current event groundwater elevation data. The groundwater gradient is relatively steep—approximately 2 feet per foot—between well MW-1 and the former UFST source area, resulting from the steep topography immediately upgradient, and the highly disturbed nature of sediments in the landslide debris. Downgradient from (west of) the UFST source area (between MW-2 and Redwood Creek), the groundwater gradient is approximately 0.1 feet per foot. The direction of shallow groundwater flow during the current event was to the west-southwest (toward Redwood Creek), which is consistent with historical site groundwater flow direction.



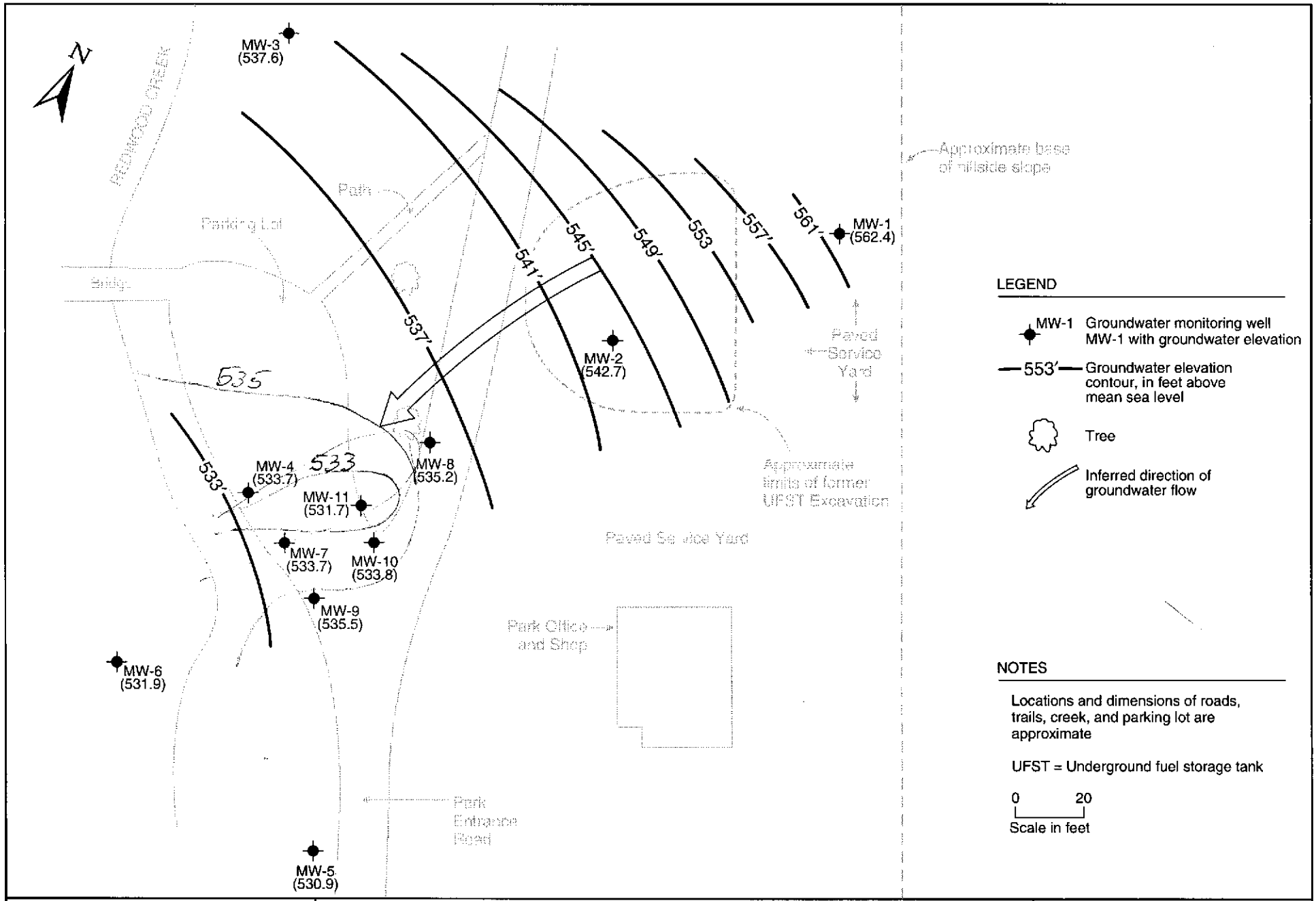
2003-02-29

Stellar Environmental Solutions
Geoscience & Engineering Consulting

Cross Section A-A'
Redwood Regional Park Service Yard, Oakland, CA

Figure 3

by: MJC | DECEMBER 2003



Stellar Environmental Solutions, Inc.
Geoscience & Engineering Consulting

GROUNDWATER ELEVATION MAP–DECEMBER 10, 2003
Redwood Regional Park Service Yard, Oakland, CA

Figure 4

by: MJC | JANUARY 2004

2003-02-31

Appendix B contains historical groundwater elevations and a plot of water level elevation trendlines for petroleum-impacted wells since January 2001. The following general conclusions can be drawn from the available data:

- Groundwater elevations show a seasonal fluctuation of approximately 2 to 6 feet, with lowest elevations observed during the end of the dry season and highest elevations at the peak of the rainy season; and
- Groundwater elevation trends are similar between wells.

We estimate site groundwater velocity to be at least 7 to 10 feet per year using site-specific empirical data, from the date of UST installation (late 1970s) to the date when contamination was first observed in Redwood Creek (1993). Actual groundwater velocity could be greater.

Redwood Creek, which borders the site to the west, is a seasonal creek known for the occurrence of rainbow trout. Creek flow in the vicinity of the site shows significant seasonal variation, with little to no flow during the summer and fall dry season, and vigorous flow with depths exceeding 1 foot during the winter and spring wet season. The creek is a gaining stream (i.e., it is recharged by groundwater) in the vicinity of the site, and discharges into Upper San Leandro Reservoir located approximately 1 mile southeast of the site.

3.0 DECEMBER 2003 CREEK AND GROUNDWATER SAMPLING

This section presents the creek surface water and groundwater sampling and analytical methods for the current event. Groundwater and surface water analytical results are summarized in Section 4.0. Monitoring and sampling protocols were in accordance with the ACHCSA-approved SES technical workplan (SES 1998a). Activities included:

- Measuring static water levels and field analyzing pre-purge groundwater samples for indicators of natural attenuation [dissolved oxygen (DO), ferrous iron, and redox potential] in all site wells (MW-1 through MW-11);
- Collecting post-purge groundwater samples for laboratory analysis of the natural attenuation indicators nitrate and sulfate, and of site contaminants from wells located within the groundwater plume (MW-2, MW-4, and MW-7 through MW-11); and
- Collecting Redwood Creek surface water samples for laboratory analysis from locations SW-2 and SW-3.

Creek sampling and groundwater monitoring/sampling was conducted on December 10, 2003. The locations of all site monitoring wells and creek water sampling locations are shown on Figure 2. Well construction information and water level data are summarized in Table 1. Appendix C contains the groundwater monitoring field records.

GROUNDWATER LEVEL MONITORING AND SAMPLING

Groundwater monitoring well water level measurements, purging, sampling, and field analyses were conducted by Blaine Tech Services under the direct supervision of SES personnel. Groundwater sampling was conducted in accordance with State of California guidelines for sampling dissolved analytes in groundwater associated with leaking UFSTs (RWQCB, 1989), and followed the methods and protocols approved by the ACHCSA in the SES 1998 workplan (SES, 1998a).

As the first task of the monitoring event, static water levels were measured using an electric water level indicator. Pre-purge groundwater samples were then collected for field and laboratory analysis

Table 1
Groundwater Monitoring Well Construction and Groundwater Elevation Data
Redwood Regional Park Corporation Yard, Oakland, California

Well	Well Depth	Screened Interval	TOC Elevation	Groundwater Elevation (12/10/03)
MW-1	18	7 to17 10	565.9	562.4
MW-2	36	20 to 35 15	566.5	542.7
MW-3	42	7 to 41 34?	560.9	537.6
MW-4	26	10 to 25 15	548.1	533.7
MW-5	26	10 to 25 15	547.5	530.9
MW-6	26	10 to 25 15	545.6	531.9
MW-7	24	9 to24 15	547.7	533.7
MW-8	23	8 to 23 15	549.2	535.2
MW-9	26	11 to 26 15	549.4	535.5
MW-10	26	11 to 26 15	547.3	533.8
MW-11	26	11 to 26 15	547.9	531.7

Notes:

TOC = Top of casing.

Wells MW-1 through MW-6 are 4-inch diameter; all other wells are 2inch diameter.

All elevations are feet above USGS mean sea level. Elevations of Wells MW through MW-6 were surveyed by EBRPD relative to USGS Benchmark No. JHF-49. Wells MW-7 through MW-11 were surveyed by a licensed land surveyor using existing site wells as datum.

of natural attenuation indicators. The wells to be sampled for contaminant analyses were then purged (by bailing and/or pumping) of a minimum of three wetted casing volumes. Aquifer stability parameters (temperature, pH, and electrical conductivity) were measured after each purged casing volume to ensure that representative formation water would be sampled.

Approximately 90 gallons of well purge water and decontamination rinseate from the current event were containerized in the onsite plastic tank. Purge water from future events will continue to be accumulated in the onsite tank until it is full, at which time the water will be transported offsite for proper disposal.

CREEK SURFACE WATER SAMPLING

Surface water sampling was conducted by SES on December 10, 2003. Surface water samples were collected from Redwood Creek location SW-2 (immediately downgradient of the former UFST source area and within the area of documented creek bank soil contamination) and location SW-3 (approximately 500 feet downstream from SW-2) (see Figure 2 for locations). In accordance with a

previous ACHCSA-approved SES recommendation, upstream sample location SW-1 was not sampled.

At the time of sampling, water in the creek was relatively low and stagnant (between locations SW-2 and SW-3). Creek water depth was approximately 6 inches to 1 foot. Neither petroleum sheen nor odor were evident at either location.

4.0 CURRENT MONITORING EVENT ANALYTICAL RESULTS AND REGULATORY CONSIDERATIONS

This section presents the field and laboratory analytical results of the most recent monitoring event, preceded by a brief summary of regulatory considerations regarding surface water and groundwater contamination. Table 2 and Figure 5 summarize the contaminant analytical results of the current monitoring event; Table 3 summarizes natural attenuation indicator results from the current event. Appendix D contains the certified analytical laboratory report and chain-of-custody record. Section 6.0 contains a detailed discussion of hydrochemical trends, and Appendix A contains a tabular summary of historical groundwater and surface water analytical results and hydrochemical trend plots.

REGULATORY CONSIDERATIONS

Groundwater Contamination

As specified in the RWQCB's *San Francisco Bay Region Water Quality Control Plan*, all groundwaters are considered potential sources of drinking water unless otherwise approved by the RWQCB, and are also assumed to ultimately discharge to a surface water body and potentially impact aquatic organisms. While it is likely that site groundwater would satisfy geology-related criteria for exclusion as a drinking water source (excessive total dissolved solids and/or insufficient sustained yield), RWQCB approval for this exclusion has not been obtained for the site. As summarized in Table 2, site groundwater contaminant levels are compared to RWQCB Tier 1 Environmental Screening Levels (ESLs) for groundwater (using the criteria for residential sites where groundwater is a known or potential drinking water resource) and for surface water (freshwater environment). For the site contaminants, the groundwater and surface water ESLs are identical.

As stipulated in the ESL document (RWQCB, 2003), the ESLs are not cleanup criteria; rather, they are conservative screening-level criteria designed to be protective of both drinking water resources and aquatic environments in general. The groundwater ESLs include one or more components, including ceiling value, human toxicity, indoor air impacts, and aquatic life protection. Exceedance of ESLs suggests that additional investigation and/or remediation is warranted. While drinking water standards (e.g., Maximum Contaminant Levels [MCLs]) are published for the site

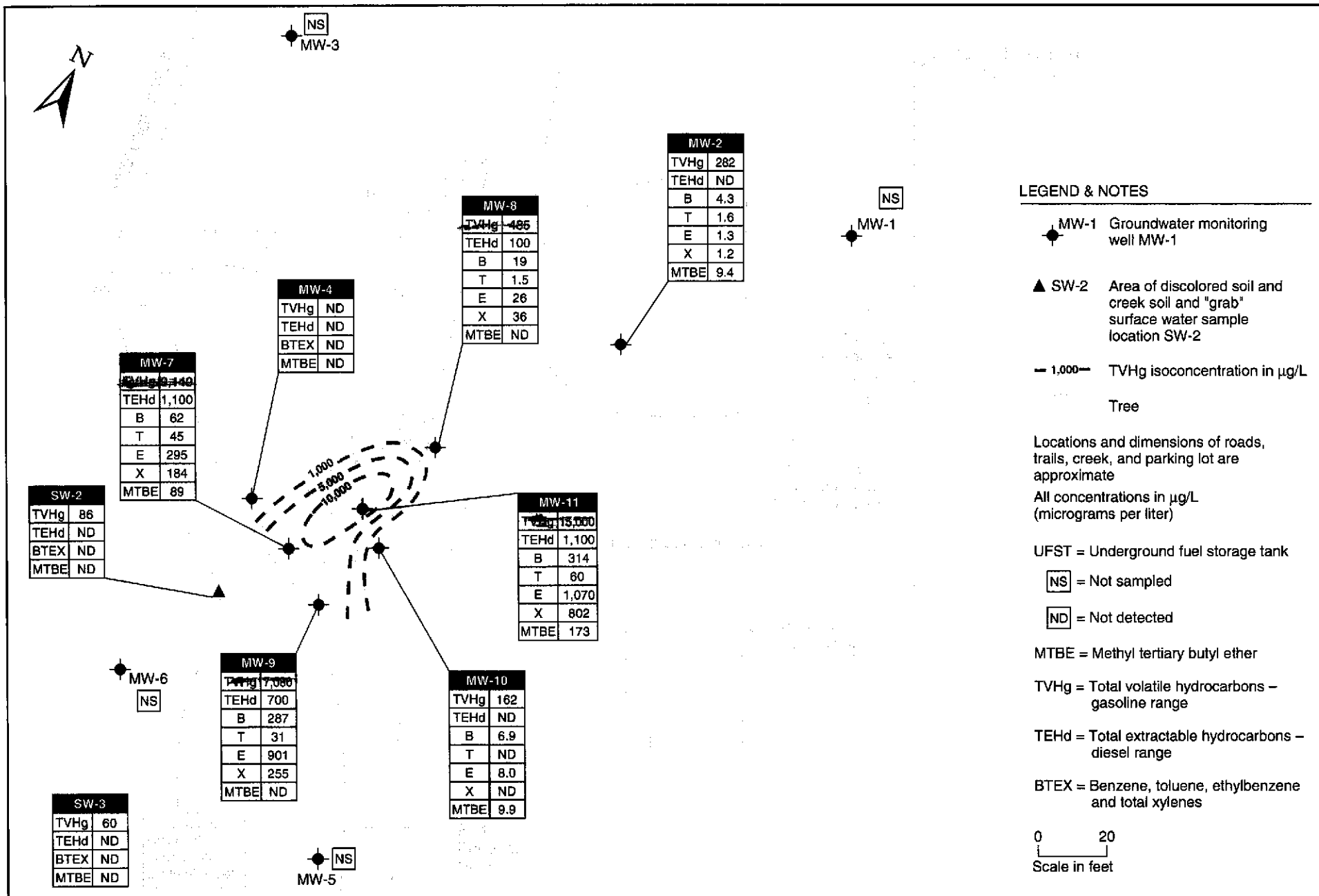
Table 2
Groundwater and Surface Water Sample
Analytical Results – December 2003
Redwood Regional Park Corporation Yard, Oakland, California

Compound	Concentrations in µg/L						
	TPHg	TPHd	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE
Groundwater Samples							
MW-2	282	*<100*	4.3	1.6	1.3	1.2	9.4
MW-4	*<50*	*<100*	*<0.3*	*<0.3*	*<0.3*	*<0.6*	*<5.0*
MW-7	9,140	1,100	62	45	295	184	89
MW-8	485	100	19	*1.5*	26	36	*<5.0*
MW-9	7,080	700	287	31	901	255	*<10*
MW-10	162	*<100*	6.9	*<0.3*	8.0	*<0.6*	9.9
MW-11	15,000	1,100	314	60	1,070	802	173
Groundwater ESLs [(a)]	100	100	1.0	40	30	13	5.0
Redwood Creek Surface Water Samples							
SW-2	86	*<100*	*<0.3*	*<0.3*	*<0.3*	*<0.6*	*<5.0*
SW-3	60	*<100*	*<0.3*	*<0.3*	*<0.3*	*<0.6*	*<5.0*
Surface Water ESLs	100	100	1.0	40	30	13	5.0

Notes:

[(a)] RWQCB Environmental Screening Levels (for residential sites where groundwater is a known or potential drinking water resource (RWQCB, 2003).

MTBE = Methyl *tertiary*-butyl ether.
TPHg = Total petroleum hydrocarbons gasoline range (equivalent to total volatile hydrocarbons gasoline range).
TPHd = Total petroleum hydrocarbons diesel range (equivalent to total extractable hydrocarbons diesel range).
µg/L = Micrograms per liter, equivalent to parts per billion (ppb).



LEGEND & NOTES

MW-1 Groundwater monitoring well MW-1

▲ SW-2 Area of discolored soil and creek soil and "grab" surface water sample location SW-2

— 1,000— TVHg isoconcentration in µg/L

Tree

Locations and dimensions of roads, trails, creek, and parking lot are approximate

All concentrations in µg/L (micrograms per liter)

UFST = Underground fuel storage tank

NS = Not sampled

ND = Not detected

MTBE = Methyl tertiary butyl ether

TVHg = Total volatile hydrocarbons – gasoline range

TEHd = Total extractable hydrocarbons – diesel range

BTEX = Benzene, toluene, ethylbenzene and total xylenes

0 20

Scale in feet

Stellar Environmental Solutions, Inc.
Geoscience & Engineering Consulting

ANALYTICAL RESULTS AND GASOLINE PLUME—DECEMBER, 2003
Redwood Regional Park Service Yard, Oakland, CA

Figure 5

by: MJC | JANUARY 2004

2003-02-32

Table 3
Groundwater Sample Analytical Results
Natural Attenuation Indicators – December 10, 2003
Redwood Regional Park Corporation Yard, Oakland, California

Sample I.D.	Nitrogen (as Nitrate) (mg/L)	Sulfate (mg/L)	Dissolved Oxygen (mg/L)	Ferrous Iron (mg/L)	Redox Potential (milliVolts)
MW-1	NA	NA	0.2	0.0	16
MW-2	NA	NA	0.6	0.1	62
MW-3	*<0.44*	37	1.0	0.0	99
MW-4	1.3	59	13.0	0.0	146
MW-5	NA	NA	1.0	0.0	152
MW-6	NA	NA	2.0	0.6	134
MW-7	*<0.44*	2.0	0.2	3.8	15
MW-8	*<0.44*	88	1.5	1.0	128
MW-9	*<0.44*	71	0.8	0.0	138
MW-10	*<0.44*	66	9.0	0.0	148
MW-11	*<0.44*	4.0	1.2	3.2	-23

Notes:

mg/L = Milligrams per liter, equivalent to parts per million (ppm).
NA = Not analyzed.

contaminants of concern, the ACHCSA has indicated that impacts to nearby Redwood Creek are of primary importance, and that site target cleanup standards should be evaluated primarily within the context of surface water quality criteria.

Surface Water Contamination

As discussed in the RWQCB ESL document, benthic communities at the groundwater/surface water interface (e.g., at site groundwater discharge location SW-2) are assumed to be exposed to the full concentration of groundwater contamination prior to dilution/mixing with the surface water). This was also a fundamental assumption in the instream benthic macroinvertebrate bioassessment events, which documented no measurable impacts.

Historical surface water sampling in the immediate vicinity of contaminated groundwater discharge (SW-2) has sporadically documented petroleum contamination, usually in periods of low stream flow, and generally at concentrations several orders of magnitude less than adjacent (within 20 feet) groundwater monitoring well concentrations. It is likely that mixing/dilution between groundwater

and surface water precludes obtaining an "instantaneous discharge" surface water sample that is wholly representative of groundwater contamination at the discharge location. Therefore, the most conservative assumption is that surface water contamination at the groundwater/surface water interface is equivalent to the upgradient groundwater contamination (e.g., site downgradient wells MW-4, MW-7, and MW-9).

While site target cleanup standards for groundwater have not been determined, it is likely that no further action will be required by regulatory agencies when groundwater (and surface water) contaminant concentrations are all below their respective screening level criteria. Residual contaminant concentrations in excess of screening level criteria might be acceptable to regulatory agencies, if a more detailed risk assessment (e.g., Tier 2 and/or Tier 3) can demonstrate that no significant impacts are likely.

GROUNDWATER AND SURFACE WATER CONTAMINANT FINDINGS

Current event groundwater and surface water data indicate the following:

- Current site groundwater contaminant concentrations exceed their respective groundwater ESLs (for both cases, where drinking water resource *is* or *is not* threatened) for all contaminants. Methyl *tertiary*-butyl ether (MTBE) exceeds the "drinking water resource threatened" criterion in four of the onsite wells. Site groundwater contaminant concentrations also exceed surface water screening levels for total petroleum hydrocarbons, gasoline range (TPHg).
- Maximum groundwater contaminant concentrations for TPHg; total petroleum hydrocarbons, diesel range (TPHd); benzene; ethylbenzene; and xylenes were detected in well MW-11 (approximately 50 feet upgradient of Redwood Creek). Wells MW-7 and MW-9 (both located at the extreme downgradient edge of the site, immediately upgradient of Redwood Creek), showed the next highest groundwater contaminant concentrations for most site contaminants. Trace to non-detectable groundwater contaminant concentrations were present in former source area well MW-2 (approximately 130 feet upgradient of Redwood Creek), well MW-4 (northern boundary of the plume), and MW-10 (southern boundary of the plume).
- The existing well layout adequately constrains the lateral extent of groundwater contamination. The vertical (lowest) limit of groundwater contamination is very likely the top of the siltstone bedrock, at a depth of approximately 25 to 28 feet. The saturated interval extends approximately 12 to 15 feet from top of bedrock upward through the capillary fringe.
- The plume of groundwater contamination above screening levels appears to be approximately 120 feet long and approximately 50 feet wide. The zone of greatest

contamination (greater than 10,000 µg/L TPH) is an approximately 20- to 30-foot-wide by 50-foot-long area extending from just downgradient of MW-8 to the most downgradient well MW-7.

- The groundwater contaminant plume has become disconnected from the former source, and has migrated well beyond the former source area (represented by well MW-2) toward Redwood Creek.
- Gasoline was detected in both of the current event surface water samples; however, concentrations do not exceed the surface water screening levels.

NATURAL ATTENUATION INDICATORS

Pre-purge groundwater samples from selected wells were collected and analyzed for indicators of natural biodegradation of the hydrocarbon contamination (a.k.a. "natural attenuation"). Petroleum hydrocarbons prefer molecular oxygen (i.e., aerobic conditions) to break down the ring structure of specific constituents. Although biodegradation of hydrocarbons can occur under anaerobic conditions in the absence of oxygen, hydrocarbon biodegradation is faster under aerobic conditions. Remediation by natural attenuation has been found to be a viable option for addressing many hydrocarbon plumes, replacing the need for more aggressive remediation.

The concentration in soil or groundwater above which natural attenuation is unlikely to take place is still the subject of various research studies. In general, biodegradation of petroleum hydrocarbons in groundwater has a significant role in creating a stable plume and minimizing groundwater plume configuration and concentrations over time; however, quickly reducing the size of a plume requires the removal of all remaining sources. Evidence of the historical occurrence and potential for future occurrence of biodegradation can be obtained from analysis of groundwater for specific biodegradation-indicator parameters, including DO, oxidation-reduction potential (ORP), nitrate, ferrous iron, and sulfate.

Dissolved Oxygen

DO is the most thermodynamically-favored electron acceptor for biodegradation of hydrocarbons. Active aerobic biodegradation of petroleum hydrocarbon compounds requires at least 1 to 2 mg/L of DO in groundwater. During aerobic biodegradation, DO levels are reduced in the hydrocarbon plume as respiration occurs. Therefore, DO levels that vary inversely to hydrocarbon concentrations are consistent with the occurrence of aerobic biodegradation.

Current monitoring event DO concentrations for 9 of the 11 wells were between 0.2 and 2.0 mg/L. As has historically (since ORC™ injection) been observed, elevated DO concentrations were observed in MW-4 and MW-10 (9.0 mg/L and 13.0 mg/L, respectively). The elevated DO

concentration in these two wells is probably a function of localized DO supersaturation resulting from the previous ORC™ injection and the fact that hydrocarbon concentrations in these wells, especially the BTEX (benzene, toluene, ethylbenzene, and total xylenes) components, are relatively low. The DO concentrations for the remaining nine wells indicate that site groundwater would generally be considered to be anaerobic since concentrations are below 2.0 mg/L.

Oxidation-Reduction Potential

The ORP of groundwater is a measure of electron activity and is an indicator of the relative tendency of a solute species to gain or lose electrons and measure the strength of the particular reducing environment for groundwater. The ORP of groundwater can range widely from -400 millivolts (mV) to +800 mV. In oxidizing (aerobic) conditions, the ORP of groundwater is typically positive; in a reducing (anaerobic) conditions, the ORP is typically negative or less positive. Therefore, groundwater ORP values inside a hydrocarbon plume would typically be less than those measured outside the plume.

For this monitoring event, ORP values ranged from -23 mV to +152 mV, and showed the expected general inverse correlation with hydrocarbon concentrations. These ORP values are also consistent with the DO concentrations, which indicated that most site groundwater is anaerobic. At these ORP values, the reducing environment would theoretically be between manganese-reducing and iron-reducing. The two wells with the lowest ORP values (MW-7 and MW-11) were the wells with the highest hydrocarbon concentrations.

Nitrate, Ferrous Iron, and Sulfate

A comparison of nitrate, ferrous iron, and sulfate concentrations to hydrocarbon concentrations can be used as indicative of anaerobic biodegradation and the strength of the reducing environment. More specifically, anaerobic degradation of hydrocarbon compounds is indicated when, compared to background or uncontaminated groundwater, nitrate concentrations are relatively low (or non-detect), ferrous iron is detected, and sulfate concentrations are relatively low. A more strongly-reducing environment has the potential to degrade a wider variety of contaminants and at faster rates.

In the current site monitoring event, for the three wells within the 1,000 µg/L TPHg contour (MW-7, MW-9, and MW-11), nitrate concentrations were low (or non-detect), and ferrous iron was detected in two of the wells (MW-7 and MW-11). A third well, MW-8, also had detected ferrous iron; this well has historically had TPHg concentrations above 1,000 µg/L as well. Sulfate concentrations were also significantly lower in the two wells with recent greatest contamination (MW-7 and MW-11).

Natural Attenuation Conclusions

These results indicate that the most-contaminated portions of site groundwater (central portion of the plume) are in a very strongly-reducing (i.e. sulfate-reducing) anaerobic environment, while lesser-contaminated groundwater (plume fringes) is probably in a nitrate-reducing environment and also anaerobic. Recent DO and ORP data are generally consistent with the nitrate, ferrous iron, and sulfate data. The low DO concentrations are most likely currently limiting a more efficient aerobic biodegradation process; however, anaerobic biodegradation can also break down a significant mass of hydrocarbons over time. As discussed in Sections 6.0 and 7.0, these conditions will almost certainly persist for a period of at least several years, unless additional corrective action is taken to reduce residual contamination in the unsaturated zone (i.e., by supplementing the system with oxygen).

QUALITY CONTROL SAMPLE ANALYTICAL RESULTS

Laboratory QC samples (e.g., method blanks, matrix spikes, surrogate spikes, etc.) were analyzed by the laboratory in accordance with requirements of each analytical method. All laboratory QC sample results and sample holding times were within the acceptance limits of the methods (see Appendix D).

5.0 ADDITIONAL SITE CHARACTERIZATION ACTIVITIES

This section summarizes site investigation activities conducted by SES at the subject property on September 25 and 26, 2003. Figure 6 shows exploratory borehole locations. Appendix E contains photodocumentation of our work activities.

The primary objectives of the additional site characterization program included:

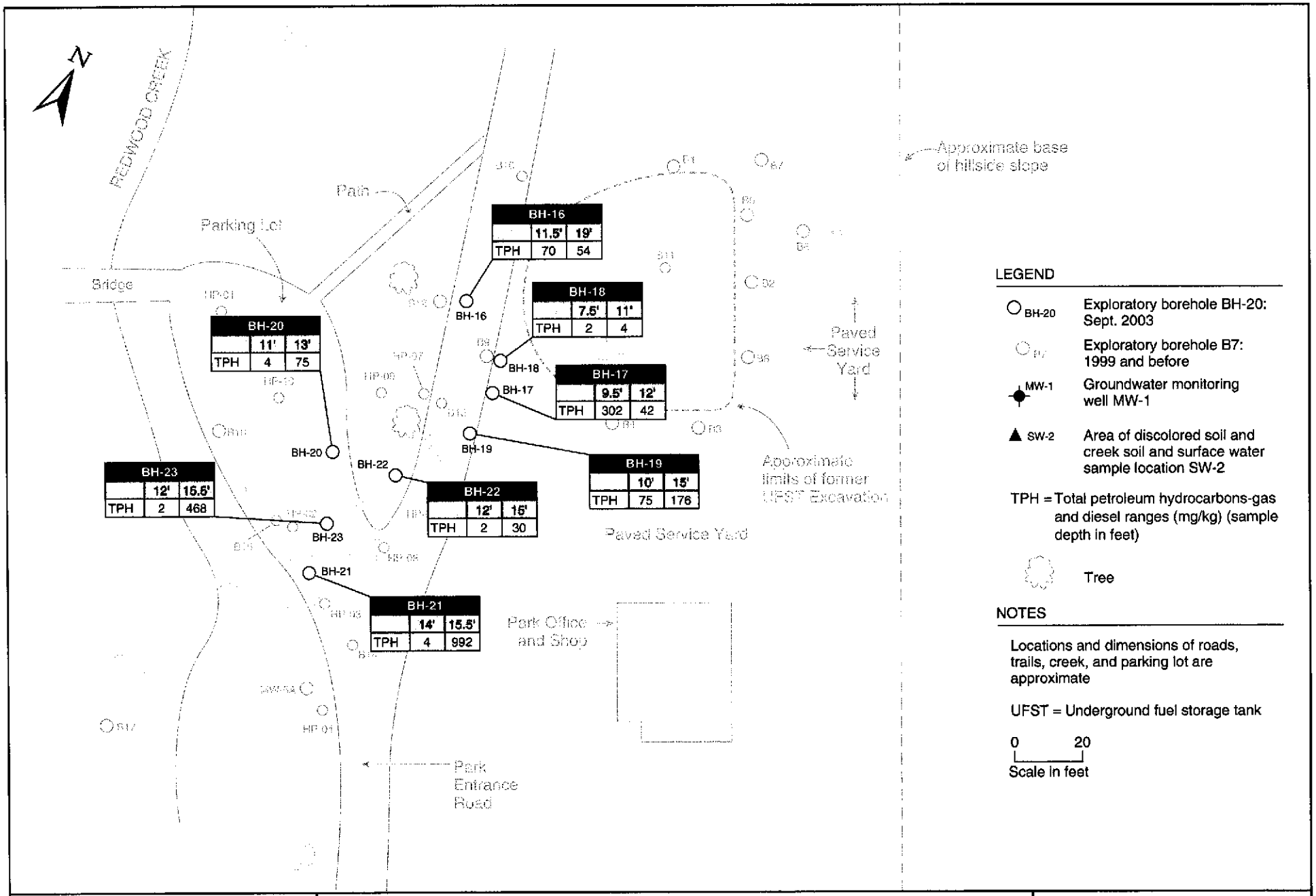
- Evaluating the magnitude and extent of soil contamination in the unsaturated zone in areas overlying the groundwater contaminant plume, which is considered a likely source of ongoing contaminant contribution to groundwater;
- Evaluating groundwater contamination along the northern (crossgradient) edge of the groundwater contaminant plume; and
- Evaluating lithologic conditions, especially potential permeability differences and the thickness of the unsaturated zone, that might be influencing the effectiveness of the ORC™ injection as a corrective action for this site.

BOREHOLE LOCATION AND SAMPLING RATIONALE

The following discusses the borehole locations, as well as the technical rationale for their locations and sampling depths.

Borehole locations were selected to meet the aforementioned technical objectives. Boreholes BH-16 and BH-20 were located on the northern (crossgradient) edge of the contaminant plume, to provide additional data on contaminant extent and magnitude in that area. Because recent groundwater contaminant data are not available in these areas, "grab" groundwater samples were collected from these two boreholes. Boreholes BH-17, BH-18, and BH-19 were located in the roadway, upgradient of MW-8, to evaluate contaminant magnitude in that area. Boreholes BH-17 and BH-18 were drilled at an angle (20 degrees off vertical) because vertical drilling along the steep embankment was not possible and the objective was to evaluate conditions as far upgradient (east) as possible. Actual vertical depth in these samples was converted from core length by the formula:

Depth = (core length) * cosine(20 degrees) = (0.93) * (core length)



Stellar Environmental Solutions, Inc.
Geoscience & Engineering Consulting

BOREHOLE SOIL ANALYTICAL RESULTS—SEPTEMBER 2003
Redwood Regional Park Service Yard, Oakland, CA

Figure 6

by: MJC | JANUARY 2004

2003-02-32

All references to BH-17 and BH-18 depths in this report are true depth; these borehole geologic logs (Appendix F) show core length.

Boreholes BH-21, BH-22, and BH-23 were located along the inferred centerline of the groundwater contaminant plume, to provide additional data on potential unsaturated zone soil contamination above the plume.

Two soil samples from each borehole were retained and submitted for laboratory analysis. The sampling depths (all within the unsaturated zone) were selected as follows. The upper soil sample was collected from the depth just above where field evidence (PID readings, visual observation and/or odor) indicated contamination; these samples were used to estimate the upper limit of unsaturated zone soil contamination. The lower soil sample was collected from the depth indicated by field evidence to have the maximum contamination; these samples will be used to estimate the mass of unsaturated zone soil contamination.

DRILLING METHODS AND PROTOCOLS

Exploratory borehole drilling and sampling was conducted on September 25 and 26, 2003 by EnProb Environmental Probing (C-57 License No. 777007) under direct supervision of a SES California Registered Geologist. Prior to drilling, Underground Service Alert (USA) was contacted with regard to potential underground utilities, and a drilling permit was obtained from Alameda County Public Works Agency (copy of permit included in Appendix E).

The boreholes were drilled with a truck-mounted GeoProbe™ rig that advances approximately 2-inch-diameter steel outer drive casing and interior steel sample casing lined with acetate sampling sleeves. Continuous soil cores were collected for geologic logging and for field analytical screening. Borehole geologic logging was conducted using the visual method of the Unified Soils Classification System (USCS). To aid in evaluating the extent of soil contamination, soil samples were field-screened with a photoionization detector (PID). Soil was placed in glass jars with Teflon lids with Tygon tubing installed through a drilled airtight hole. The soil was allowed to volatilize for approximately 30 seconds and a PID reading was collected. A summary of PID readings is shown in Table 4.

Soil samples retained for laboratory analysis were cut into approximately 6-inch lengths (contained within the acetate sleeve), sealed at the ends with Teflon tape and non-reactive plastic caps, labeled, and chilled for transport to the analytical laboratory.

One "grab" groundwater sample was collected from each of boreholes BH-16 and BH-20 by installing temporary PVC slotted casing and withdrawing water with either a new disposable plastic

Table 4
September 2003 Borehole Soil PID Readings
Redwood Regional Park, Oakland, California

Sample Depth (feet below grade)	BH-16	BH-17 [a]	BH-18 [a]	BH-19	BH-20	BH-21	BH-22	BH-23
4'	<25	<25	<25	<25	27	<25	<25	<25
5'	<25	<25	<25	<25	<25	<25	<25	<25
6'	<25	<25	<25	<25	<25	<25	<25	<25
7'	<25	<25	<25	<25	<25	<25	<25	<25
8'	<25	<25	<25	<25	<25	<25	<25	<25
9'	<25	66	<25	<25	<25	<25	<25	<25
10'	<25	214	78	128	<25	<25	<25	<25
11'	<25	390	307	268	<25	<25	<25	<25
12'	30	264	190	206	86	<25	<25	<25
13'	NM	<25	187	116	533	<25	92	254
14'	28	<25	240	230	61	<25	68	273
15'	45	63	<25	295	311	73	224	280
16'	<25	78	25	58	160	564	41	281
17'	<25	<25	<25	74	76	Top of wet sample	Top of wet sample	112
18'	<25	<25	<25	62	Top of wet sample	—	—	Top of wet sample
19'	44	<25	<25	<25	—	—	—	—
20'	<25	<25	Top of wet sample	<25	—	—	—	—
21'	<25	NM	—	36	—	—	—	—
22'	31	<25	—	<25	—	—	—	—
23'	<25	Top of wet sample	—	<25	—	—	—	—
24'	<25	—	—	<25	—	—	—	—
25'	<25	—	—	Top of wet sample	—	—	—	—

Notes:

[a] Borehole drilled at approximately 20 degree angle off vertical. "Depths" in table are true depth and were converted from borehole core length.

PID = Photoionization detector (calibrated for volatile range hydrocarbons).
ppmv = parts per million by volume air.
NM = Not measured.

bailer or with tubing connected to a peristaltic pump. Those samples were collected in containers appropriate to the individual analyses, and were managed in the same manner described above for the soil samples. Groundwater recharge into BH-16 was extremely slow, such that the VOAs were collected on the afternoon of September 25, 2003, and the 1-liter glass jar (for diesel analysis) was collected the following morning.

Following completion of drilling and sampling activities, the boreholes were tremie-grouted to surface with a slurry of neat Portland cement and potable water.

Exploratory borehole soil cuttings were containerized in six labeled, plastic 5-gallon buckets. This waste will continue to be stored onsite until it is known that no further investigation-derived waste will be generated, at which time it will be disposed of at an appropriately permitted facility.

ANALYTICAL RESULTS AND DISCUSSION OF FINDINGS

Laboratory Analyses Performed

The laboratory analyses performed were based on the long site history and identified chemicals of concern. Appendix D contains the certified analytical laboratory reports and chain-of-custody records. All current investigation soil and groundwater samples were analyzed by Associated Laboratories (Orange, California), which maintains current ELAP certifications for all the analytical methods utilized in this investigation.

Soil and groundwater samples collected were analyzed for the following site chemicals of concern:

- Total volatile hydrocarbons, gasoline range (TVHg), by modified EPA Method 8015;
- BTEX, by EPA Method 8020;
- MTBE, by EPA Method 8020; and
- Total extractable hydrocarbons, diesel range (TEHd), by modified EPA method 8015.

Table 5 summarizes the borehole analytical results. Figure 6 shows soil analytical results.

Soil Analytical Results

Gasoline concentrations in the samples collected from the depths inferred to represent maximum unsaturated zone contamination ranged from non-detect to 821 mg/kg. Two of the boreholes had concentrations of approximately 800 mg/kg (BH-20 and BH-21), and three boreholes had concentrations between 170 and 414 mg/kg.

Table 5
September 2003 Borehole Soil and Groundwater Analytical Results
Redwood Regional Park, Oakland, California

Sample I.D.	Date Sampled	Sample Depth (feet)	TVHg	TEHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
Soil Analytical Results (mg/kg)									
BH-16-11.5'	9/25/03	11.5'	**35**	**35**	**0.01**	**0.22**	**0.19**	**0.98**	*<0.035*
BH-16-19'	9/25/03	19'	**5.2**	**49**	*<0.005*	**0.04**	**0.08**	**0.08**	*<0.035*
BH-17-10' [a]	9/25/03	9.5'	**236**	**66**	*<0.125*	**0.73**	**3.7**	**7.7**	*<0.875*
BH-17-13' [a]	9/25/03	12'	**33**	**8.5**	**0.04**	**0.28**	**0.52**	**0.78**	*<0.175*
BH-18-8' [a]	9/25/03	7.5'	*<3.0*	**2.0**	*<0.005*	*<0.005*	*<0.005*	*<0.015*	*<0.035*
BH-18-12' [a]	9/25/03	11'	*<3.0*	**4.0**	*<0.005*	*<0.005*	**0.019**	**0.063**	*<0.035*
BH-19-10'	9/25/03	10'	**20**	**55**	*<0.005*	*<0.005*	**0.43**	**2.0**	*<0.035*
BH-19-15'	9/25/03	15'	**170**	**6.0**	**0.13**	*<0.005*	**2.2**	**3.2**	**0.15**
BH-20-11'	9/25/03	11'	*<3.0*	**1.5**	*<0.005*	*<0.005*	*<0.005*	*<0.015*	*<0.035*
BH-20-13'	9/25/03	13'	**792**	**77**	*<0.5*	*<0.5*	**8.3**	**26**	*<3.5*
BH-21-14'	9/26/03	14'	*<3.0*	**4.0**	*<0.005*	*<0.005*	*<0.005*	*<0.015*	*<0.035*
BH-21-15.5'	9/26/03	15.5'	**821**	**71**	**0.49**	*<0.125*	**5.6**	**14**	*<0.875*
BH-22-12'	9/26/03	12'	*<3.0*	**2.3**	*<0.005*	*<0.005*	*<0.005*	*<0.015*	*<0.035*
BH-22-15'	9/26/03	15'	**17**	**13**	**0.07**	*<0.025*	**0.98**	**1.5**	*<0.175*
BH-23-12'	9/26/03	12'	*<3.0*	**2.0**	*<0.005*	*<0.005*	*<0.005*	*<0.015*	*<0.035*
BH-23-15.5'	9/26/03	15.5'	**414**	**54**	*<0.25*	**3.4**	**2.8**	**9.0**	*<1.75*
Soil ESLs [b]			100	100	0.0045	2.6	2.5	1.0	0.028
Groundwater Analytical Results (µg/L)									
BH-16-GW	9/25/03	--	**9,990**	**600**	**267**	**7.9**	**780**	**485**	**142**
BH-20-GW	9/26/03	--	**956**	**400**	**9.3**	**1.7**	**80**	**38**	**7.9**
Groundwater ESLs [b]			100	100	1.0	40	30	13	5.0

Notes:

[a] Borehole drilled at 20° angle (off vertical). Depth reference in soil sample ID is actually core length, and actual vertical depth is approximately 0.93 x core length.
[b] RWQCB Environmental Screening Levels (for residential sites where groundwater is a known or potential drinking water resource (RWQCB, 2003).

TEH = Total extractable hydrocarbons (diesel through motor oil ranges). TVHg = Total volatile hydrocarbons - gasoline range. TPH = Total petroleum hydrocarbons = TVHg + TEHd. NLP = No level published.

Diesel concentrations in the samples collected from the depths inferred to represent maximum unsaturated zone contamination ranged from non-detect to 77 mg/kg.

Aromatic hydrocarbons (BTEX) were detected sporadically, and were generally associated with samples with elevated TVHg concentrations. Maximum concentrations included 0.49 mg/kg (benzene); 3.4 mg/kg (toluene); 8.3 mg/kg (ethylbenzene); and 26 mg/kg (total xylenes).

The fuel oxygenate MTBE was detected in only borehole soil sample (BH-19-15'), although method reporting limits for some of the samples was elevated due to elevated TPH concentrations.

Groundwater Analytical Results

Elevated concentrations of all site contaminants were detected in the BH-16 groundwater sample, north of MW-8 and near the source area. The detected concentrations approximate the site maximum concentrations observed in well samples in September and December 2003.

All contaminant concentrations for the BH-20 groundwater sample were approximately 1 order of magnitude lower than those observed in BH-16, and the concentrations are consistent with its location on lateral edge of the contaminant plume.

6.0 HYDROCHEMICAL TREND EVALUATION

This section evaluates the observed hydrochemical trends with regard to plume stability and migration of the center of contaminant mass toward Redwood Creek. Site groundwater monitoring has included the following number of consecutive groundwater monitoring events: 10 events in wells MW-9 through MW-12; 12 events in MW-7 and MW-8; 13 events in MW-5; and 21 events in MW-1 through MW-4. Appendix A contains a tabular summary of historical groundwater analytical results, as well as figures showing the historical extent of the contaminant plume relative to the ORC™ injection footprints. Section 7.0 includes a detailed discussion of the effectiveness of the ORC™ corrective action.

HYDROCHEMICAL TRENDS

Contaminant concentrations in an individual well can fluctuate over time for one or more reasons—contaminant migration; seasonal effects due to fluctuating groundwater levels (i.e., desorption from the unsaturated zone and/or dilution of saturated zone contamination); and/or natural attenuation (plus enhancement by ORC™ injection). These hydrochemical trends can result in changes in the lateral extent and magnitude of a dissolved contaminant plume.

Quarter to quarter comparisons can be unduly influenced by seasonal effects that mask longer trends. Therefore, it is useful to compare same-season data over time to determine if concentrations are increasing, decreasing, or remaining stable. Our evaluation of hydrochemical trends focuses on gasoline and diesel, which, combined, represent the majority of contaminant mass. To more closely evaluate plume stability differences, the following discussion focuses on four separate portions of the plume relative to the long axis (along the hydraulic gradient): "upgradient" (trailing edge of plume); "mid-plume"; "downgradient"; and "plume fringe."

Important components of plume stability include: degree of contaminant fluctuations in individual wells over time; changes in the lateral extent of the plume; and changes in the location of the center of contaminant mass within the plume. Historical gasoline isoconcentration contour maps in Appendix A are presented to show temporal changes in plume lateral extent and center of contaminant mass, which are discussed below.

In general, the contaminant plume has disconnected from the source such that recent historical downgradient concentrations are higher than upgradient (near the source) concentrations. To evaluate plume stability with regard to changes in the center of contaminant mass, we evaluated total petroleum hydrocarbons (TPHg and TPHd combined) concentrations in individual wells over time. The data show no obvious correlation between maximum TPH concentrations and well location, suggesting high plume instability. Since January 2001, maximum TPH concentrations have been variously detected in upgradient, mid-plume, and downgradient wells. These variations are likely due in large part to differing contaminant mass in unsaturated zone soils at particular locations, resulting in variable amounts of desorbed mass to the plume during high water conditions.

Upgradient Plume Trends

Well MW-2, installed in the area of the former UFSTs, has historically shown relatively low (sometimes not detected) contaminant levels. Well MW-8, located approximately 60 feet downgradient of MW-2, has historically shown much higher concentrations. These data suggest that the plume has become disconnected from the former source area near MW-2, and that the center of contaminant mass has moved downgradient, with significant contaminant mass entrained in the soil that continues to "feed" the dissolved concentration represented by MW-8 (the first well downgradient of MW-2 along the inferred centerline of the plume).

Figure 7 shows hydrochemical trends for gasoline and diesel for MW-8. Both gasoline and diesel concentrations have fluctuated widely. A strong seasonal effect is apparent, with annual maximum concentrations generally occurring in late winter/early spring, and annual minimum concentrations generally occurring in the fall. Neither contaminant has shown an overall reducing concentration trend (i.e., annual maxima and minima are approximately the same over the previous 3 years). In the previous three March/April events, MW-8 has shown site-wide maxima (or near maxima) in TPH concentrations.

Mid-Plume Trends

Well MW-11 represents the high concentration centerline of the plume, approximately mid-way between upgradient well MW-8 and downgradient well MW-7. Figure 8 shows hydrochemical trends for gasoline and diesel for this well. Gasoline concentrations showed a large reduction in 2001, followed by an equally large increase by late 2002. Since that time, concentrations have fluctuated widely, with a strong seasonal effect. Overall, gasoline concentrations in this well are not showing a reducing trend. Diesel concentrations in this well have shown a similar trend to gasoline, except that a downward trend over the last year may be occurring. Maximum or near maximum site-wide TPH concentrations have been detected in 6 of the last 10 monitoring events.

Figure 7: Gasoline and Diesel Hydrochemical Trends: Well MW-8
Redwood Regional Park Service Yard, Oakland, California

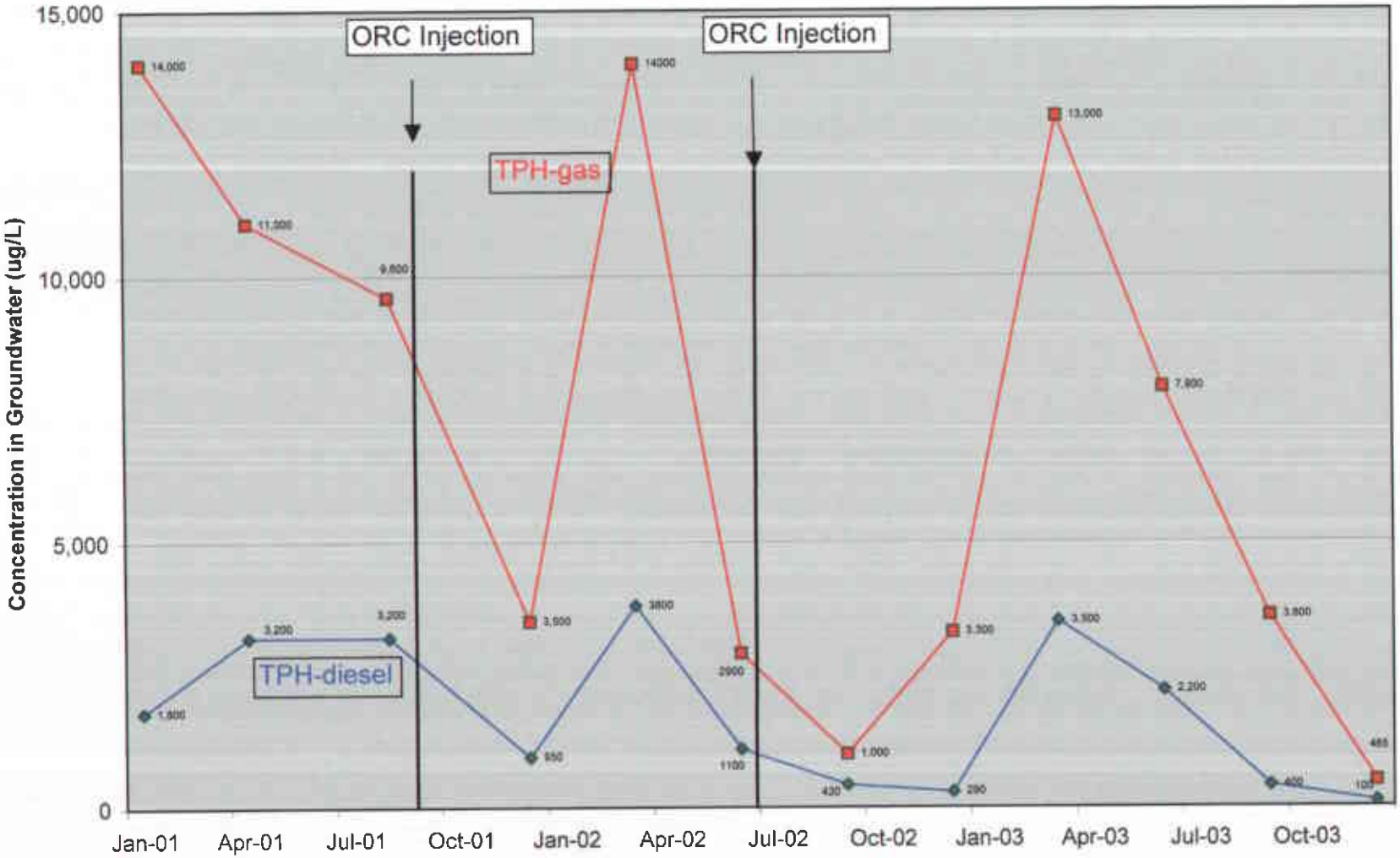
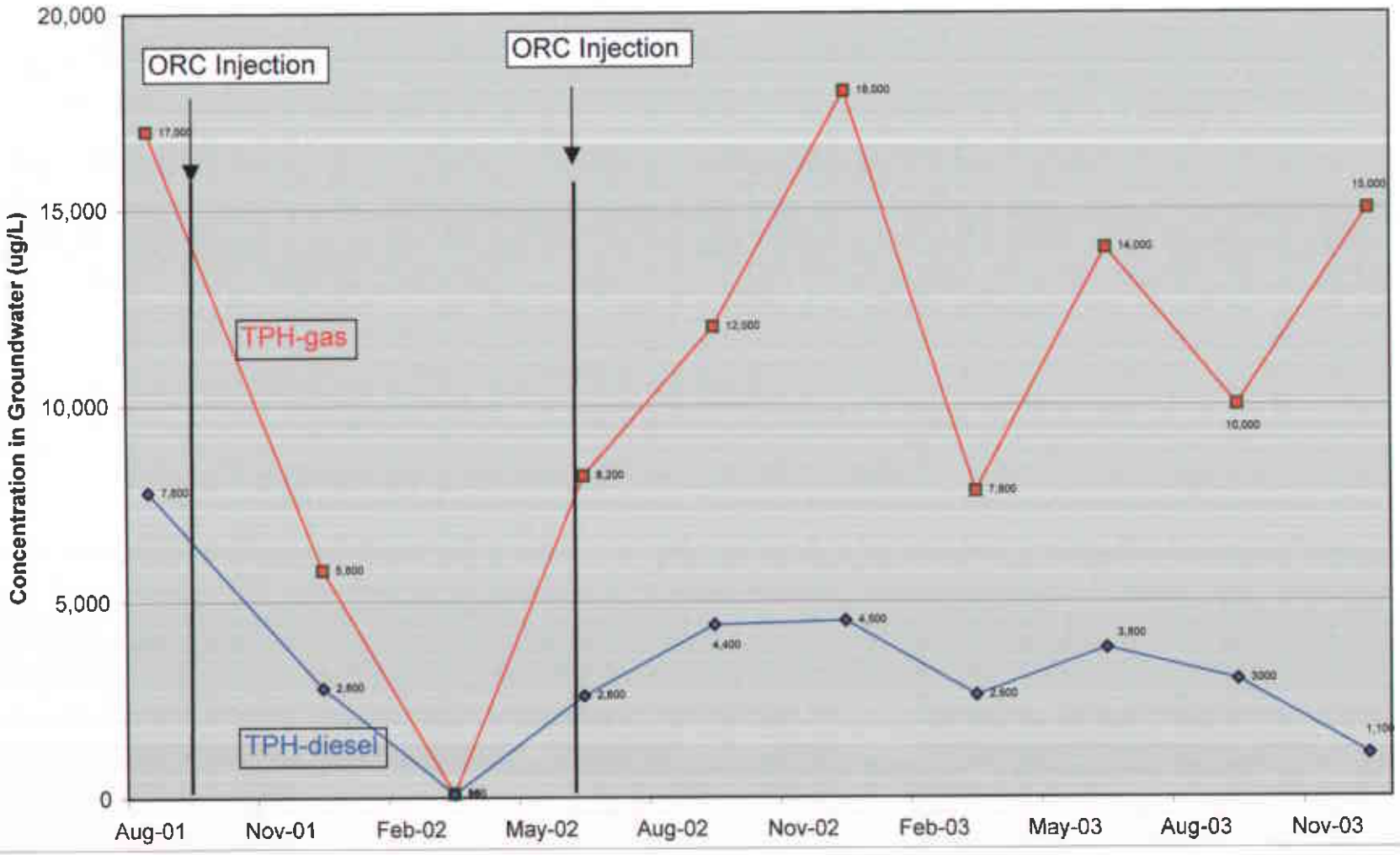


Figure 8: Gasoline and Diesel Hydrochemical Trends: Well MW-11
Redwood Regional Park Service Yard, Oakland, California



Downgradient Plume Trends

Well MW-7 represents the high concentration centerline of the plume at the downgradient area approximately 20 feet from Redwood Creek. Figure 9 shows hydrochemical trends for gasoline and diesel for this well. Beginning in January 2002, both gasoline and diesel concentrations have been relatively stable, with no obvious seasonal effects. A large reduction in diesel was observed in the most recent event, which does not fit the generally stable trendline. Maximum or near maximum site-wide TPH concentrations have been detected in 5 of the last 12 monitoring events.

Plume Fringe Trends

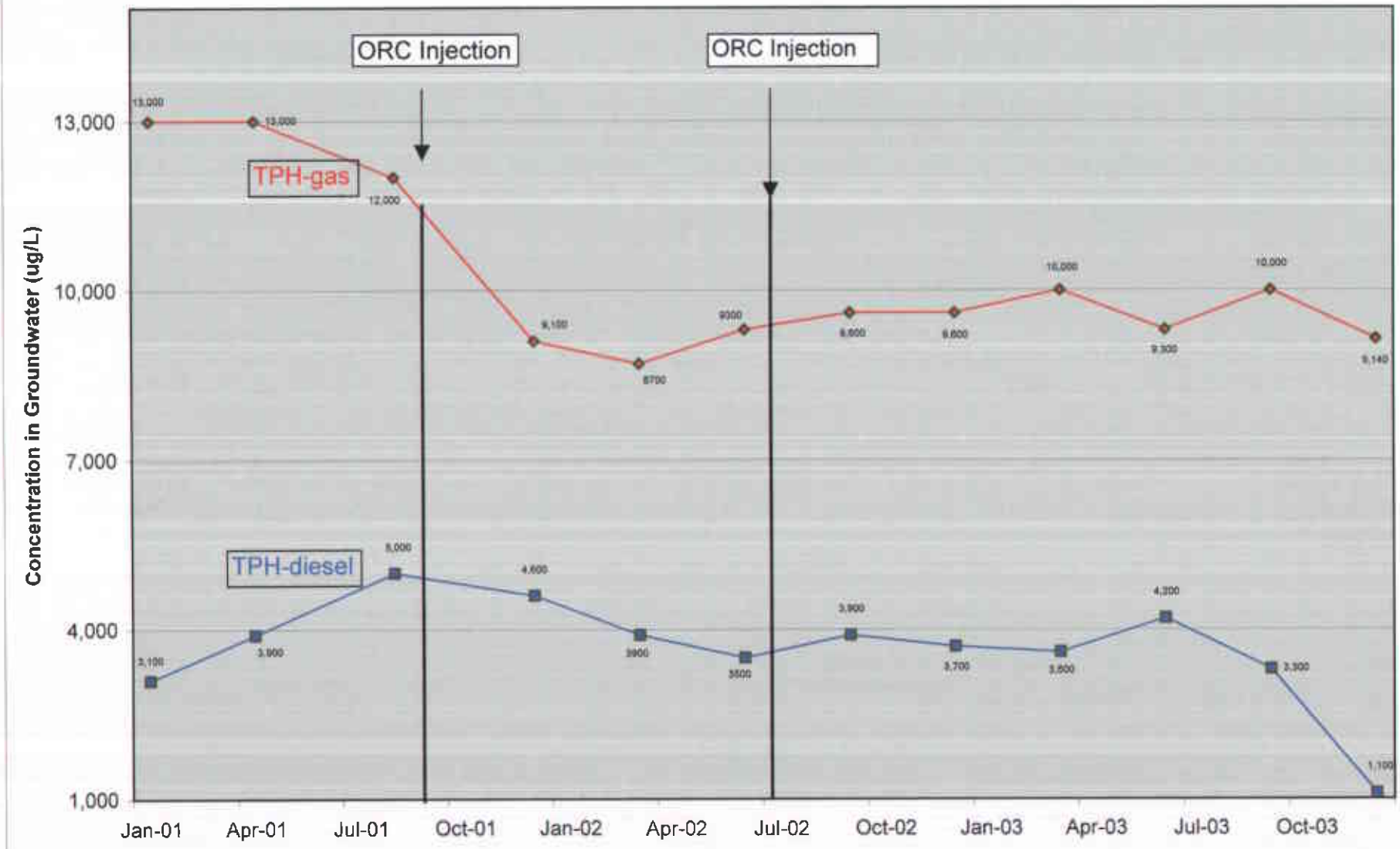
Well MW-4 is located on the northern edge of the plume, just upgradient of Redwood Creek. Figure 10 shows hydrochemical trends for gasoline and diesel for this well. Concentrations of both gasoline and diesel showed a sharp reduction beginning in April 2001; since early 2002, neither contaminant has been detected. This well (as well as MW-10, located on the southern edge of the plume at mid-plume distance) shows the positive effect of ORC™ injection in areas with low to moderate contamination, on the lateral edge of the plume, where natural attenuation is not overwhelmed by continued contaminant input (discussed in more detail in Section 7.0 of this report).

Dissolved Oxygen Trends

DO concentrations in petroleum-impacted wells are expected to increase following the ORC™ injection, then decrease within 6 to 9 months (the expected active life in the product following injection). A substantial increase in DO was observed following the September 2001 ORC™ injection (first phase) in all impacted wells, with the exception of MW-9 and MW-11. DO concentrations then showed the expected decrease, with the exception of MW-4 and MW-10 which remained elevated. Following the July 2002 injection event (second phase), DO concentrations generally showed the same trend, increasing for a period of 2 to 12 months, then decreasing. DO concentrations have remained elevated in MW-4 and MW-10, possibly due to localized supersaturation of oxygen resulting from the ORC™ injection. The data suggest that the injection program has measurably increased DO concentrations within the contaminant plume, or at least has maintained DO concentrations at pre-ORC™ injection levels.

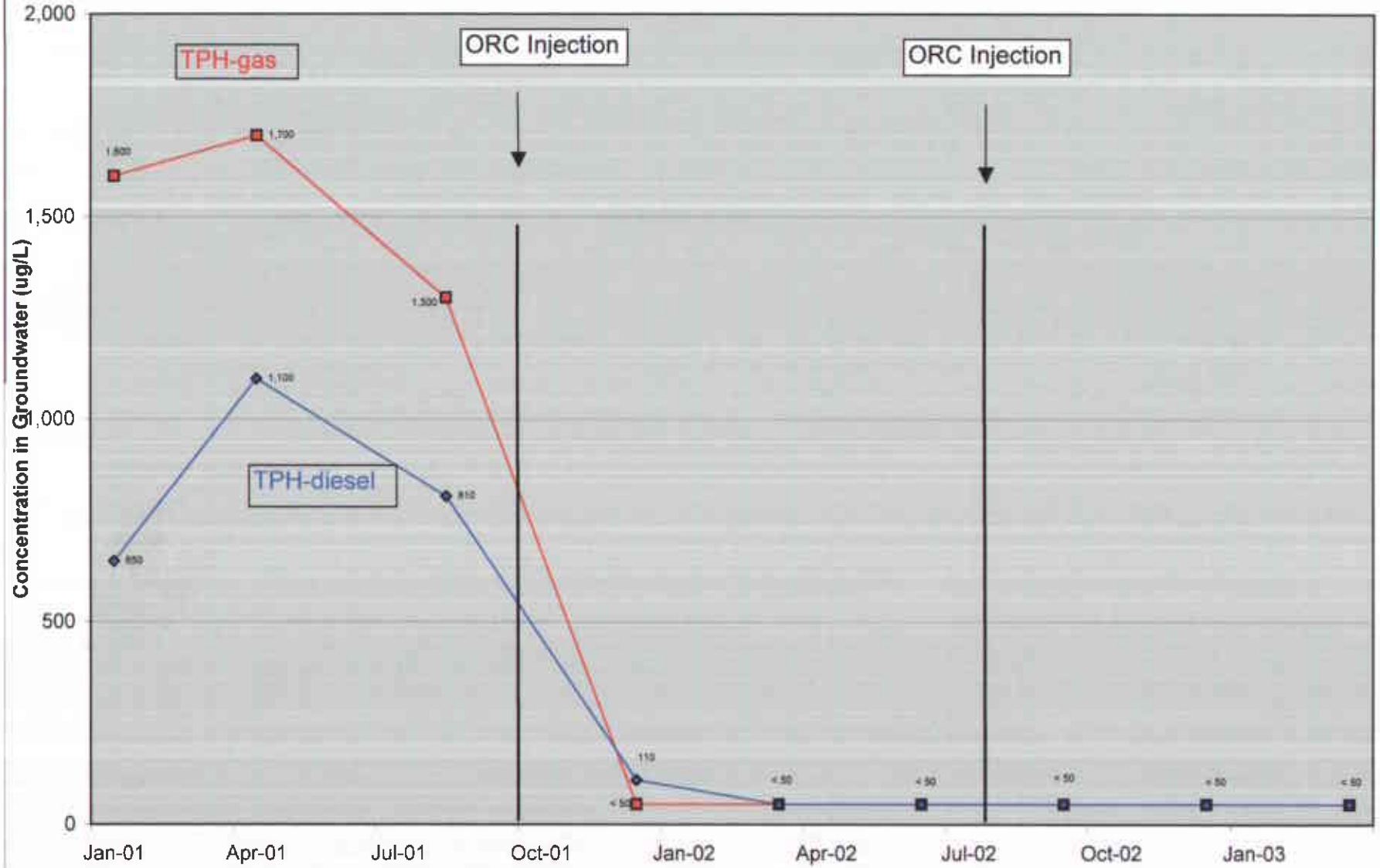
As of the most recent groundwater monitoring event, approximately 18 months (6 monitoring events) has passed since the second phase of ORC™ injection. This is beyond the useful life of injected ORC™ (generally 6 to 9 months). Despite continued elevated DO in low dissolved-phase concentrations in fringe wells MW-4 and MW-10, we infer that the previously-injected ORC™ is no longer substantially contributing to contamination reduction.

Figure 9: Gasoline and Diesel Hydrochemical Trends: Well MW-7
Redwood Regional Park Service Yard, Oakland, California



Stellar Environmental Solutions, Inc.

Figure 10: Gasoline and Diesel Hydrochemical Trends: Well MW-4
Redwood Regional Park Service Yard, Oakland, California



Stellar Environmental Solutions, Inc.

7.0 EVALUATION OF ORC™ CORRECTIVE ACTION EFFECTIVENESS

This section evaluates the effectiveness of the ORC™ injection corrective action to date, and whether it is technically appropriate as a continued remedy. A detailed discussion of the ORC™ injection program was provided in previous reports, and is summarized below.

Two ORC™ injection events have been conducted at the site: 1) September 2001 (3,000 pounds ORC™ in 44 boreholes); and 2) July 2002 (1,000 pounds ORC™ in 30 boreholes). The ORC™ remedy is designed primarily to address dissolved-phase contamination; only minor effectiveness is expected in the unsaturated zone due. Both injections focused on the area of elevated petroleum contamination in groundwater, with the second injection occurring over a smaller footprint, based on observed reductions in the footprint of the contaminant plume following the initial injection. More ORC™ product was loaded into and around the centerline of the plume (as represented by wells MW-8, MW-11, and MW-7) than along the plume margins. Figure 11 shows the footprints of the two ORC™ injection phases.

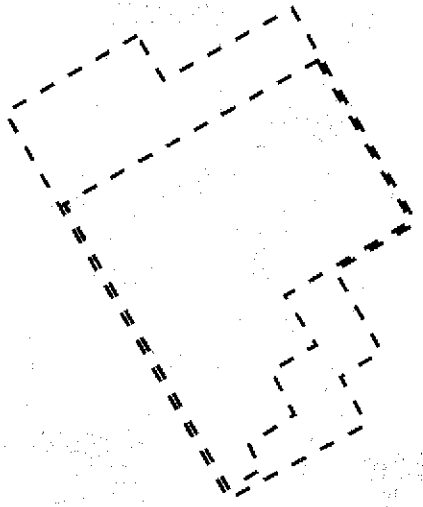
As discussed in Section 6.0, the ORC™ injections were reasonably effective in increasing dissolved oxygen (DO) concentrations. In general, DO concentrations increased more and/or stayed elevated longer in wells along the plume fringe (MW-4 and MW-10) than in wells along the plume centerline (MW-7, MW-8, and MW-11).

With the exception of wells MW-4 and MW-10 on the plume fringes, no significant permanent reduction in contaminant concentrations in plume centerline wells can be directly attributed to the ORC™ injections. These wells either showed an initial decrease in contaminant concentrations followed by a rebound, or were only marginally improved from the onset of injection.

The available data suggest the following regarding the effectiveness of the ORC™ injection:

- The recent borehole program identified a large mass of contamination in the unsaturated zone overlying the contaminant plume, and in the upgradient area near the former UFSTs that is inaccessible to ORC™ injection. Seasonal desorption of contamination in these areas occurs during high-water periods, acting as a long-term source of dissolved contamination.

LEGEND & NOTES



Footprint of September 2001 ORC Injection

Footprint of July 2002 ORC Injection

0 20

Scale in feet

Stellar Environmental Solutions, Inc.
Geoscience & Engineering Consulting

AREA OF PREVIOUS ORC INJECTIONS
Redwood Regional Park Service Yard, Oakland, CA

Figure 11

by: MJC | JANUARY 2004

2003-02-34

- The capillary fringe at the site is seasonally-variable, with low water conditions (i.e., thinner dissolved-phase plume) present throughout much of the year, limiting the time and area available for ORC™ to work on the plume.
- The low-permeability soils result in a low radius of influence around injection boreholes, therefore requiring a high borehole density to achieve desired effects.
- Partial and temporary reductions in contaminant concentrations indicate that site conditions support aerobic biodegradation, but are limited by oxygen concentrations primarily in the unsaturated zone.
- Permanent reductions in dissolved-phase contamination have not been achieved due to continued contaminant input.
- Continued injection of ORC™ will likely yield similar results, essentially providing short-term reductions in groundwater contamination, while not reducing the primary source of residual contamination (unsaturated zone sorbed contamination). Should that contamination be reduced/eliminated, it may be appropriate to conduct a final ORC™ injection to "polish" residual dissolved-phase contamination to acceptable levels.

8.0 PROPOSED BIOVENTING REMEDY

The available data indicate that the ORC™ corrective action was only partially effective in reducing the lateral extent and magnitude of the groundwater contaminant plume because residual unsaturated zone soil contamination will continue to act as a long-term source of contaminant input to the system. Reduction/elimination of that secondary source will be necessary to prevent future discharge of contaminated groundwater to Redwood Creek. As discussed in Section 7.0, ORC™ injection as a corrective action is limited by site-specific conditions, and will be useful only as a late-stage "polish" remedy.

EBRPD is proposing to install and operate a soil bioventing system to address the residual unsaturated zone soil contamination, to be potentially augmented with an ORC™ injection phase once the majority of soil contamination has been removed. The design, specifications, and operation/maintenance of the system will be detailed in a technical workplan to be submitted to ACHCSA and RWQCB for comment/approval. The installation, startup, operation & maintenance, and findings of the bioventing system will be discussed in upcoming technical reports.

Bioventing is a proven technology for addressing unsaturated zone contamination in both low- and high-permeability soils. In brief, the technology provides supplemental oxygen to the contaminated zone, which is necessary for enhancing contaminant biodegradation by naturally-occurring microorganisms. The proposed system will consist of five air-injection vent wells (VWs), within the area of elevated unsaturated zone soil contamination and the groundwater plume. The wells will be connected by a network of underground plastic piping to one or two air low-flow blowers to be located in the service yard. Approximately three vapor monitoring points (VMPs) will be installed within the contaminated area to allow for monitoring contaminant vapor concentrations and evaluating the effectiveness of the VWs in aerating the subsurface. Following installation and startup, both the VWs and the VMPs will be used to conduct respiration tests to estimate contaminant mass removal rates. Given site conditions, we estimate that the bioventing system will be required to operate for 2 to 3 years to reduce unsaturated zone soil contamination levels such that the soil will not be a long-term source of groundwater contamination.

The advantages of the bioventing strategy include:

- It is a proven technology with good regulatory acceptance, low uncertainty, and safe and straightforward system engineering and installation;
- The proposed network of injection wells will exert a sufficient radius of influence in low-permeability soils (including the upgradient area not accessible to ORC™ injection), and can operate under both high and low groundwater conditions, although its effectiveness is proportional to the thickness of the unsaturated zone;
- The technology is proven effective under the site's conditions that have been shown to support aerobic biodegradation;
- It will address the primary source of residual soil contamination (unsaturated zone), and can be combined with other technologies to directly address dissolved-phase contamination, as warranted;
- The system is automated, will work continuously, and has long-term "permanence," making it cost-effective relative to short-term remedies such as ORC™ injection;
- Installation and operation of the system will not interfere with ongoing groundwater monitoring;
- Contaminant mass removal can be directly determined by onsite testing; and
- The completed system will be underground, maintaining the aesthetic quality of the park setting and eliminating the risk of system disturbance.

9.0 SUMMARY CONCLUSIONS AND PROPOSED ACTIONS

SUMMARY AND CONCLUSIONS

- Groundwater sampling has been conducted on an approximately quarterly basis since November 1994 (28 events in the initial site wells). A total of 11 site wells are available for monitoring; 7 of the available wells are currently monitored for contamination.
- Site contaminants of concern include gasoline, diesel, BTEX, and MTBE. Current groundwater concentrations exceed applicable regulatory agency screening levels for all constituents except toluene.
- The primary environmental risk is discharge of contaminated groundwater to the adjacent Redwood Creek. A stream bioassessment concluded that there were no direct impacts to the surface water benthic community; however, groundwater contamination is sporadically detected in surface water samples, and there is historical visual evidence of plume discharge at the creek/groundwater interface. To date, surface water samples have not exceeded surface water ESL criteria.
- The existing well layout adequately constrains the lateral extent of groundwater contamination, and the vertical limit is very likely the top of the near-surface (25 to 28 feet) siltstone bedrock. The saturated interval extends approximately 12 to 15 feet from top of bedrock through the capillary fringe. Groundwater elevations fluctuate seasonally, creating a capillary fringe that varies seasonally in thickness.
- The groundwater contaminant plume has become disconnected from the former source, and has migrated well beyond the former source area (represented by well MW-2) toward Redwood Creek. The plume of groundwater contamination above screening levels appears to be approximately 120 feet long and approximately 50 feet wide. The zone of greatest contamination (greater than 10,000 µg/L TPH) is an approximately 20- to 30-foot-wide by 50-foot-long area extending from just downgradient of MW-8 to the most downgradient well MW-7.
- The contaminant plume is neither stable nor reducing, as groundwater contaminant concentrations fluctuate seasonally, and the center of mass of the contaminant plume (represented by maximum concentrations) has swung between two separate wells in recent history.

- A two-phase ORC™ injection corrective action program was been implemented at the site. In September 2001, approximately 3,000 pounds of ORC™ was injected into 44 boreholes over a 4,400-square foot area of the maximum groundwater contamination. In June 2002, approximately 1,000 pounds of ORC™ was injected in 30 boreholes over a smaller area that showed residual high contaminant concentrations following the initial injection phase. The ORC™ was injected over the full saturated interval (including the capillary fringe). The findings indicate that the corrective action was partially effective in reducing the lateral extent of the groundwater contaminant plume; however, initial contaminant reductions were followed by rebounds to pre-injection concentrations. The data suggest that site conditions support aerobic biodegradation when not limited by oxygen concentrations, notably on the plume margins and upgradient former source area but not along the centerline of the contaminant plume.
- A September 2003 exploratory borehole program confirmed that sorbed-phase contamination in the seasonally-unsaturated zone is a primary source of long-term contaminant contribution to the groundwater plume. Reduction/removal of this contamination will be necessary to eliminate continued discharge of contaminated groundwater to Redwood Creek, and ultimately obtain site closure.
- Continued injection of ORC™ will not be effective in addressing the primary source of residual contamination, but might be useful as a late-stage "polish" technique to address residual dissolved-phase contamination following removal of the unsaturated zone soil contamination.
- Soil bioventing is a proven technology for contaminant mass removal in the unsaturated zone, under conditions similar to the site, and appears to be the most appropriate corrective action strategy giving consideration to technical, cost, safety, and aesthetic issues. A 2- to 3-year program of bioventing will likely reduce unsaturated zone contamination such that it will no longer be a long-term source of contamination to groundwater.

PROPOSED ACTIONS

The EBRPD proposes to implement the following actions to address regulatory concerns:

- Continue the quarterly program of creek and groundwater sampling and reporting.
- Submit a technical workplan to ACHCSA and RWQCB detailing the proposed bioventing system installation and operation, obtain regulatory agency concurrence, and implement the corrective action.

- Continue to evaluate analytical results (and bioventing contaminant removal data) in the context of hydrochemical trends, impacts of groundwater contamination on Redwood Creek, and the effectiveness of the corrective action.

10.0 LIMITATIONS

This report has been prepared for the exclusive use of the East Bay Regional Park District, its authorized representatives, and the regulatory agencies. No reliance on this report shall be made by anyone other than those for whom it was prepared.

The findings and conclusions presented in this report are based on the review of previous investigators' findings at the site, as well as onsite activities conducted by SES since September 1998. This report provides neither a certification nor guarantee that the property is free of hazardous substance contamination. This report has been prepared in accordance with generally accepted methodologies and standards of practice. The SES personnel who performed these activities are qualified to perform such investigations and have accurately reported the information available, but cannot attest to the validity of that information. No warranty, expressed or implied, is made as to the findings, conclusions, and recommendations included in the report.

The findings of this report are valid as of the present. Site conditions may change with the passage of time, natural processes, or human intervention, which can invalidate the findings and conclusions presented in this report. As such, this report should be considered a reflection of the current site conditions as based on the investigation and remediation completed.

11.0 REFERENCES AND BIBLIOGRAPHY

Alameda County Health Care Services (ACHCSA), 2000. Letter to Mr. Ken Burger of East Bay Regional Park District. August 22.

Parsons Engineering Science (Parsons), 1998. Quarterly Progress Report 11, Redwood Regional Park Service Yard, Oakland, California. January 28.

Parsons, 1997a. Quarterly Progress Report 7, Redwood Regional Park Service Yard, Oakland, California. January 31.

Parsons, 1997b. Quarterly Progress Report 8 and Annual Summary Assessment, Redwood Regional Park Service Yard, Oakland, California. April 4.

Parsons, 1997c. Quarterly Progress Report 9, Redwood Regional Park Service Yard, Oakland, California. June 30.

Parsons, 1997d. Quarterly Progress Report 10, Redwood Regional Park Service Yard, Oakland, California. September 22.

Parsons, 1996a. Quarterly Progress Report 5, Redwood Regional Park Service Yard, Oakland, California. June 6.

Parsons, 1996b. Quarterly Progress Report 6, Redwood Regional Park Service Yard, Oakland, California. September 24.

Parsons, 1995a. Quarterly Progress Report 2, Redwood Regional Park Service Yard, Oakland, California. March 8.

Parsons, 1995b. Quarterly Progress Report 3, Redwood Regional Park Service Yard, Oakland, California. June 23.

Parsons, 1995c. Quarterly Progress Report 4 and Annual Summary Assessment (November 1994 - August 1995), Redwood Regional Park Service Yard, Oakland, California. November 13.

Parsons, 1994a. Creek and Soil Sampling at Redwood Regional Park, Oakland, California. March 2.

Parsons, 1994b. Creek Surface Water at Redwood Regional Park, Oakland, California. May 13.

Parsons, 1994c. Workplan for Groundwater Characterization Program at East Bay Regional Park Service Yard, Oakland, California. August 17.

Parsons, 1994d. Quarterly Progress Report 1, Redwood Regional Park Service Yard, Oakland, California. December 28.

Parsons, 1993a. Closure of Underground Fuel Storage Tanks and Initial Site Characterization at Redwood Regional Park Service Yard, Oakland, California. December 16.

Parsons, 1993b. Workplan for Site Characterization at East Bay Regional Park District, Redwood Regional Park Corporation Yard, Oakland, Alameda County, California. September 3.

Regional Water Quality Control Board – San Francisco Bay Region (RWQCB), 2003. Screening for Environmental Concerns at Sites With Contaminated Soil and Groundwater. July.

State Water Resources Control Board (SWRCB), 1989. Leaking Underground Fuel Tank Field Manual: Guidelines for Site Assessment, Cleanup, and Underground Storage Tank Closure – State of California Leaking Underground Fuel Tank Task Force. October.

Stellar Environmental Solutions (SES), 2003a. Year 2002 Annual Summary Report, Redwood Regional Park Service Yard, Oakland, California. January 27.

SES, 2003b. First Quarter 2003 Site Monitoring Report, Redwood Regional Park Service Yard, Oakland, California. May 5.

SES, 2003c. Second Quarter 2003 Site Monitoring Report, Redwood Regional Park Service Yard, Oakland, California. July 29.

SES, 2003d. Third Quarter 2003 Site Monitoring Report, Redwood Regional Park Service Yard, Oakland, California. October 3.

SES, 2002a. Year 2001 Annual Summary Report, Redwood Regional Park Service Yard, Oakland, California. January 15.

SES, 2002b. First Quarter 2002 Site Monitoring Report, Redwood Regional Park Service Yard, Oakland, California. April 16.

SES, 2002c. Second Quarter 2002 Site Monitoring Report, Redwood Regional Park Service Yard, Oakland, California. July 23.

SES, 2002d. Third Quarter 2002 Site Monitoring Report, Redwood Regional Park Service Yard, Oakland, California. October 14.

SES, 2001a. Monitoring Well Installation and Site Monitoring Report, Redwood Regional Park Service Yard, Oakland, California. February 8.

SES, 2001b. Site Monitoring Report, Redwood Regional Park Service Yard, Oakland, California. May 4.

SES, 2001c. Well Installation, Site Monitoring and Corrective Action Report, Redwood Regional Park Service Yard, Oakland, California. October 26.

SES, 2000a. Site Monitoring Report, Redwood Regional Park Service Yard, Oakland, California. April 21.

SES, 2000b. Workplan for Groundwater Monitoring Well Installations, Redwood Regional Park Service Yard, Oakland, California. October 19.

SES, 2000c. Site Monitoring Report, Redwood Regional Park Service Yard, Oakland, California. October 19.

SES, 2000d. Site Feasibility Study Report, Redwood Regional Park Service Yard, Oakland, California. October 20.

SES, 1999a. Workplan for Subsurface Investigation, Redwood Regional Park Service Yard, Oakland, California. April 8.

SES, 1999b. Residual Contamination Investigation and Remedial Action Assessment Report, Redwood Regional Park Service Yard, Oakland, California. June 9.

SES, 1998a. Workplan for Continued Site Investigation and Closure Assessment, Redwood Regional Park Service Yard, Oakland, California. October 9.

SES, 1998b. Site Investigation and Closure Assessment Report, Redwood Regional Park Service Yard, Oakland, California. December 4.

HISTORICAL GROUNDWATER MONITORING WELLS ANALYTICAL RESULTS

REDWOOD REGIONAL PARK SERVICE YARD, OAKLAND, CALIFORNIA

(all concentrations in ug/L, equivalent to parts per billion [ppb])

Well MW-2									
Event	**Date**	**TPHg**	**TPHd**	**Benzene**	**Toluene**	**Ethylbenzene**	**Total Xylenes**	**Total BTEX**	**MTBE**
1	Nov-94	**66**	*< 50*	**3.4**	*< 0.5*	*< 0.5*	**0.9**	**4.3**	*NA*
2	Feb-95	**89**	*< 50*	**18**	**2.4**	**1.7**	**7.5**	**29.6**	*NA*
3	May-95	*< 50*	*< 50*	**3.9**	*< 0.5*	**1.6**	**2.5**	**8**	*NA*
4	Aug-95	*< 50*	*< 50*	**5.7**	*< 0.5*	*< 0.5*	*< 0.5*	**5.7**	*NA*
5	May-96	*< 50*	*< 50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	*NA*
6	Aug-96	*< 50*	*< 50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	*NA*
7	Dec-96	*< 50*	*< 50*	**6.3**	*< 0.5*	**1.6**	*< 0.5*	**7.9**	*NA*
8	Feb-97	*< 50*	*< 50*	**0.69**	*< 0.5*	**0.55**	*< 0.5*	**1.2**	*NA*
9	May-97	**67**	*< 50*	**8.9**	*< 0.5*	**5.1**	*< 1.0*	**14**	*NA*
10	Aug-97	*< 50*	*< 50*	**4.5**	*< 0.5*	**1.1**	*< 0.5*	**5.6**	*NA*
11	Dec-97	**61**	*< 50*	**21**	*< 0.5*	**6.5**	**3.9**	**31.4**	*NA*
12	Feb-98	**2,000**	**200**	**270**	**92**	**150**	**600**	**1,112**	*NA*
13	Sep-98	*< 50*	*< 50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	**7**
14	Apr-99	**82**	**710**	**4.2**	*< 0.5*	**3.4**	**4**	**12**	**7.5**
15	Dec-99	**57**	*< 50*	**20**	**0.6**	**5.9**	*<0.5*	**27**	**4.5**
16	Sep-00	*< 50*	*< 50*	**0.72**	*< 0.5*	*< 0.5*	*< 0.5*	**0.7**	**7.9**
17	Jan-01	**51**	*< 50*	**8.3**	*< 0.5*	**1.5**	*< 0.5*	**9.8**	**8.0**
18	Apr-01	**110**	*< 50*	**10**	*< 0.5*	**11**	**6.4**	**27**	**10**
19	Aug-01	**260**	**120**	**30**	**6.7**	**1.6**	**6.4**	**45**	**27**
20	Dec-01	**74**	**69**	**14**	**0.8**	**3.7**	**3.5**	**22**	**6.6**

Well MW-2 (continued)									
Event	Date	TPHg	TPHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
21	Mar-02	< 50	< 50	2.3	0.51	1.9	1.3	8.3	8.2
22	Jun-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	7.7
23	Sep-02	98	< 50	5.0	< 0.5	< 0.5	< 0.5	—	13
24	Dec-02	< 50	< 50	4.3	< 0.5	< 0.5	< 0.5	—	< 2.0
25	Mar-03	130	82	39	< 0.5	20	4.1	63	16
26	Jun-03	< 50	< 50	1.9	< 0.5	< 0.5	< 0.5	1.9	8.7
27	Sep-03	120	< 50	8.6	0.51	0.53	< 0.5	9.6	23.0
28	Dec-03	282	<100	4.3	1.6	1.3	1.2	8.4	9.4

Well MW-4									
Event	Date	TPHg	TPHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Nov-94	2,600	230	120	4.8	150	88	363	NA
2	Feb-95	11,000	330	420	17	440	460	1,337	NA
3	May-95	7,200	440	300	13	390	330	1,033	NA
4	Aug-95	1,800	240	65	6.8	89	67	227	NA
5	May-96	1,100	140	51	< 0.5	< 0.5	47	98	NA
6	Aug-96	3,700	120	63	2	200	144	409	NA
7	Dec-96	2,700	240	19	< 0.5	130	93	242	NA
8	Feb-97	3,300	< 50	120	1.0	150	103	374	NA
9	May-97	490	< 50	2.6	6.7	6.4	6.7	22	NA
10	Aug-97	1,900	150	8.6	3.5	78	53	143	NA
11	Dec-97	1,000	84	4.6	2.7	61	54	123	NA
12	Feb-98	5,300	340	110	24	320	402	856	NA
13	Sep-98	1,800	< 50	8.9	< 0.5	68	27	104	23
14	Apr-99	2,900	710	61	1.2	120	80	263	32
15	Dec-99	1,000	430	4	2	26	14	45.9	< 2.0
16	Sep-00	570	380	< 0.5	< 0.5	16	4.1	20.1	2.4
17	Jan-01	1,600	650	4.2	0.89	46	13.8	65	8.4
18	Apr-01	1,700	1,100	4.5	2.8	48	10.7	66.0	5.0

Well MW-4 (continued)									
Event	Date	TPHg	TPHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
19	Aug-01	**1,300**	**810**	**3.2**	**4.0**	**29**	**9.7**	**46**	< 2.0
20	Dec-01	< 50	**110**	< 0.5	< 0.5	< 0.5	**1.2**	**1.2**	< 2.0
21	Mar-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 2.0
22	Jun-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 2.0
23	Sep-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 2.0
24	Dec-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 2.0
25	Mar-03	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 2.0
26	Jun-03	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 2.0
27	Sep-03	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 2.0
28	Dec-03	<50	<100	<0.3	<0.3	<0.3	<0.6	< 0.5	< 5.0

Well MW-5									
Event	Date	TPHg	TPHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Nov-94	**50**	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
2	Feb-95	**70**	< 50	**0.6**	< 0.5	< 0.5	< 0.5	**0.6**	NA
3	May-95	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
4	Aug-95	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
5	May-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
6	Aug-96	**80**	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
7	Dec-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
8	Feb-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
9	May-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
10	Aug-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
11	Dec-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
12	Feb-98	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
13	Sep-98	< 50	<50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2
Groundwater monitoring in this well discontinued with Alameda County Health Care Services Agency approval									

Well MW-7									
Event	Date	TPHg	TPHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Jan-01	13,000	3,100	95	4	500	289	888	95
2	Apr-01	13,000	3,900	140	< 0.5	530	278	948	52
3	Aug-01	12,000	5,000	55	25	440	198	718	19
4	Dec-01	9,100	4,600	89	< 2.5	460	228	777	< 10
5	Mar-02	8,700	3,900	220	6.2	450	191	867	200
6	Jun-02	9,300	3,500	210	6.3	380	155	751	18
7	Sep-02	9,600	3,900	180	< 0.5	380	160	720	< 2.0
8	Dec-02	9,600	3,700	110	< 0.5	400	188.9	699	< 2.0
9	Mar-03	10,000	3,600	210	12	360	143	725	45
10	Jun-03	9,300	4,200	190	< 10	250	130	570	200
11	Sep-03	10,000	3,300	150	11	300	136	597	< 2.0
12	Dec-03	9,140	1,100	62	45	295	184	586	89

Well MW-8									
Event	Date	TPHg	TPHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Jan-01	14,000	1,800	430	17	360	1230	2,037	96
2	Apr-01	11,000	3,200	320	13	560	1,163	2,056	42
3	Aug-01	9,600	3,200	130	14	470	463	1,077	14
4	Dec-01	3,500	950	69	2.4	310	431	812	< 4.0
5	Mar-02	14,000	3,800	650	17	1,200	1,510	3,377	240
6	Jun-02	2,900	1,100	70	2.0	170	148	390	19
7	Sep-02	1,000	420	22	< 0.5	64	50	136	< 2.0
8	Dec-02	3,300	290	67	< 0.5	190	203	460	< 2.0
9	Mar-03	13,000	3,500	610	12	1,100	958	2,680	< 10
10	Jun-03	7,900	2,200	370	7.4	620	562	1,559	< 4.0
11	Sep-03	3,600	400	120	3.3	300	221	644	< 2.0
12	Dec-03	485	100	19	1.5	26	36	83	< 5.0

Well MW-9									
Event	Date	TPHg	TPHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Aug-01	11,000	170	340	13	720	616	1,689	48
2	Dec-01	9,400	2,700	250	5.1	520	317	1,092	*< 10*
3	Mar-02	1,700	300	53	4.2	120	67	244	20
4	Jun-02	11,000	2,500	200	16	600	509	1,325	85
5	Sep-02	3,600	2,800	440	11	260	39	750	*< 4.0*
6	Dec-02	7,000	3,500	380	9.5	730	147	1,266	*< 10*
7	Mar-03	4,400	1,400	320	6.9	400	93	820	*< 2.0*
8	Jun-03	7,600	1,600	490	10	620	167	1,287	*< 4.0*
9	Sep-03	8,300	2,900	420	14	870	200	1,504	*< 10*
10	Dec-03	7,080	700	287	31	901	255	1,474	*< 10*

Well MW-10									
Event	Date	TPHg	TPHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Aug-01	550	2,100	17	*< 0.5*	31	44	92	40
2	Dec-01	*< 50*	81	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	25
3	Mar-02	*< 50*	*< 50*	0.61	*< 0.5*	*< 0.5*	*< 0.5*	0.61	6.0
4	Jun-02	*< 50*	*< 50*	0.59	*< 0.5*	0.58	*< 0.5*	1.2	9.0
5	Sep-02	160	120	10	*< 0.5*	6.7	3.6	20	26
6	Dec-02	*< 50*	*< 50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	16
7	Mar-03	110	*< 50*	11	*< 0.5*	12	1.3	24	15
8	Jun-03	110	*< 50*	9.6	*< 0.5*	6.8	*< 0.5*	16	9.0
9	Sep-03	< 50	*< 50*	1.1	*< 0.5*	1.5	*< 0.5*	3	7.0
10	Dec-03	162	*<100*	6.9	*<0.3*	8	*<0.6*	15	9.9

Well MW-11									
Event	Date	TPHg	TPHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Aug-01	17,000	7,800	390	17	820	344	1,571	*< 10*
2	Dec-01	5,800	2,800	280	7.8	500	213	1,001	*< 10*
3	Mar-02	100	94	*< 0.5*	*< 0.5*	0.64	*< 0.5*	0.64	2.4
4	Jun-02	8,200	2,600	570	13	560	170	1,313	*< 4*
5	Sep-02	12,000	4,400	330	13	880	654	1,877	*< 10*
6	Dec-02	18,000	4,500	420	*< 2.5*	1100	912	2,432	*< 10*
7	Mar-03	7,800	2,600	170	4.7	530	337	1,042	53
8	Jun-03	14,000	3,800	250	*< 2.5*	870	693	1,813	*< 10*
9	Sep-03	10,000	3000	250	9.9	700	527	1,487	*< 4*
10	Dec-03	15,000	1,100	314	60	1070	802	2,246	173

HISTORICAL SURFACE WATER ANALYTICAL RESULTS

REDWOOD REGIONAL PARK SERVICE YARD, OAKLAND, CALIFORNIA

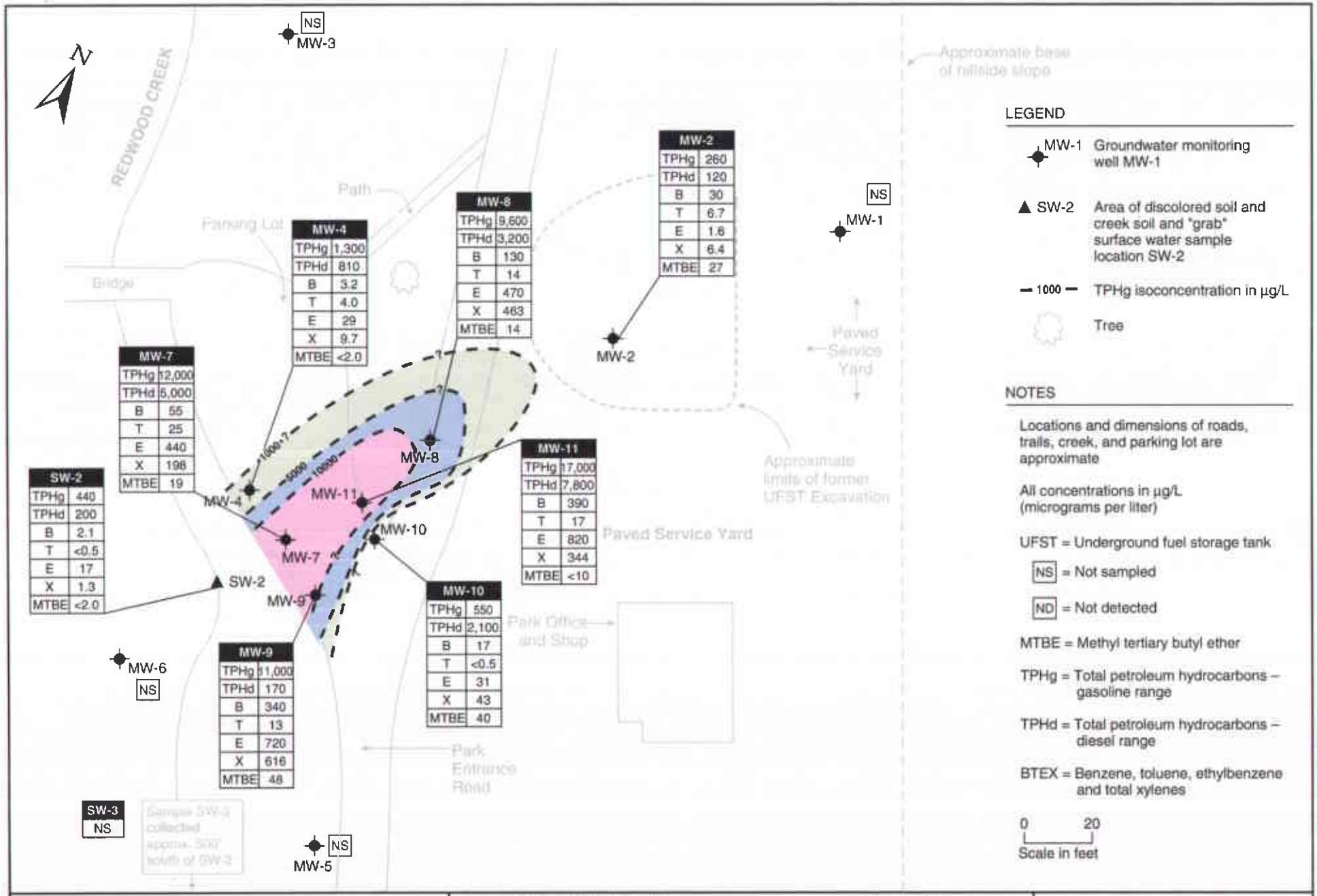
(all concentrations in ug/L, equivalent to parts per billion [ppb])

Sampling Location SW-1 (Upstream of Contaminated Groundwater Discharge Location SW-2)									
Event	**Date**	**TPHg**	**TPHd**	**Benzene**	**Toluene**	**Ethylbenzene**	**Total Xylenes**	**Total BTEX**	**MTBE**
1	Feb-94	**50**	*< 50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	*NA*
2	May-95	*< 50*	*< 50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	*NA*
3	May-96	*< 50*	*< 50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	*NA*
4	Aug-96	*< 50*	*< 50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	*NA*
5	Dec-96	*< 50*	*< 50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	*NA*
6	Feb-97	*< 50*	*< 50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	*NA*
7	Aug-97	*< 50*	*< 50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	*NA*
8	Dec-97	*< 50*	*< 50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	*NA*
9	Feb-98	*< 50*	*< 50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	*NA*
10	Sep-98	*< 50*	*<50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	*< 2.0*
11	Apr-99	*< 50*	*<50*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	—	*< 2.0*
Sampling at this location discontinued after April 1999 with Alameda County Health Services Agency approval.									

Sampling Location SW-2 (Area of Historical Contaminated Groundwater Discharge)									
Event	Date	TPHg	TPHd	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	MTBE
1	Feb-94	130	< 50	1.9	< 0.5	4.4	3.2	9.5	NA
2	May-95	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
3	Aug-95	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
4	May-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
5	Aug-96	200	< 50	7.5	< 0.5	5.4	< 0.5	13	NA
6	Dec-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
7	Feb-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
8	Aug-97	350	130	13	0.89	19	11	44	NA
9	Dec-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
10	Feb-98	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
11	Sep-98	< 50	<50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
12	Apr-99	81	<50	2.0	< 0.5	2.5	1.3	5.8	2.3
13	Dec-99	1,300	250	10	1.0	47	27	85	2.2
14	Sep-00	160	100	2.1	< 0.5	5.2	1.9	9.2	3.4
15	Jan-01	< 50	< 50	< 0.5	< 0.5	0.53	< 0.5	0.5	< 2.0
16	Apr-01	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
17	Sep-01	440	200	2.1	< 0.5	17	1.3	20	10
18	Dec-01	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
19	Mar-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
20	Jun-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
21	Sep-02	220	590	10	< 0.5	13	< 0.5	23	< 2.0
22	Dec-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
23	Mar-03	< 50	< 50	< 0.5	< 0.5	0.56	< 0.5	0.56	2.8
24	Jun-03	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
25	Sep-03	190	92	2.1	< 0.5	4.2	< 0.5	6.3	< 2.0
26	Dec-03	86	< 100	< 0.3	< 0.3	< 0.3	< 0.6	-	< 5.0

Sampling Location SW-3 (Downstream of Contaminated Groundwater Discharge Location SW-2)									
Event	**Date**	**TPHg**	**TPHd**	**Benzene**	**Toluene**	**Ethylbenzene**	**Total Xylenes**	**Total BTEX**	**MTBE**
1	May-95	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
2	Aug-95	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
3	May-96	< 50	**74**	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
4	Aug-96	**69**	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
5	Dec-96	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
6	Feb-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
7	Aug-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
8	Dec-97	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
9	Feb-98	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	NA
10	Sep-98	< 50	<50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
11	Apr-99	< 50	<50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
12	Dec-99	< 50	<50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
13	Sep-00	NS	NS	NS	NS	NS	NS	—	NS
14	Jan-01	< 50	<50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
15	Apr-01	< 50	<50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
16	Sep-01	NS	NS	NS	NS	NS	NS	—	NS
17	Dec-01	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
18	Mar-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	< 2.0
19	Jun-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	—	**2.4**
20	Sep-02	NS	NS	NS	NS	NS	NS	—	NS
21	Dec-02	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
22	Mar-03	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
23	Jun-03	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	-	< 2.0
24	Sep-03	NA	NA	NA	NA	NA	NA	-	NA
25	Dec-03	**60**	< 100	< 0.3	< 0.3	< 0.3	< 0.6	-	< 5.0

NA = Not Analyzed for this Constituent
NS = Not Sampled (no surface water present during sampling event)



LEGEND

- MW-1 — Groundwater monitoring well MW-1
- ▲ SW-2 — Area of discolored soil and creek soil and "grab" surface water sample location SW-2
- — 1000 — TPHg isoconcentration in µg/L
- Tree

NOTES

Locations and dimensions of roads, trails, creek, and parking lot are approximate

All concentrations in µg/L (micrograms per liter)

UFST = Underground fuel storage tank

NS = Not sampled

ND = Not detected

MTBE = Methyl tertiary butyl ether

TPHg = Total petroleum hydrocarbons – gasoline range

TPHd = Total petroleum hydrocarbons – diesel range

BTEX = Benzene, toluene, ethylbenzene and total xylenes

0 20
Scale in feet

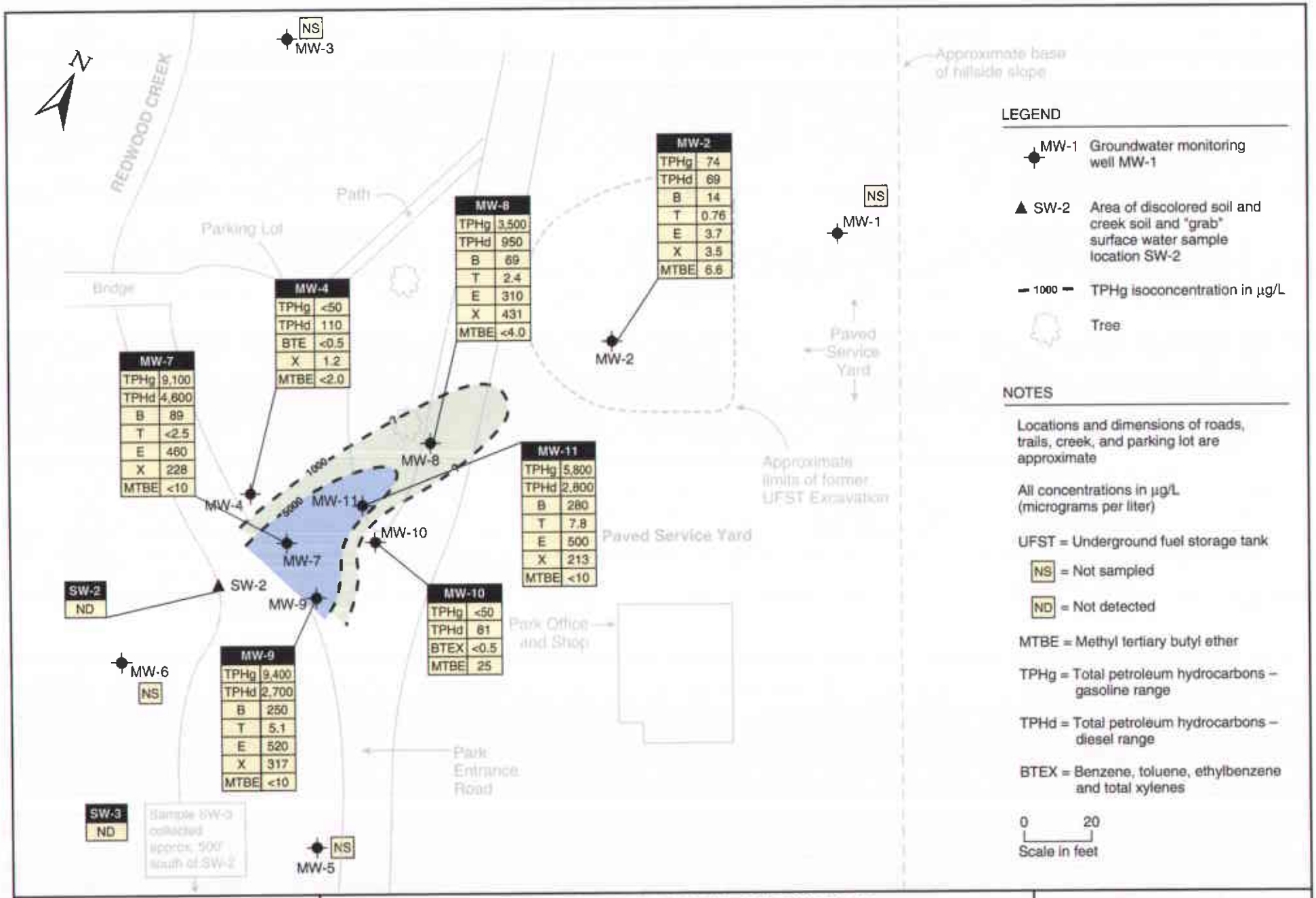
★ Stellar Environmental Solutions
Geoscience & Engineering Consulting

GROUNDWATER MONITORING WELL AND SURFACE WATER ANALYTICAL RESULTS–SEPTEMBER, 2001
Redwood Regional Park Service Yard, Oakland, CA

Figure 4

by: MJC | OCTOBER 2001

2001-53-02



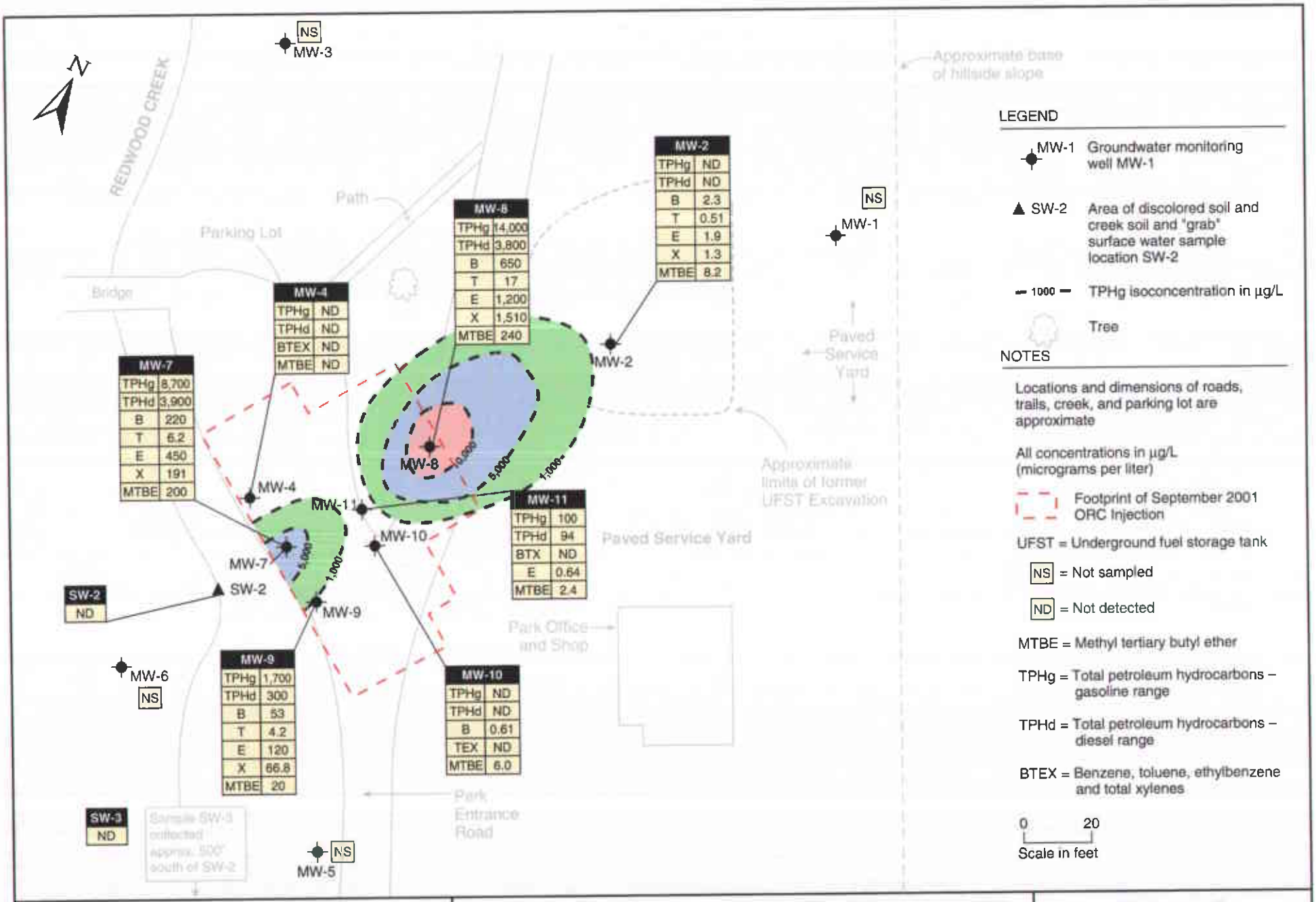
Stellar Environmental Solutions, Inc.
Geoscience & Engineering Consulting

GROUNDWATER MONITORING WELL AND SURFACE WATER ANALYTICAL RESULTS–DECEMBER, 2001
Redwood Regional Park Service Yard, Oakland, CA

Figure 4

by: MJC | JANUARY 2002

2001-53-17



Stellar Environmental Solutions

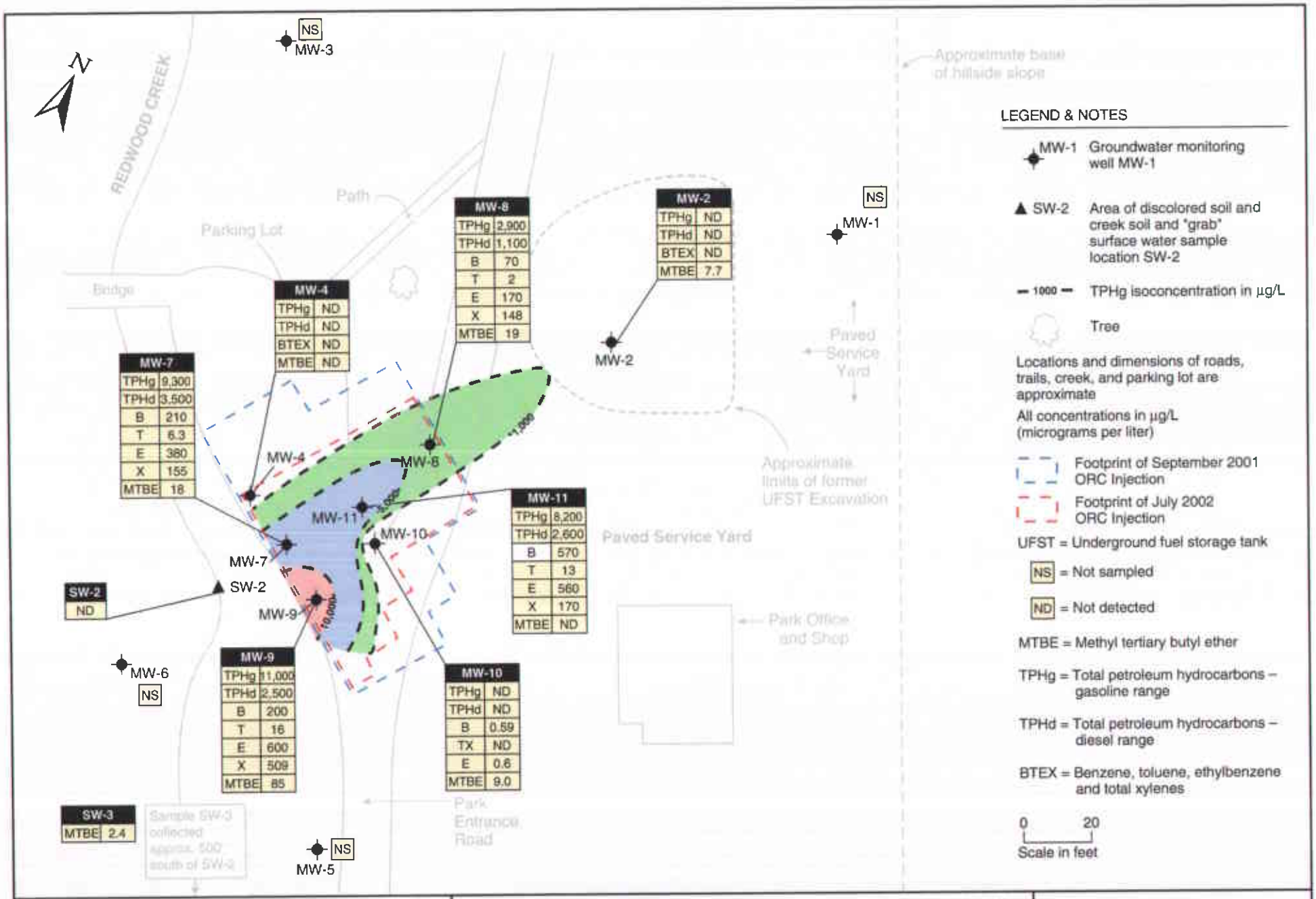
Geoscience & Engineering Consulting

GROUNDWATER MONITORING WELL AND SURFACE WATER ANALYTICAL RESULTS—MARCH 2002
Redwood Regional Park Service Yard, Oakland, CA

Figure 5

by: MJC | APRIL 2002

2001-53-18



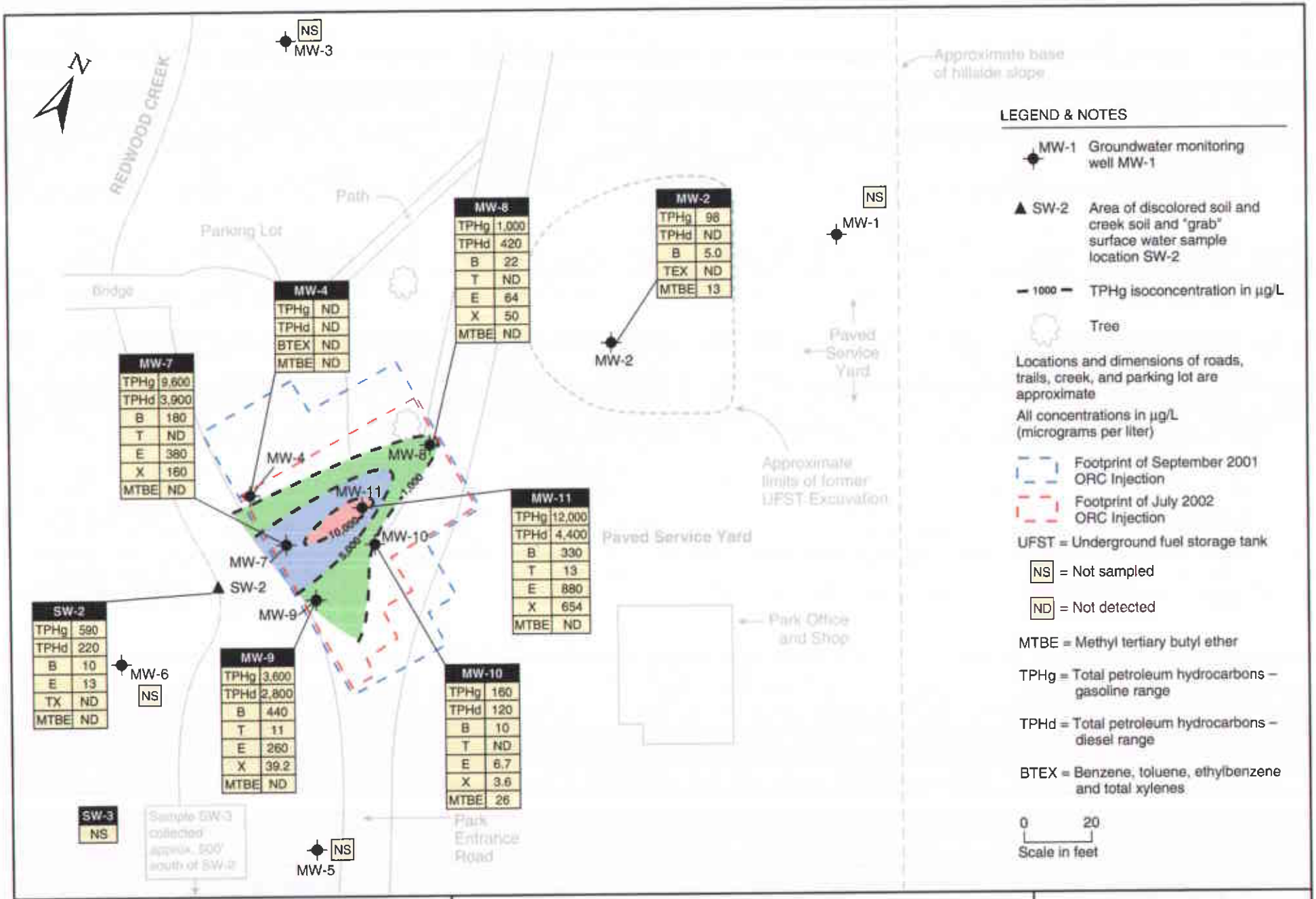
Stellar Environmental Solutions
Geoscience & Engineering Consulting

GROUNDWATER MONITORING WELL AND SURFACE WATER ANALYTICAL RESULTS—JULY 2002
Redwood Regional Park Service Yard, Oakland, CA

Figure 4

by: MJC | JULY 2002

2001-53-22



Stellar Environmental Solutions

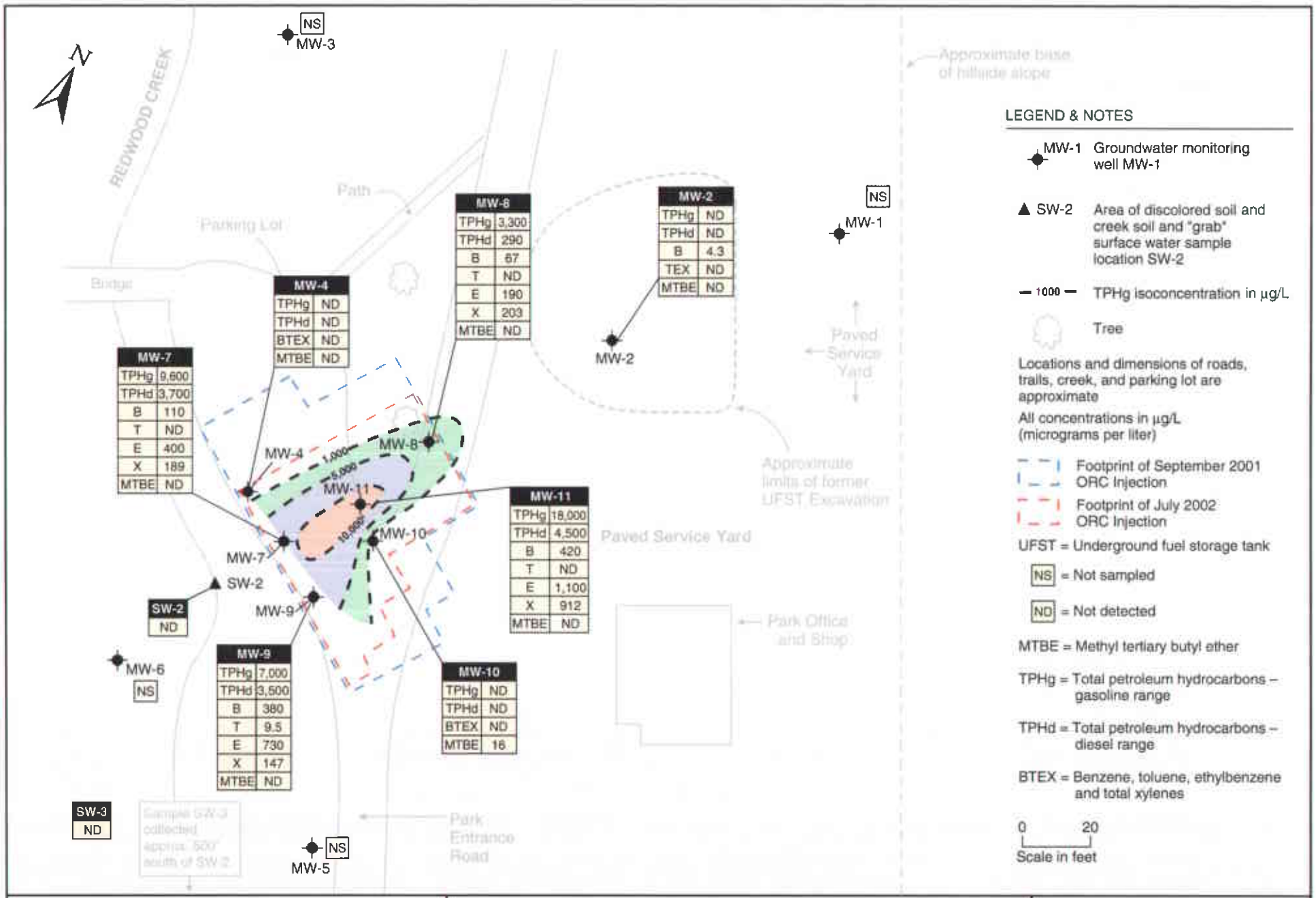
Geoscience & Engineering Consulting

ANALYTICAL RESULTS AND TPH-GAS PLUME—SEPTEMBER 2002
Redwood Regional Park Service Yard, Oakland, CA

Figure 4

by: MJC | OCTOBER 2002

2001-03-25



Stellar Environmental Solutions

Geoscience & Engineering Consulting

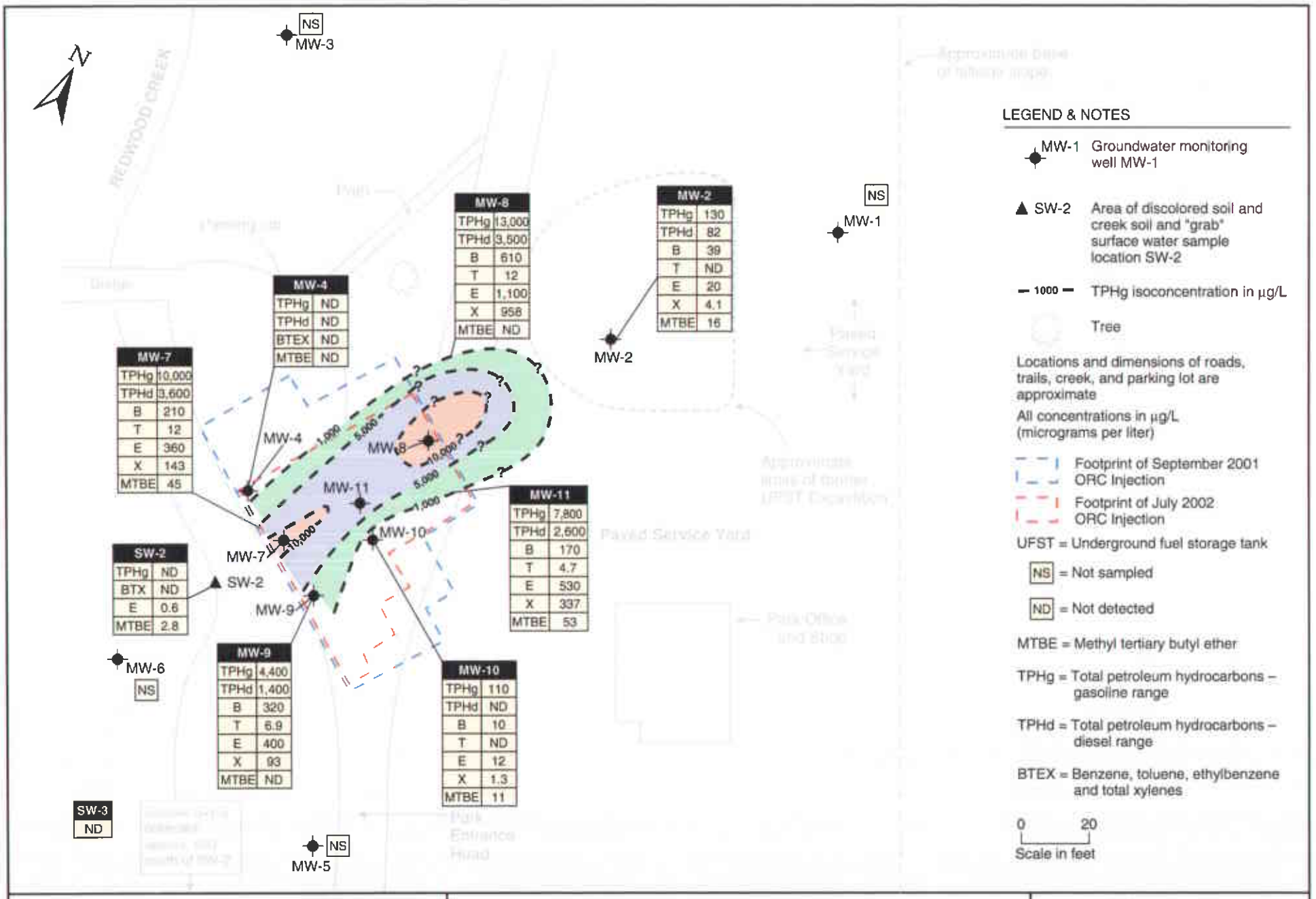
ANALYTICAL RESULTS AND TPH-GAS PLUME—DECEMBER 2002

Redwood Regional Park Service Yard, Oakland, CA

Figure 4

by: MJC | JANUARY 2003

2003-02-02



Stellar Environmental Solutions

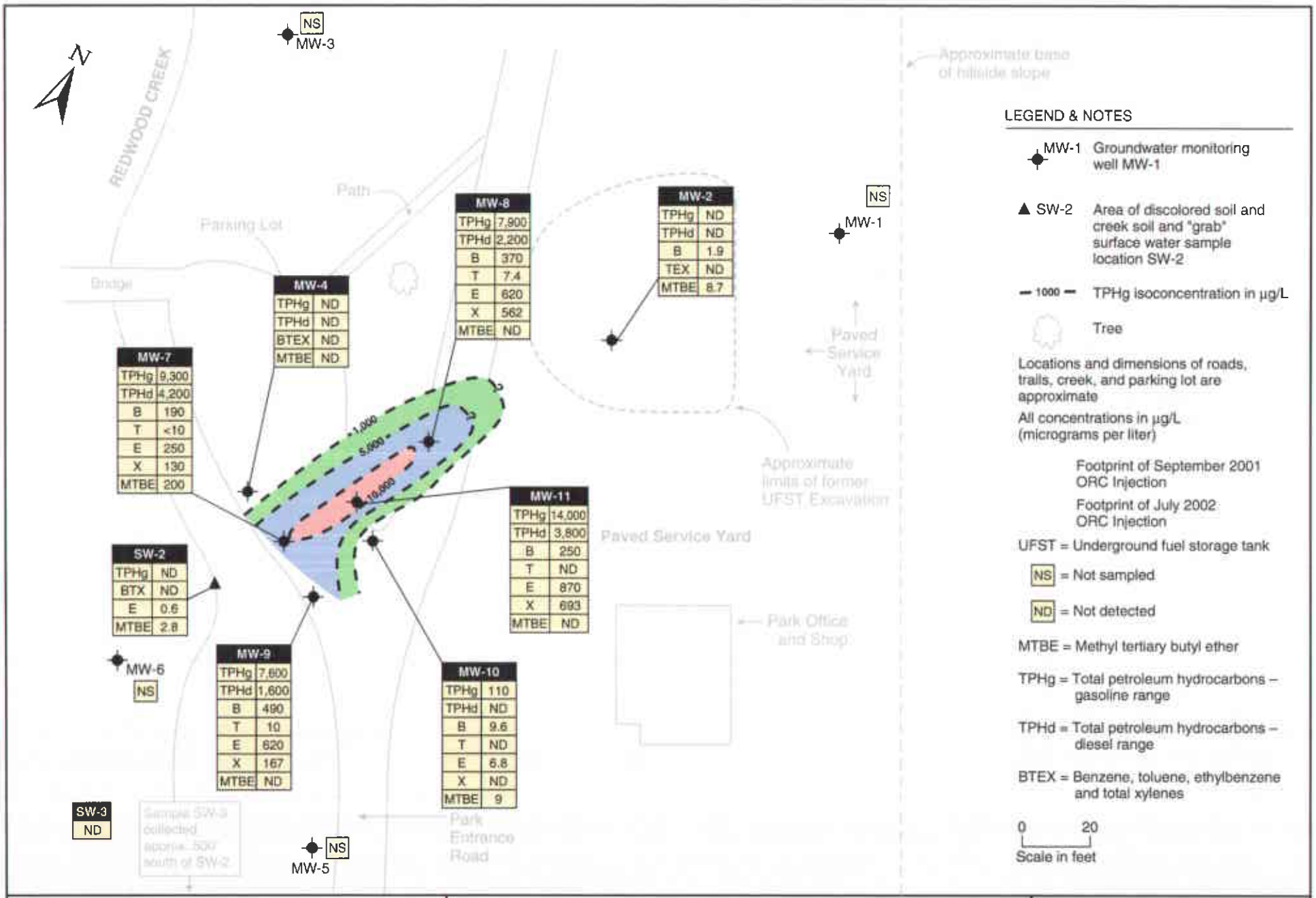
Geoscience & Engineering Consulting

ANALYTICAL RESULTS AND TPH-GAS PLUME—MARCH 27, 2003
Redwood Regional Park Service Yard, Oakland, CA

Figure 4

by: MJC | APRIL 2003

2003-02-07



Stellar Environmental Solutions

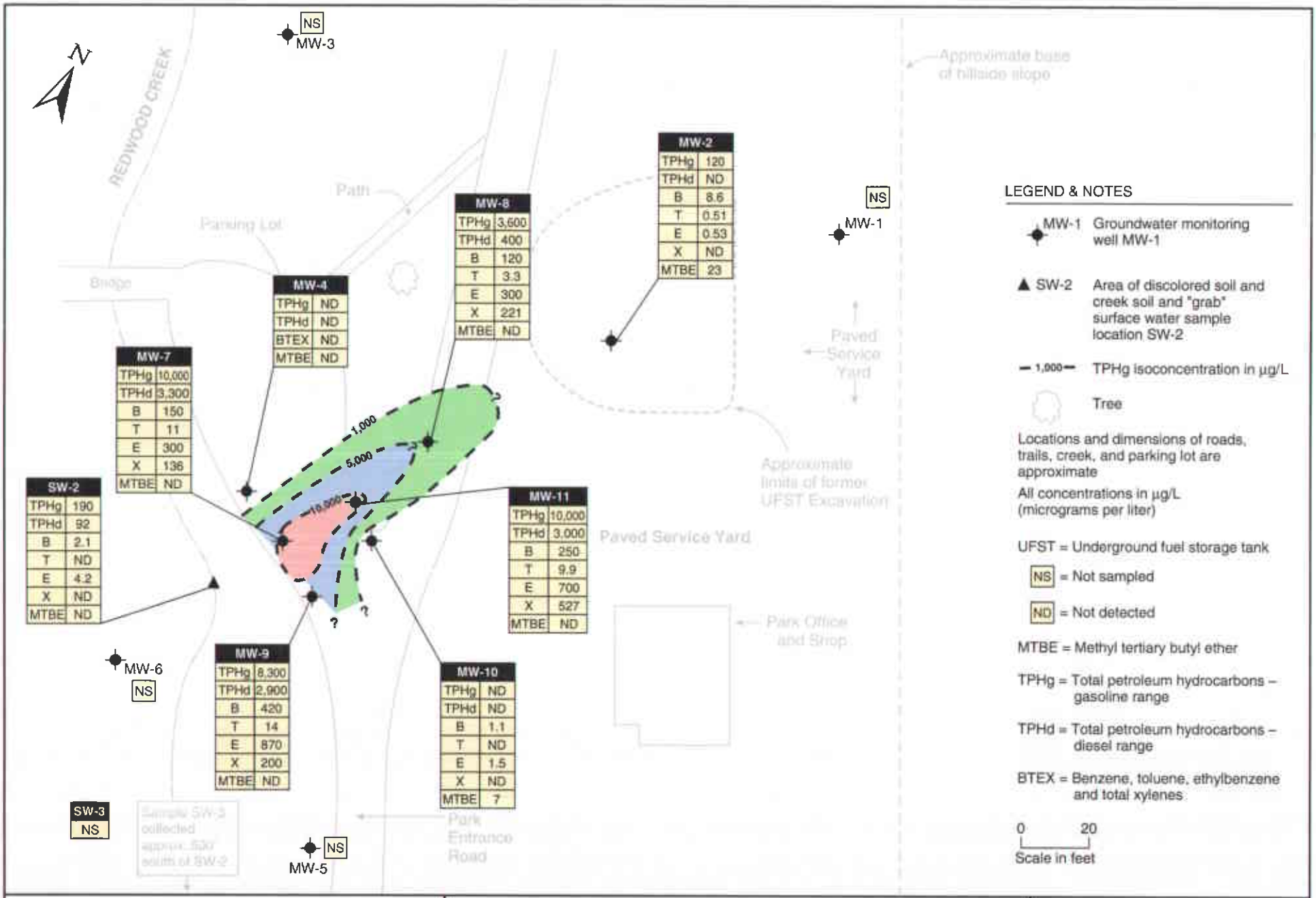
Geoscience & Engineering Consulting

ANALYTICAL RESULTS AND TPH-GAS PLUME—JUNE 19, 2003
Redwood Regional Park Service Yard, Oakland, CA

Figure 4

by: MJC | JULY 2003

2003-02-10



Stellar Environmental Solutions

Geoscience & Engineering Consulting

ANALYTICAL RESULTS AND TPH-GAS PLUME—SEPTEMBER, 2003

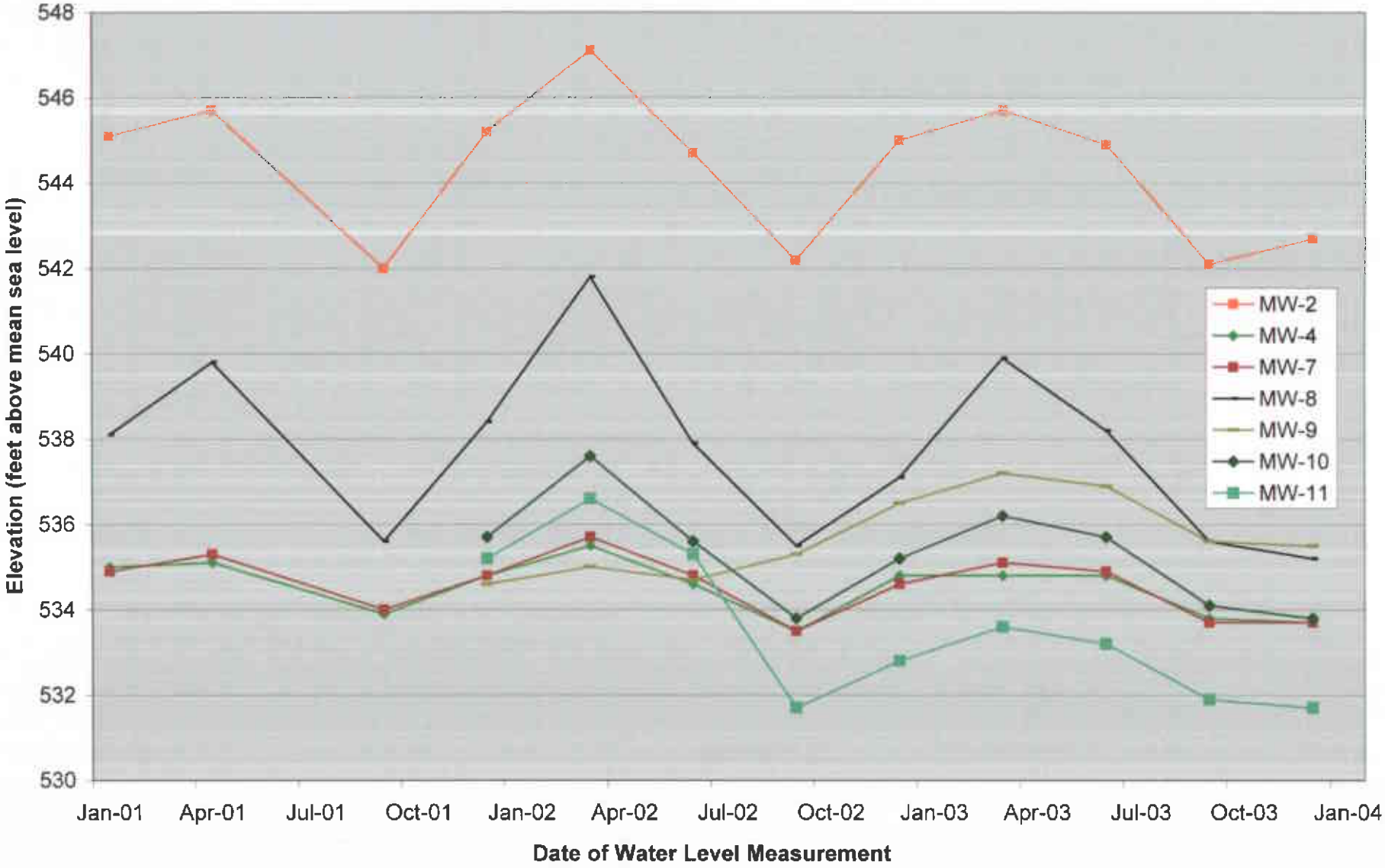
Redwood Regional Park Service Yard, Oakland, CA

Figure 4

by: MJC | SEPTEMBER 2003

2003-02-12

Historical Groundwater Elevations
Redwood Regional Park Service Yard - Oakland, California



HISTORICAL GROUNDWATER ELEVATIONS
REDWOOD REGIONAL PARK SERVICE YARD
7867 REDWOOD ROAD, OAKLAND, CALIFORNIA

Well I.D.	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11
TOC Elevation	565.90	566.50	560.90	548.10	547.50	545.60	547.70	549.20	549.40	547.30	547.90
Date Monitored	Groundwater Elevations (feet above mean sea level)										
September 18, 1998	563.72	544.19	540.80	534.51	531.06	545.60					
April 6, 1999	565.15	546.90	542.25	535.59	532.30	532.88					
December 20, 1999	562.90	544.70	541.46	534.89	531.16	532.22					
September 28, 2000	562.80	542.74	538.34	532.21	530.90	531.95					
January 11, 2001	562.90	545.10	541.70	535.00	531.20	532.30	534.90	538.10			
April 13, 2001	562.10	545.70	541.70	535.10	531.50	532.40	535.30	539.80			
September 1, 2001	560.90	542.00	537.70	533.90	530.70	531.80	534.00	535.60			
December 17, 2001	562.20	545.20	542.20	534.80	531.40	532.40	534.80	538.40	534.60	535.70	535.20
March 14, 2002	563.00	547.10	542.20	535.50	532.40	533.30	535.70	541.80	535.00	537.60	536.60
June 18, 2002	562.10	544.70	541.10	534.60	531.20	532.20	534.80	537.90	534.70	535.60	535.30
September 24, 2002	561.40	542.20	537.30	533.50	530.60	531.80	533.50	535.50	535.30	533.80	531.70
December 18, 2002	562.40	545.00	542.00	534.80	531.50	532.50	534.60	537.10	536.50	535.20	532.80
March 27, 2003	562.60	545.70	541.70	534.80	531.60	532.40	535.10	539.90	537.20	536.20	533.60
June 19, 2003	562.30	544.90	541.50	534.80	531.30	532.30	534.90	538.20	536.90	535.70	533.20
September 10, 2003	561.60	542.10	537.90	533.80	530.80	531.90	533.70	535.60	535.60	534.10	531.90
December 10, 2003	562.40	542.70	537.60	533.70	530.90	531.90	533.70	535.20	535.50	533.80	531.70

Notes:

TOC = Top of well Casing

WELLHEAD INSPECTION CHECKLIST

Client Stellar Environmental Date 12-10-03

Site Address Redwood Regional Park Oakland, CA

Job Number 031210-ACI Technician AC

Well ID	Well Inspected - No Corrective Action Required	Water Bailed From Wellbox	Wellbox Components Cleaned	Cap Replaced	Lock Replaced	Other Action Taken (explain below)	Well Not Inspected (explain below)	Repair Order Submitted
MW-1	X							
MW-2	X							
MW-3	X							
MW-4	X							
MW-5	X							
MW-6	X							
MW-7	X							
MW-8						X		
MW-9	X							
MW-10	X							
MW-11	X							

NOTES: MW-8 1bolt missing

WELL GAUGING DATA

Project # 031210-Acl Date 12.10.03 Client Stellar Environ

Site Redwood Regional Park Oakland CA

Well ID	Well Size (in.)	Sheen / Odor	Depth to Immiscible Liquid (ft.)	Thickness of Immiscible Liquid (ft.)	Volume of Immiscibles Removed (ml)	Depth to water (ft.)	Depth to well bottom (ft.)	Survey Point: TOB or TOC	
MW-1	4					3.52	19.20	TOC	
MW-2	4					23.85	39.00		P
MW-3	4					23.32	45.10		
MW-4	4					14.37	26.45		P
MW-5	4					16.60	27.00		
MW-6	4					13.73	27.55		
MW-7	2					14.05	25.43		P
MW-8	2					14.00	22.30		P
MW-9	2					13.95	26.30		P
MW-10	2					13.55	28.35		P
MW-11	2					16.20	30.30		P

WELL MONITORING DATA SHEET

Project #: 031210-Acl	Client: Stellar Environ.
Sampler: AC	Date: 12-10-03
Well I.D.: MW-1	Well Diameter: 2 3 (4) 6 8 ____
Total Well Depth (TD): 19.20	Depth to Water (DTW): 3.52
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: (PVC) Grade	D.O. Meter (if req'd): YSI (HACH)
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]:	

Purge Method: Bailer, Disposable Bailer, Positive Air Displacement, Electric Submersible, Waterra, Peristaltic, Extraction Pump, Other_____

Sampling Method: Bailer, (Disposable Bailer), Extraction Port, Dedicated Tubing, Other: _____

Field Analysis

_____(Gals.) X _____ = _____ Gals.
Case Volume | Specified Volumes | Calculated Volume

Well Diameter	Multiplier	Well Diameter	Multiplier
1"	0.04	4"	0.65
2"	0.16	6"	1.47
3"	0.37	Other	radius^2 * 0.163

Time	Temp (°F or (°C))	pH	Cond. (mS or µS)	Turbidity (NTUs)	Gals. Removed	Observations
0915	12.8	7.0	916	11	—	Fe^{2+}: 0 mg/L

Did well dewater? Yes No Gallons actually evacuated:

Sampling Date: Sampling Time: Depth to Water:

Sample I.D.: Laboratory: Kiff CalScience Other Associated

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

EB I.D. (if applicable): @ Time Duplicate I.D. (if applicable):

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

D.O. (if req'd):	(Pre-purge):	0.2	mg/L	Post-purge:	mg/L
O.R.P. (if req'd):	Pre-purge:	16	mV	Post-purge:	mV

WELL MONITORING DATA SHEET

Project #: 031210-Acl	Client: Stellar Environ.
Sampler: AC	Date: 12.10.03
Well I.D.: MW-2	Well Diameter: 2 3 (4) 6 8 ____
Total Well Depth (TD): 39.00	Depth to Water (DTW): 23.85
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: (PVC) Grade	D.O. Meter (if req'd): YSI (HACH)
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]: 26.88	

Purge Method: Bailer; Disposable Bailer; Positive Air Displacement; (Electric Submersible); Waterra; Peristaltic; Extraction Pump; Other_____

Sampling Method: Bailer; (Disposable Bailer); Extraction Port; Dedicated Tubing; Other: _____

10 (Gals.) X 3 = 30 Gals.
1 Case Volume | Specified Volumes | Calculated Volume

Well Diameter	Multiplier	Well Diameter	Multiplier
1"	0.04	4"	0.65
2"	0.16	6"	1.47
3"	0.37	Other	radius² * 0.163

Time	Temp (°F or (°C))	pH	Cond. (mS or (µS))	Turbidity (NTUs)	Gals. Removed	Observations
0930	—	—	—	—	—	Fe^{2+}: 0.1 mg/L
1044	13.8	6.6	830	47	10	slight odor
wtr	dewatered	@			15 gal	
1415	14.4	6.7	910	196	—	

Did well dewater? (Yes) No Gallons actually evacuated: 15

Sampling Date: 12.10.03 Sampling Time: 1415 Depth to Water: 24.21

Sample I.D.: MW-2 Laboratory: Kiff CalScience Other Associated

Analyzed for: (TPH-G) (BTEX) (MTBE) (TPH-D) Oxygenates (5) Other:

EB I.D. (if applicable): @ Time Duplicate I.D. (if applicable):

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

D.O. (if req'd): (Pre-purge)	0.6	mg/L	Post-purge:	mg/L
O.R.P. (if req'd): (Pre-purge)	62	mV	Post-purge:	mV

WELL MONITORING DATA SHEET

Project #: 031210-Ac1	Client: Stellar Environ.
Sampler: AC	Date: 12.10.03
Well I.D.: MW-3	Well Diameter: 2 3 (4) 6 8 ___
Total Well Depth (TD): 45.10	Depth to Water (DTW): 23.32
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: (PVC) Grade	D.O. Meter (if req'd): YSI (HACH)
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]:	

Purge Method: Bailer; Disposable Bailer; Positive Air Displacement; Electric Submersible; Waterra; Peristaltic; Extraction Pump; Other_____

Sampling Method: Bailer; (Disposable Bailer); Extraction Port; Dedicated Tubing; Other: _____

Field Analysis

_____(Gals.) X _____ = _____ Gals.
Case Volume | Specified Volumes | Calculated Volume

Well Diameter	Multiplier	Well Diameter	Multiplier
1"	0.04	4"	0.65
2"	0.16	6"	1.47
3"	0.37	Other	radius² * 0.163

Time	Temp (°F or °C)	pH	Cond. (mS or µS)	Turbidity (NTUs)	Gals. Removed	Observations
0945	—	—	—	—	—	Fe^{2+}: 0 mg/L

Did well dewater? Yes (No) Gallons actually evacuated: —

Sampling Date: 12.10.03 Sampling Time: 0945 Depth to Water:

Sample I.D.: MW-3 Laboratory: Kiff CalScience Other Associated

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other: Nitrate + Sulfate

EB I.D. (if applicable): @ Time Duplicate I.D. (if applicable):

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

D.O. (if req'd):	(Pre-purge)	1.0 mg/L	Post-purge:	mg/L
O.R.P. (if req'd):	(Pre-purge)	99 mV	Post-purge:	mV

WELL MONITORING DATA SHEET

Project #: 031210-Ac1	Client: Stellar Environ.
Sampler: AC	Date: 12-10-03
Well I.D.: MW-4	Well Diameter: 2 3 (4) 6 8 ___
Total Well Depth (TD): 26.45	Depth to Water (DTW): 14.37
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: (PVC) Grade	D.O. Meter (if req'd): YSI (HACH)
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]: 16.78	

Purge Method: Bailer; Disposable Bailer; Positive Air Displacement; (Electric Submersible); Waterra; Peristaltic; Extraction Pump; Other_____

Sampling Method: Bailer; (Disposable Bailer); Extraction Port; Dedicated Tubing; Other: _____

8 (Gals.) X	3	=	24 Gals.
1 Case Volume	Specified Volumes		Calculated Volume

Well Diameter	Multiplier	Well Diameter	Multiplier
1"	0.04	4"	0.65
2"	0.16	6"	1.47
3"	0.37	Other	radius² * 0.163

Time	Temp (°F or (°C))	pH	Cond. (mS or (µS))	Turbidity (NTUs)	Gals. Removed	Observations
1120	—	—	—	—	—	Fe²⁺: 0 mg/L
1259	13.2	7.9	895	40	8	clear
1301	well	dewatered @			8gal	
1405	13.4	7.9	861	31	—	

Did well dewater? (Yes) No Gallons actually evacuated: 8

Sampling Date: 12-10-03 Sampling Time: Pre 1120 Post 1405 Depth to Water: 15.31

Sample I.D.: MW-4 Laboratory: Kiff CalScience Other Associated

Analyzed for: (TPH-G) (BTEX) (MTBE) (TPH-D) Oxygenates (5) Other: Nitrate + Sulfate

EB I.D. (if applicable): @ Time Duplicate I.D. (if applicable):

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

D.O. (if req'd):	(Pre-purge):	13.0	mg/L	Post-purge:	mg/L
O.R.P. (if req'd):	(Pre-purge):	146	mV	Post-purge:	mV

WELL MONITORING DATA SHEET

Project #: 031210-Ac	Client: Stellar Environ.
Sampler: AC	Date: 12.10.03
Well I.D.: MW-5	Well Diameter: 2 3 (4) 6 8 ___
Total Well Depth (TD): 27.00	Depth to Water (DTW): 16.60
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: (PVC) Grade	D.O. Meter (if req'd): YSI (HACH)
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]:	

Purge Method: Bailer; Disposable Bailer; Positive Air Displacement; Electric Submersible; Waterra; Peristaltic; Extraction Pump; Other_____

Sampling Method: Bailer; (Disposable Bailer); Extraction Port; Dedicated Tubing; Other: _____

Field Analysis

_____(Gals.) X _____ = _____ Gals.
Case Volume Specified Volumes Calculated Volume

Well Diameter	Multiplier	Well Diameter	Multiplier
1"	0.04	4"	0.65
2"	0.16	6"	1.47
3"	0.37	Other	radius^2 * 0.163

Time	Temp (°F or °C)	pH	Cond. (mS or µS)	Turbidity (NTUs)	Gals. Removed	Observations
1020	—	—	—	—	—	Fe^{2+}: 0 mg/L

Did well dewater? Yes No Gallons actually evacuated:

Sampling Date: Sampling Time: Depth to Water:

Sample I.D.: Laboratory: Kiff CalScience Other Associated

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

EB I.D. (if applicable): @ Time Duplicate I.D. (if applicable):

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

D.O. (if req'd):	Pre-purge:	1.0 mg/L	Post-purge:	mg/L
O.R.P. (if req'd):	Pre-purge:	152 mV	Post-purge:	mV

WELL MONITORING DATA SHEET

Project #: 031210-Acl	Client: Stellar Environ.
Sampler: AC	Date: 12-10-03
Well I.D.: MW-6	Well Diameter: 2 3 (4) 6 8 ___
Total Well Depth (TD): 27.55	Depth to Water (DTW): 13.73
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: (PVC) Grade	D.O. Meter (if req'd): YSI (HACH)
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]:	

Purge Method: Bailer, Disposable Bailer, Positive Air Displacement, Electric Submersible, Waterra, Peristaltic, Extraction Pump, Other_____

Sampling Method: Bailer, (Disposable Bailer), Extraction Port, Dedicated Tubing, Other: _____

Field Analysis

_____(Gals.) X _____ = _____ Gals.
1 Case Volume | Specified Volumes | Calculated Volume

Well Diameter	Multiplier	Well Diameter	Multiplier
1"	0.04	4"	0.65
2"	0.16	6"	1.47
3"	0.37	Other	radius² * 0.163

Time	Temp (°F or °C)	pH	Cond. (mS or µS)	Turbidity (NTUs)	Gals. Removed	Observations
1040	—	—	—	—	—	Fe2+: 0.6 mg/L

Did well dewater? Yes No Gallons actually evacuated:

Sampling Date: Sampling Time: Depth to Water:

Sample I.D.: Laboratory: Kiff CalScience Other Associated

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

EB I.D. (if applicable): @ Time Duplicate I.D. (if applicable):

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

D.O. (if req'd):	(Pre-purge)	2.0	mg/L	Post-purge:	mg/L
O.R.P. (if req'd):	(Pre-purge)	134	mV	Post-purge:	mV

WELL MONITORING DATA SHEET

Project #: 031210-AC1	Client: Stellar Environ.
Sampler: AC	Date: 12.10.03
Well I.D.: MW-7	Well Diameter: (2) 3 4 6 8 ___
Total Well Depth (TD): 25.43	Depth to Water (DTW): 14.05
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: (PVC) Grade	D.O. Meter (if req'd): YSI (HACH)

DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]: 16.32

Purge Method: Bailer; (Disposable Bailer); Positive Air Displacement; Electric Submersible; Waterra; Peristaltic; Extraction Pump; Other_____

Sampling Method: Bailer; (Disposable Bailer); Extraction Port; Dedicated Tubing; Other: _____

Well Diameter	Multiplier	Well Diameter	Multiplier
1"	0.04	4"	0.65
2"	0.16	6"	1.47
3"	0.37	Other	radius² * 0.163

2 (Gals.) X 3 = 6 Gals.
Case Volume; Specified Volumes; Calculated Volume

Time	Temp (°F or (°C))	pH	Cond. (mS or (µS))	Turbidity (NTUs)	Gals. Removed	Observations
1145	—	—	—	—	—	Fe^{2+}: 3.8 mg/L
1331	13.6	6.8	797	188	2	Cloudy/odor
1333	13.9	6.7	792	214	4	"
1335	13.8	6.6	780	317	6	"

Did well dewater? Yes (No) Gallons actually evacuated: 6

Sampling Date: 12.10.03 Sampling Time: Pre 1145 Post 1340 Depth to Water: 15.89

Sample I.D.: MW-7 Laboratory: Kiff CalScience Other Associated

Analyzed for: (TPH-G) (BTEX) (MTBE) (TPH-D) Oxygenates (5) Other: Nitrate + Sulfate

EB I.D. (if applicable): @ Time Duplicate I.D. (if applicable):

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

D.O. (if req'd):	(Pre-purge):	0.2	mg/L	Post-purge:	mg/L
O.R.P. (if req'd):	(Pre-purge):	15	mV	Post-purge:	mV

WELL MONITORING DATA SHEET

Project #: 031210-AC1	Client: Stellar Environ.
Sampler: AC	Date: 12.10.03
Well I.D.: MW-8	Well Diameter: (2) 3 4 6 8 ___
Total Well Depth (TD): 22.30	Depth to Water (DTW): 14.00
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: (PVC) Grade	D.O. Meter (if req'd): YSI (HACH)
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]: 15.66	

Purge Method: Bailer; (Disposable Bailer); Positive Air Displacement; Electric Submersible; Waterra; Peristaltic; Extraction Pump; Other_____

Sampling Method: Bailer; (Disposable Bailer); Extraction Port; Dedicated Tubing; Other: _____

1.5 (Gals.) X 3 = 4.5 Gals.
1 Case Volume | Specified Volumes | Calculated Volume

Well Diameter	Multiplier	Well Diameter	Multiplier
1"	0.04	4"	0.65
2"	0.16	6"	1.47
3"	0.37	Other	radius² * 0.163

Time	Temp (°F or (°C))	pH	Cond. (mS or (µS))	Turbidity (NTUs)	Gals. Removed	Observations
1000	—	—	—	—	—	Fe^{2+}: 1.0 mg/L
1238	13.1	6.8	831	71000	1.5	cloudy/odor
1241	13.4	6.8	829	71000	3	"
1244	13.5	6.9	819	71000	4.5	"

Did well dewater? Yes (No) Gallons actually evacuated: 4.5

Sampling Date: 12.10.03 Sampling Time: Pre 1000 Post 1250 Depth to Water: 15.08

Sample I.D.: MW-8 Laboratory: Kiff CalScience Other Associated

Analyzed for: (TPH-G) (BTEX) (MTBE) (TPH-D) Oxygenates (5) Other: Nitrate + Sulfate

EB I.D. (if applicable): @ Time Duplicate I.D. (if applicable):

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

D.O. (if req'd):	(Pre-purge):	1.5	mg/L	Post-purge:	mg/L
O.R.P. (if req'd):	(Pre-purge):	128	mV	Post-purge:	mV

WELL MONITORING DATA SHEET

Project #: 031210-Ac1	Client: Stellar Environ.
Sampler: AC	Date: 12.10.03
Well I.D.: MW-9	Well Diameter: (2) 3 4 6 8 ____
Total Well Depth (TD): 26.30	Depth to Water (DTW): 13.95
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: (PVC) Grade	D.O. Meter (if req'd): YSI (HACH)
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]: 16.42	

Purge Method: Bailer; (Disposable Bailer); Positive Air Displacement; Electric Submersible; Waterra; Peristaltic; Extraction Pump; Other_____

Sampling Method: Bailer; (Disposable Bailer); Extraction Port; Dedicated Tubing; Other: _____

Well Diameter	Multiplier	Well Diameter	Multiplier
1"	0.04	4"	0.65
2"	0.16	6"	1.47
3"	0.37	Other	radius^2 * 0.163

2 (Gals.) X 3 = 6 Gals.
Case Volume; Specified Volumes; Calculated Volume

Time	Temp (°F or (°C))	pH	Cond. (mS or (µS))	Turbidity (NTUs)	Gals. Removed	Observations
1130	—	—	—	—	—	Fe^{2+}: 0 mg/L
1311	13.8	6.7	968	108	2	clear
1314	13.8	6.7	966	166	4	clear
1317	14.2	6.6	950	182	6	Cloudy

Did well dewater? Yes (No) Gallons actually evacuated: 6

Sampling Date: 12.10.03 Sampling Time: Pre 1130 Post 1320 Depth to Water: 16.16

Sample I.D.: MW-9 Laboratory: Kiff CalScience Other Associated

Analyzed for: (TPH-G) BTEX (MTBE) (TPH-D) Oxygenates (5) Other: Nitrate + Sulfate

EB I.D. (if applicable): @ Time Duplicate I.D. (if applicable):

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

D.O. (if req'd):	(Pre-purge):	0.8	mg/L	Post-purge:	mg/L
O.R.P. (if req'd):	(Pre-purge):	138	mV	Post-purge:	mV

WELL MONITORING DATA SHEET

Project #: 031210-Ac1	Client: Stellar Environ.
Sampler: AC	Date: 12.10.03
Well I.D.: MW-10	Well Diameter: (2) 3 4 6 8 ____
Total Well Depth (TD): 28.35	Depth to Water (DTW): 13.55
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: (PVC) Grade	D.O. Meter (if req'd): YSI (HACH)
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]: 16.51	

Purge Method: Bailer; (Disposable Bailer); Positive Air Displacement; Electric Submersible; Waterra; Peristaltic; Extraction Pump; Other_____

Sampling Method: Bailer; (Disposable Bailer); Extraction Port; Dedicated Tubing; Other: _____

2.5 (Gals.) X 3 = 7.5 Gals.
1 Case Volume | Specified Volumes | Calculated Volume

Well Diameter	Multiplier	Well Diameter	Multiplier
1"	0.04	4"	0.65
2"	0.16	6"	1.47
3"	0.37	Other	radius² * 0.163

Time	Temp (°F or (°C))	pH	Cond. (mS or (µS))	Turbidity (NTUs)	Gals. Removed	Observations
1110	—	—	—	—	—	Fe^{2+}: 0 mg/L
1214	13.7	7.2	791	236	2.5	cloudy
1218	13.9	7.2	786	161	5	"
1222	13.6	7.2	788	159	7.5	"

Did well dewater? Yes (No) Gallons actually evacuated: 7.5

Sampling Date: 12.10.03 Sampling Time: Pre 1110 Post 1230 Depth to Water: 15.22

Sample I.D.: MW-10 Laboratory: Kiff CalScience Other Associated

Analyzed for: (TPH-G) (BTEX) (MTBE) (TPH-D) Oxygenates (5) Other: Nitrate + Sulfate

EB I.D. (if applicable): @ Time Duplicate I.D. (if applicable):

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

D.O. (if req'd):	(Pre-purge):	9.0	mg/L	Post-purge:	mg/L
O.R.P. (if req'd):	(Pre-purge):	148	mV	Post-purge:	mV

WELL MONITORING DATA SHEET

Project #: 03210-AC1	Client: Stellar Environ
Sampler: AC	Date: 12-10-03
Well I.D.: MW-11	Well Diameter: (2) 3 4 6 8 ____
Total Well Depth (TD): 30.36	Depth to Water (DTW): 16.20
Depth to Free Product:	Thickness of Free Product (feet):
Referenced to: (PVC) Grade	D.O. Meter (if req'd): YSI (HACH)
DTW with 80% Recharge [(Height of Water Column x 0.20) + DTW]: 19.02	

Purge Method: Bailer; (Disposable Bailer); Positive Air Displacement; Electric Submersible; Waterra; Peristaltic; Extraction Pump; Other_____

Sampling Method: Bailer; (Disposable Bailer); Extraction Port; Dedicated Tubing; Other: _____

2.25 (Gals.) X 3 = 6.75 Gals.
Case Volume | Specified Volumes | Calculated Volume

Well Diameter	Multiplier	Well Diameter	Multiplier
1"	0.04	4"	0.65
2"	0.16	6"	1.47
3"	0.37	Other	radius² * 0.163

Time	Temp (°F or (°C))	pH	Cond. (mS or (µS))	Turbidity (NTUs)	Gals. Removed	Observations
1155	—	—	—	—	—	Fe^{2+}: 3.2 mg/L
1346	13.5	6.8	959	266	2.25	cloudy/odor
1349	13.7	6.8	931	309	4.5	"
1352	13.8	6.7	901	328	6.75	"

Did well dewater? Yes (No) Gallons actually evacuated: 6.75

Sampling Date: 12-10-03 Sampling Time: Pre 1155 Post 1355 Depth to Water: 18.75

Sample I.D.: MW-11 Laboratory: Kiff CalScience Other Associated

Analyzed for: (TPH-G) (BTEX) (MTBE) (TPH-D) Oxygenates (5) Other: Nitrate + Sulfate

EB I.D. (if applicable): @ Time Duplicate I.D. (if applicable):

Analyzed for: TPH-G BTEX MTBE TPH-D Oxygenates (5) Other:

D.O. (if req'd):	(Pre-purge)	1.2 mg/L	Post-purge:	mg/L
O.R.P. (if req'd):	(Pre-purge)	-23 mV	Post-purge:	mV

September 2003 Borehole Samples

ASSOCIATED LABORATORIES
806 North Batavia - Orange, California 92868 - 714/771-6900
FAX 714/538-1209

CLIENT Stellar Envirmonmental Solutions (10503)
ATTN: Bruce Rucker
2198 Sixth Street
#201
Berkeley, CA 94710

LAB REQUEST 117492
REPORTED 10/03/2003
RECEIVED 09/27/2003

PROJECT #2003-02
Redwood Park Service Yard

SUBMITTER Client

COMMENTS

This laboratory request covers the following listed samples which were analyzed for the parameters indicated on the attached Analytical Result Report. All analyses were conducted using the appropriate methods as indicated on the report. This cover letter is an integral part of the final report.

Order No.	Client Sample Identification
466333	BH-16-11.5
466334	BH-16-19
466335	BH-17-10
466336	BH-17-13
466337	BH-18-8
466338	BH-18-12
466339	BH-19-10
466340	BH-19-15
466341	BH-20-11
466342	BH-20-13
466343	BH-20-GW

Thank you for the opportunity to be of service to your company. Please feel free to call if there are any questions regarding this report or if we can be of further service.

ASSOCIATED LABORATORIES by,

Edward S. Behare, Ph.D.
Vice President

NOTE: Unless notified in writing , all samples will be discarded by appropriate disposal protocol 30 days from date reported.

TESTING & CONSULTING
Chemical
Microbiological
Environmental

CLIENT Stellar Envirmonmental Solutions (10503)
ATTN: Bruce Rucker
2198 Sixth Street
#201
Berkeley, CA 94710

LAB REQUEST 117492

REPORTED 10/03/2003

RECEIVED 09/27/2003

PROJECT #2003-02
Redwood Park Service Yard

SUBMITTER Client

COMMENTS

This laboratory request covers the following listed samples which were analyzed for the parameters indicated on the attached Analytical Result Report. All analyses were conducted using the appropriate methods as indicated on the report. This cover letter is an integral part of the final report.

Order No.	Client Sample Identification
466344	BH-21-14
466345	BH-21-15.5
466346	BH-22-12
466347	BH-22-15
466348	BH-23-12
466349	BH-23-15.5
466350	Laboratory Method Blank-S
466351	Laboratory Method Blank-W
466425	BH-16-GW

Thank you for the opportunity to be of service to your company. Please feel free to call if there are any questions regarding this report or if we can be of further service.

ASSOCIATED LABORATORIES by,

Edward S. Behare, Ph.D.
Vice President

NOTE: Unless notified in writing , all samples will be discarded by appropriate disposal protocol 30 days from date reported.

TESTING & CONSULTING
Chemical
Microbiological
Environmental

Order #: 466333
Matrix: SOLID
Date Sampled: 09/25/2003
Time Sampled: 09:05
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-16-11.5

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	35	1	1.0	mg/Kg	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	99			%	55 - 200
8021B BTEX + MTBE					
Benzene	0.01	1	0.005	mg/Kg	09/29/03 LT
Ethyl benzene	0.19	5	0.025	mg/Kg	09/29/03 LT
Methyl t - butyl ether	ND	1	0.035	mg/Kg	09/29/03 LT
Toluene	0.22	5	0.025	mg/Kg	09/29/03 LT
Xylene (total)	0.98	5	0.075	mg/Kg	09/29/03 LT
8015M - Gasoline					
Gasoline	35	5	15.0	mg/Kg	09/29/03 LT
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	55			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466334
Matrix: SOLID
Date Sampled: 09/25/2003
Time Sampled: 09:20
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-16-19

Analyte	Result	DF	DLR	Units	Date/Analyst	
8015 TEPH Diesel						
TEPH Diesel	49	1	1.0	mg/Kg	10/01/03	AF
Surrogates				**Units**	**Control Limits**	
o-Terphenyl (sur)	94			%	55 - 200	
8021B BTEX + MTBE						
Benzene	ND	1	0.005	mg/Kg	09/29/03	LT
Ethyl benzene	0.08	1	0.005	mg/Kg	09/29/03	LT
Methyl t - butyl ether	ND	1	0.035	mg/Kg	09/29/03	LT
Toluene	0.04	1	0.005	mg/Kg	09/29/03	LT
Xylene (total)	0.08	1	0.015	mg/Kg	09/29/03	LT
8015M - Gasoline						
Gasoline	5.2	1	3	mg/Kg	09/29/03	LT
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	150			%	55 - 200	

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466335
Matrix: SOLID
Date Sampled: 09/25/2003
Time Sampled: 11:20
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-17-10

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	66	1	1.0	mg/Kg	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	96			%	55 - 200
8021B BTEX + MTBE					
Benzene	ND	25	0.125	mg/Kg	09/30/03 LT
Ethyl benzene	3.7	25	0.125	mg/Kg	09/30/03 LT
Methyl t - butyl ether	ND	25	0.875	mg/Kg	09/30/03 LT
Toluene	0.73	25	0.125	mg/Kg	09/30/03 LT
Xylene (total)	7.7	25	0.375	mg/Kg	09/30/03 LT
8015M - Gasoline					
Gasoline	236	25	75.0	mg/Kg	09/30/03 LT
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	148			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466336
Matrix: SOLID
Date Sampled: 09/25/2003
Time Sampled: 11:45
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-17-13

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	8.5	1	1.0	mg/Kg	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	100			%	55 - 200
8021B BTEX + MTBE					
Benzene	0.04	5	0.025	mg/Kg	09/30/03 LT
Ethyl benzene	0.52	5	0.025	mg/Kg	09/30/03 LT
Methyl t - butyl ether	ND	5	0.175	mg/Kg	09/30/03 LT
Toluene	0.28	25	0.125	mg/Kg	09/30/03 LT
Xylene (total)	0.78	5	0.075	mg/Kg	09/30/03 LT
8015M - Gasoline					
Gasoline	33	5	15.0	mg/Kg	09/30/03 LT
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	161			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466337 **Client:** Stellar Envirmonmental Solutions

Matrix: SOLID **Client Sample ID:** BH-18-8

Date Sampled: 09/25/2003

Time Sampled: 12:20

Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	2.0	1	1.0	mg/Kg	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	95			%	55 - 200
8021B BTEX + MTBE					
Benzene	ND	1	0.005	mg/Kg	09/29/03 LT
Ethyl benzene	ND	1	0.005	mg/Kg	09/29/03 LT
Methyl t - butyl ether	ND	1	0.035	mg/Kg	09/29/03 LT
Toluene	ND	1	0.005	mg/Kg	09/29/03 LT
Xylene (total)	ND	1	0.015	mg/Kg	09/29/03 LT
8015M - Gasoline					
Gasoline	ND	1	3	mg/Kg	09/29/03 LT
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	62			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466338
Matrix: SOLID
Date Sampled: 09/25/2003
Time Sampled: 12:40
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-18-12

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	4.0	1	1.0	mg/Kg	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	81			%	55 - 200
8021B BTEX + MTBE					
Benzene	ND	1	0.005	mg/Kg	09/29/03 LT
Ethyl benzene	0.019	1	0.005	mg/Kg	09/29/03 LT
Methyl t - butyl ether	ND	1	0.035	mg/Kg	09/29/03 LT
Toluene	ND	1	0.005	mg/Kg	09/29/03 LT
Xylene (total)	0.063	1	0.015	mg/Kg	09/29/03 LT
8015M - Gasoline					
Gasoline	ND	1	3	mg/Kg	09/29/03 LT
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	129			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466339 **Client:** Stellar Envirmonmental Solutions

Matrix: SOLID **Client Sample ID:** BH-19-10

Date Sampled: 09/25/2003

Time Sampled: 13:30

Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	55	10	10.0	mg/Kg	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	84			%	55 - 200
8021B BTEX + MTBE					
Benzene	ND	1	0.005	mg/Kg	09/29/03 LT
Ethyl benzene	0.43	5	0.025	mg/Kg	09/29/03 LT
Methyl t - butyl ether	ND	1	0.035	mg/Kg	09/29/03 LT
Toluene	ND	1	0.005	mg/Kg	09/29/03 LT
Xylene (total)	2.0	5	0.075	mg/Kg	09/29/03 LT
8015M - Gasoline					
Gasoline	20	1	3	mg/Kg	09/29/03 LT
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	175			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466340
Matrix: SOLID
Date Sampled: 09/25/2003
Time Sampled: 13:45
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-19-15

Analyte	Result	DF	DLR	Units	Date/Analyst	
8015 TEPH Diesel						
TEPH Diesel	6.0	1	1.0	mg/Kg	10/01/03	AF
Surrogates				**Units**	**Control Limits**	
o-Terphenyl (sur)	72			%	55 - 200	
8021B BTEX + MTBE						
Benzene	0.13	5	0.025	mg/Kg	09/30/03	LT
Ethyl benzene	2.2	25	0.125	mg/Kg	09/30/03	LT
Methyl t - butyl ether	0.15	1	0.035	mg/Kg	09/30/03	LT
Toluene	ND	1	0.005	mg/Kg	09/30/03	LT
Xylene (total)	3.2	25	0.375	mg/Kg	09/30/03	LT
8015M - Gasoline						
Gasoline	170	25	75.0	mg/Kg	09/30/03	LT
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	132			%	55 - 200	

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466341
Matrix: SOLID
Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-20-11
Date Sampled: 09/25/2003
Time Sampled: 15:20
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	1.5	1	1.0	mg/Kg	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	80			%	55 - 200
8021B BTEX + MTBE					
Benzene	ND	1	0.005	mg/Kg	09/29/03 LT
Ethyl benzene	ND	1	0.005	mg/Kg	09/29/03 LT
Methyl t - butyl ether	ND	1	0.035	mg/Kg	09/29/03 LT
Toluene	ND	1	0.005	mg/Kg	09/29/03 LT
Xylene (total)	ND	1	0.015	mg/Kg	09/29/03 LT
8015M - Gasoline					
Gasoline	ND	1	3	mg/Kg	09/29/03 LT
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	57			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466342
Matrix: SOLID
Date Sampled: 09/25/2003
Time Sampled: 15:40
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-20-13

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	77	1	1.0	mg/Kg	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	71			%	55 - 200
8021B BTEX + MTBE					
Benzene	ND	100	0.5	mg/Kg	09/30/03 LT
Ethyl benzene	8.3	100	0.5	mg/Kg	09/30/03 LT
Methyl t - butyl ether	ND	100	3.5	mg/Kg	09/30/03 LT
Toluene	ND	100	0.5	mg/Kg	09/30/03 LT
Xylene (total)	26	100	1.5	mg/Kg	09/30/03 LT
8015M - Gasoline					
Gasoline	792	100	300.0	mg/Kg	09/30/03 LT
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	127			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466343
Matrix: WATER
Date Sampled: 09/25/2003
Time Sampled: 16:00
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-20-GW

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	0.4	1	0.1	mg/L	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	101			%	55 - 200
8021B BTEX + MTBE					
Benzene	9.3	1	0.3	ug/L	09/29/03 LZ
Ethyl benzene	80	5	1.5	ug/L	09/29/03 LZ
Methyl t - butyl ether	7.9	1	5	ug/L	09/29/03 LZ
Toluene	1.7	1	0.3	ug/L	09/29/03 LZ
Xylene (total)	38	1	0.6	ug/L	09/29/03 LZ
8015M - Gasoline					
Gasoline	956	1	50	ug/L	09/29/03 LZ
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	160			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466344
Matrix: SOLID
Date Sampled: 09/26/2003
Time Sampled: 08:45
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-21-14

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	4.0	1	1.0	mg/Kg	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	66			%	55 - 200
8021B BTEX + MTBE					
Benzene	ND	1	0.005	mg/Kg	09/29/03 LT
Ethyl benzene	ND	1	0.005	mg/Kg	09/29/03 LT
Methyl t - butyl ether	ND	1	0.035	mg/Kg	09/29/03 LT
Toluene	ND	1	0.005	mg/Kg	09/29/03 LT
Xylene (total)	ND	1	0.015	mg/Kg	09/29/03 LT
8015M - Gasoline					
Gasoline	ND	1	3	mg/Kg	09/29/03 LT
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	113			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466345
Matrix: SOLID
Date Sampled: 09/26/2003
Time Sampled: 09:00
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-21-15.5

Analyte	Result	DF	DLR	Units	Date/Analyst	
8015 TEPH Diesel						
TEPH Diesel	71	1	1.0	mg/Kg	10/01/03	AF
Surrogates				**Units**	**Control Limits**	
o-Terphenyl (sur)	89			%	55 - 200	
8021B BTEX + MTBE						
Benzene	0.49	25	0.125	mg/Kg	09/30/03	LT
Ethyl benzene	5.6	50	0.25	mg/Kg	09/30/03	LT
Methyl t - butyl ether	ND	25	0.875	mg/Kg	09/30/03	LT
Toluene	ND	25	0.125	mg/Kg	09/30/03	LT
Xylene (total)	14	50	0.75	mg/Kg	09/30/03	LT
8015M - Gasoline						
Gasoline	821	50	150.0	mg/Kg	09/30/03	LT
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	190			%	55 - 200	

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466346
Matrix: SOLID
Date Sampled: 09/26/2003
Time Sampled: 09:40
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-22-12

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	2.3	1	1.0	mg/Kg	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	83			%	55 - 200
8021B BTEX + MTBE					
Benzene	ND	1	0.005	mg/Kg	09/29/03 LT
Ethyl benzene	ND	1	0.005	mg/Kg	09/29/03 LT
Methyl t - butyl ether	ND	1	0.035	mg/Kg	09/29/03 LT
Toluene	ND	1	0.005	mg/Kg	09/29/03 LT
Xylene (total)	ND	1	0.015	mg/Kg	09/29/03 LT
8015M - Gasoline					
Gasoline	ND	1	3	mg/Kg	09/29/03 LT
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	124			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466347
Matrix: SOLID
Date Sampled: 09/26/2003
Time Sampled: 10:00
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-22-15

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	13	1	1.0	mg/Kg	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	71			%	55 - 200
8021B BTEX + MTBE					
Benzene	0.07	5	0.025	mg/Kg	09/30/03 LT
Ethyl benzene	0.98	5	0.025	mg/Kg	09/30/03 LT
Methyl t - butyl ether	ND	5	0.175	mg/Kg	09/30/03 LT
Toluene	ND	5	0.025	mg/Kg	09/30/03 LT
Xylene (total)	1.5	5	0.075	mg/Kg	09/30/03 LT
8015M - Gasoline					
Gasoline	17	5	15.0	mg/Kg	09/30/03 LT
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	189			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466348
Matrix: SOLID
Date Sampled: 09/26/2003
Time Sampled: 10:30
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-23-12

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	2.0	1	1.0	mg/Kg	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	67			%	55 - 200
8021B BTEX + MTBE					
Benzene	ND	1	0.005	mg/Kg	09/30/03 LT
Ethyl benzene	ND	1	0.005	mg/Kg	09/30/03 LT
Methyl t - butyl ether	ND	1	0.035	mg/Kg	09/30/03 LT
Toluene	ND	1	0.005	mg/Kg	09/30/03 LT
Xylene (total)	ND	1	0.015	mg/Kg	09/30/03 LT
8015M - Gasoline					
Gasoline	ND	1	3	mg/Kg	09/30/03 LT
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	93			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466349
Matrix: SOLID
Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-23-15.5
Date Sampled: 09/26/2003
Time Sampled: 10:40
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
8015 TEPH Diesel						
TEPH Diesel	54	1	1.0	mg/Kg	10/01/03	AF
Surrogates				**Units**	**Control Limits**	
o-Terphenyl (sur)	71			%	55 - 200	
8021B BTEX + MTBE						
Benzene	ND	50	0.25	mg/Kg	09/30/03	LT
Ethyl benzene	2.8	50	0.25	mg/Kg	09/30/03	LT
Methyl t - butyl ether	ND	50	1.75	mg/Kg	09/30/03	LT
Toluene	3.4	50	0.25	mg/Kg	09/30/03	LT
Xylene (total)	9.0	50	0.75	mg/Kg	09/30/03	LT
8015M - Gasoline						
Gasoline	414	50	150.0	mg/Kg	09/30/03	LT
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	150			%	55 - 200	

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466350
Matrix: SOLID
Date Sampled:
Time Sampled:
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: Laboratory Method Blank-S

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	ND	1	1.0	mg/Kg	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	126			%	55 - 200
8021B BTEX + MTBE					
Benzene	ND	1	0.005	mg/Kg	09/29/03 LT
Ethyl benzene	ND	1	0.005	mg/Kg	09/29/03 LT
Methyl t - butyl ether	ND	1	0.035	mg/Kg	09/29/03 LT
Toluene	ND	1	0.005	mg/Kg	09/29/03 LT
Xylene (total)	ND	1	0.015	mg/Kg	09/29/03 LT
8015M - Gasoline					
Gasoline	ND	1	3	mg/Kg	09/29/03 LT
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	106			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466351 **Client:** Stellar Envirmonmental Solutions

Matrix: WATER **Client Sample ID:** Laboratory Method Blank-W

Date Sampled:

Time Sampled:

Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
8015 TEPH Diesel						
TEPH Diesel	ND	1	0.1	mg/L	10/01/03	AF
Surrogates				**Units**	**Control Limits**	
o-Terphenyl (sur)	119			%	55 - 200	
8021B BTEX + MTBE						
Benzene	ND	1	0.3	ug/L	09/29/03	LZ
Ethyl benzene	ND	1	0.3	ug/L	09/29/03	LZ
Methyl t - butyl ether	ND	1	5	ug/L	09/29/03	LZ
Toluene	ND	1	0.3	ug/L	09/29/03	LZ
Xylene (total)	ND	1	0.6	ug/L	09/29/03	LZ
8015M - Gasoline						
Gasoline	ND	1	50	ug/L	09/29/03	LZ
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	128			%	55 - 200	

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 466425
Matrix: WATER
Date Sampled: 09/26/2003
Time Sampled:
Sampled By:

Client: Stellar Envirmonmental Solutions
Client Sample ID: BH-16-GW

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	0.6	1	0.1	mg/L	10/01/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	106			%	55 - 200
8021B BTEX + MTBE					
Benzene	267	10	3.0	ug/L	09/29/03 LZ
Ethyl benzene	780	20	6.0	ug/L	09/29/03 LZ
Methyl t - butyl ether	142	10	50.0	ug/L	09/29/03 LZ
Toluene	7.9	10	3.0	ug/L	09/29/03 LZ
Xylene (total)	485	10	6.0	ug/L	09/29/03 LZ
8015M - Gasoline					
Gasoline	9990	10	500.0	ug/L	09/29/03 LT
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	278*			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

ASSOCIATED LABORATORIES
QA REPORT FORM

QC Sample: LCS/LCSD

Matrix: SOLID

Extraction Method : 3545

Prep. Date: 09/29/03

Analysis Date: 10/01/03

ID#'s in Batch: LR 117492, 117478

Reporting Units = mg/Kg

PREPARATION BLANK / LAB CONTROL SAMPLE RESULTS

			PREP BLK					
			Value	Result	True	%Rec	L.Limit	H.Limit
Test	Method	LCS	ND	26.7	25	107	70%	130%
DIESEL	8015D	LCSD	ND	28.3	25	113	70%	130%

LCS Result = Lab Control Sample Result
True = True Value of LCS
L.Limit / H.Limit = LCS Control Limits

SURROGATE RECOVERY

Sample No.	O-Terphenyl
QC Limit	55-200
Method Blank	126
LCS	144
LCSD	148

ASSOCIATED LABORATORIES
QA REPORT FORM

QC Sample: LCS / LCSD

Matrix: SOLID

Prep. Date: 09/29/03

Analysis Date: 9/29-9/30/03

ID#'s in Batch: LR 117435, 117478, 117492

Reporting Units = mg/Kg

PREPARATION BLANK / LAB CONTROL SAMPLE RESULTS

			PREP BLK					
			Value	Result	True	%Rec	L.Limit	H.Limit
Test	Method	LCS	ND	5.0	5	100	80%	120%
TPH	8015M-G	LCSD	ND	4.9	5	98	80%	120%

LCS Result = Lab Control Sample Result
True = True Value of LCS
L.Limit / H.Limit = LCS Control Limits

SURROGATE RECOVERY

Sample No.	AAA-TFT
QC Limit	55-200
Method Blank	103
LCS	168
LCSD	160

AAA-TFT = a,a,a-Trifluorotoluene

ASSOCIATED LABORATORIES

LCS REPORT FORM

QC Sample: LCS / LCSD

Matrix: SOLID

Prep. Date: 09/29/03

Analysis Date: 9/29-9/30/03

LAB ID#'s in Batch: LR 117492

REPORTING UNITS = mg/Kg

PREPARATION BLANK / LAB CONTROL SAMPLE RESULTS

Test	Method	PREP. BLK	LCS			LCSD	
		Value	Result	TRUE	%Rec	Result	%Rec
Benzene	8021	ND	0.016	0.02	80	0.017	85
Toluene	8021	ND	0.021	0.02	105	0.021	105
Ethylbenzene	8021	ND	0.021	0.02	105	0.021	105
Xylenes	8021	ND	0.062	0.06	103	0.069	115

L.Limit	*H.Limit*
80%	*120%*

LCS = Lab Control Sample Result

TRUE = True Value of LCS

L.LIMIT / H.LIMIT = LCS Control Limits

SURROGATE RECOVERY

Sample No.	AAA-TFT
QC Limit	55-200
Method Blank	106
LCS	141
LCSD	114

AAA-TFT = a,a,a-Trifluorotoluene

ASSOCIATED LABORATORIES
QA REPORT FORM

QC Sample: LCS/LCSD

Matrix: WATER

Extraction Method : 3510 B

Prep. Date: 09/30/03

Analysis Date: 10/01/03

ID#'s in Batch: LR 117492, 117414

Reporting Units = mg/L

PREPARATION BLANK / LAB CONTROL SAMPLE RESULTS

			PREP BLK					
			Value	Result	True	%Rec	L.Limit	H.Limit
Test	Method	LCS	ND	0.84	1	84	80%	120%
DIESEL	8015D	LCSD	ND	0.89	1	89	80%	120%

LCS Result = Lab Control Sample Result
True = True Value of LCS
L.Limit / H.Limit = LCS Control Limits

SURROGATE RECOVERY

Sample No.	O-Terphenyl
QC Limit	55-200
Method Blank	119
LCS	152
LCSD	155

ASSOCIATED LABORATORIES
QA REPORT FORM

QC Sample: LCS / LCSD

Matrix: WATER

Prep. Date: 09/29/03

Analysis Date: 09/29/03-09/30/03

ID#'s in Batch: LR 117433, 117467, 117492

Reporting Units = mg/L

PREPARATION BLANK / LAB CONTROL SAMPLE RESULTS

			PREP BLK					
			Value	Result	True	%Rec	L.Limit	H.Limit
Test	Method	LCS	ND	530	500	106	80%	120%
TPH	8015M-G	LCSD	ND	564	500	113	80%	120%

LCS Result = Lab Control Sample Result
True = True Value of LCS
L.Limit / H.Limit = LCS Control Limits

SURROGATE RECOVERY

Sample No.	AAA-TFT
QC Limit	55-200
Method Blank	128
LCS	185
LCSD	190

AAA-TFT = a,a,a-Trifluorotoluene

ASSOCIATED LABORATORIES

LCS REPORT FORM

QC Sample: LCS / LCSD

Matrix: WATER

Prep. Date: 09/29/03

Analysis Date: 09/29/03

LAB ID#'s in Batch: LR 117433, 117434, 117492

REPORTING UNITS = mg/L

PREPARATION BLANK / LAB CONTROL SAMPLE RESULTS

Test	Method	PREP. BLK	LCS			LCSD	
		Value	Result	TRUE	%Rec	Result	%Rec
Benzene	8021	ND	18.4	20	92	18.8	94
Toluene	8021	ND	19.8	20	99	20.1	101
Ethylbenzene	8021	ND	20.4	20	102	20.8	104
Xylenes	8021	ND	61.6	60	103	61.8	103

LCS = Lab Control Sample Result

TRUE = True Value of LCS

L.LIMIT / H.LIMIT = LCS Control Limits

L.Limit	*H.Limit*
80%	*120%*

SURROGATE RECOVERY

Sample No.	AAA-TFT
QC Limit	55-200
Method Blank	128
LCS	141
LCSD	130

AAA-TFT = a,a,a-Trifluorotoluene

11742

Chain of Custody Record

Lab job no. _____
Date 9/26/03
Page 1 of 2

Laboratory: Associated Laboratories
Address: 806 North Batavia, Orange CA, 714/771-6900
Project Owner: East Bay Regional Park District
Site Address: 7867 Redwood Road, Oakland CA
Project Name: Redwood Park Service Yard
SES Project Number: 2003-02

Method of Shipment: Fed Express
Shipment No.: 8317 9411 2835
Airbill No.: _____
Cooler No.: /
Project Manager: Bruce Rucker
Telephone No.: (510) 644-3123
Fax No.: (510) 644-3859
Samplers: (Signature) Bruce M. Rucker

Field Sample Number	Location/ Depth	Date	Time	Sample Type	Type/Size of Container	Preservation: Cooler	Preservation: Chemical	Filtered	No. of Containers	TVH-gas + BTEX + MTBE (8015 + 8021)	TEH-diesel (8015 + 3510)	Remarks
BH-16-11.5'	11.5'	9/25/03	905	Soil	6" acetate sleeve	✓	—		1	X	X	
BH-16-19'	19'		920				—		1	X	X	
BH-17-10'	10'		1120				—		1	X	X	
BH-17-13'	13'		1145				—		1	X	X	
BH-18-8'	8'		1220				—		1	X	X	
BH-18-12'	12'		1240				—		1	X	X	
BH-19-10'	10'		1330				—		1	X	X	
BH-19-15'	15'		1345				—		1	X	X	
BH-20-11'	11'		1520				—		1	X	X	
BH-20-13'	13'		1540	↓	↓		—		1	X	X	
BH-20-GW	—		1600	GW	40 ml VOA		HCl		2	X	X	
" "	—	↓	"	GW	1-L amber glass	↓	None		1			X	

Relinquished by:	Date	Received by:	Date
Signature: B.M. Rucker	9/26/03	Signature:	9/27
Printed: Bruce M. Rucker	Time: 1530	Printed:	Time: 1020
Company: Stellar Env. Solns		Company:	

Relinquished by:	Date	Received by:	Date
Signature:		Signature:	
Printed:	Time:	Printed:	Time:
Company:		Company:	

Relinquished by:	Date	Received by:	Date
Signature:		Signature:	
Printed:	Time:	Printed:	Time:
Company:		Company:	

Turnaround Time: Normal

Comments:
BH-20: VOAs collected on 9/25/03. No recharge that day.
TEH containers filled at 0800 on 9/26/03

BH-16-GW was also received, Danielle Roberts was notified and she

2000-00-01

★ Stellar Environmental Solutions

2198 Sixth Street #201, Berkeley, CA 94710

Chain of Custody Record

Lab job no. _____
Date 9/26/03
Page 2 of 2

Laboratory Associated Laboratories
Address 806 North Batavia
Orange CA
714/771-6900
Project Owner East Bay Regional Park District
Site Address 7867 Redwood Road
Oakland CA
Project Name Redwood Park Service Yard
SES Project Number 2003-02

Method of Shipment Fed Express
Shipment No. 8317 9411 2835
Airbill No. _____
Cooler No. /
Project Manager Bruce Rucker
Telephone No. (510) 644-3123
Fax No. (510) 644-3859
Samplers: (Signature) Bruce M. Rucker

Field Sample Number	Location/ Depth	Date	Time	Sample Type	Type/Size of Container	Preservation: Cooler	Preservation: Chemical	Filtered	No. of Containers	TVH-gas + BTEX + MTBE (8015 + 8021)	TEH-diesel	Remarks
BH-21-14'	14'	9/26/03	845	Soil	6" acetate sleeve	Yes			1	X	X	
BH-21-15.5'	15.5'	"	900	"	"	"			1	X	X	
BH-22-12'	12'		940						1	X	X	
BH-22-15'	15'		1000						1	X	X	
BH-23-12'	12'		1030						1	X	X	
BH-23-15.5'	15.5'		1040						1	X	X	

Relinquished by:	Date	Received by:	Date	Relinquished by:	Date	Received by:	Date
Signature B.M. Rucker	9/26/03	Signature		Signature		Signature	
Printed Bruce M. Rucker	Time 1530	Printed	Time	Printed	Time	Printed	Time
Company Stellar Env. Solutions		Company		Company		Company	

Turnaround Time: Normal
Comments:

Relinquished by:	Date	Received by:	Date
Signature		Signature	
Printed	Time	Printed	Time
Company		Company	

2000-00-01

December 2003 Groundwater and Surface Water Samples

ASSOCIATED LABORATORIES
806 North Batavia - Orange, California 92868 - 714/771-6900 FAX 714/538-1209

CLIENT Stellar Environmental Solutions (10503)
ATTN: Bruce Rucker
2198 Sixth Street
#201
Berkeley, CA 94710

LAB REQUEST 121278
REPORTED 12/17/2003
RECEIVED 12/11/2003

PROJECT Redwood Regional Park

SUBMITTER Client

COMMENTS

This laboratory request covers the following listed samples which were analyzed for the parameters indicated on the attached Analytical Result Report. All analyses were conducted using the appropriate methods as indicated on the report. This cover letter is an integral part of the final report.

Order No.	Client Sample Identification
483716	MW-2
483717	MW-3
483718	MW-4
483719	MW-7
483720	MW-8
483721	MW-9
483722	MW-10
483723	MW-11
483724	Laboratory Method Blank

Thank you for the opportunity to be of service to your company. Please feel free to call if there are any questions regarding this report or if we can be of further service.

ASSOCIATED LABORATORIES by,

Edward S. Behare, Ph.D.
Vice President

NOTE: Unless notified in writing , all samples will be discarded by appropriate disposal protocol 30 days from date reported.

TESTING & CONSULTING
Chemical
Microbiological
Environmental

Order #: 483716 **Client:** Stellar Environmental Solutions
Matrix: WATER **Client Sample ID:** MW-2
Date Sampled: 12/10/2003
Time Sampled: 14:15
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	ND	1	0.1	mg/L	12/16/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	114			%	55 - 200
8021B BTEX + MTBE					
Benzene	4.3	1	0.3	ug/L	12/12/03 LZ
Ethyl benzene	1.3	1	0.3	ug/L	12/12/03 LZ
Methyl t - butyl ether	9.4	1	5	ug/L	12/12/03 LZ
Toluene	1.6	1	0.3	ug/L	12/12/03 LZ
Xylene (total)	1.2	1	0.6	ug/L	12/12/03 LZ
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	203*			%	70 - 130
8015M - Gasoline					
Gasoline	282	1	50	ug/L	12/12/03 LZ
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	203*			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 483717 **Client:** Stellar Environmental Solutions

Matrix: WATER **Client Sample ID:** MW-3

Date Sampled: 12/10/2003

Time Sampled: 09:45

Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
300.0 Nitrate as NO3 by Ion Chromatography						
Nitrate (as NO3)	ND	1	0.44	mg/L	12/11/03	GP
Sulfate	37	1	1.0	mg/L	12/11/03	GP

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 483718
Matrix: WATER
Date Sampled: 12/10/2003
Time Sampled: 14:05
Sampled By:

Client: Stellar Environmental Solutions
Client Sample ID: MW-4

Analyte	Result	DF	DLR	Units	Date/Analyst	
300.0 Nitrate as NO3 by Ion Chromatography						
Nitrate (as NO3)	1.3	1	0.44	mg/L	12/11/03	GP
Sulfate	59	1	1.0	mg/L	12/11/03	GP
8015 TEPH Diesel						
TEPH Diesel	ND	1	0.1	mg/L	12/16/03	AF
Surrogates				**Units**	**Control Limits**	
o-Terphenyl (sur)	133			%	55 - 200	
8021B BTEX + MTBE						
Benzene	ND	1	0.3	ug/L	12/12/03	LZ
Ethyl benzene	ND	1	0.3	ug/L	12/12/03	LZ
Methyl t - butyl ether	ND	1	5	ug/L	12/12/03	LZ
Toluene	ND	1	0.3	ug/L	12/12/03	LZ
Xylene (total)	ND	1	0.6	ug/L	12/12/03	LZ
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	187			%	70 - 130	
8015M - Gasoline						
Gasoline	ND	1	50	ug/L	12/12/03	LZ
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	187			%	55 - 200	

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 483719
Matrix: WATER
Date Sampled: 12/10/2003
Time Sampled: 13:40
Sampled By:

Client: Stellar Environmental Solutions
Client Sample ID: MW-7

Analyte	Result	DF	DLR	Units	Date/Analyst	
300.0 Nitrate as NO3 by Ion Chromatography						
Nitrate (as NO3)	ND	1	0.44	mg/L	12/11/03	GP
Sulfate	2.0	1	1.0	mg/L	12/11/03	GP
8015 TEPH Diesel						
TEPH Diesel	1.1	1	0.1	mg/L	12/16/03	AF
Surrogates				**Units**	**Control Limits**	
o-Terphenyl (sur)	109			%	55 - 200	
8021B BTEX + MTBE						
Benzene	62	10	3.0	ug/L	12/12/03	LZ
Ethyl benzene	295	10	3.0	ug/L	12/12/03	LZ
Methyl t - butyl ether	89	10	50.0	ug/L	12/12/03	LZ
Toluene	45	10	3.0	ug/L	12/12/03	LZ
Xylene (total)	184	10	6.0	ug/L	12/12/03	LZ
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	201*			%	70 - 130	
8015M - Gasoline						
Gasoline	9140	10	500.0	ug/L	12/12/03	LZ
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	201*			%	55 - 200	

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 483720 **Client:** Stellar Environmental Solutions
Matrix: WATER **Client Sample ID:** MW-8
Date Sampled: 12/10/2003
Time Sampled: 12:50
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
300.0 Nitrate as NO3 by Ion Chromatography						
Nitrate (as NO3)	ND	1	0.44	mg/L	12/11/03	GP
Sulfate	88	1	1.0	mg/L	12/11/03	GP
8015 TEPH Diesel						
TEPH Diesel	0.1	1	0.1	mg/L	12/16/03	AF
Surrogates				**Units**	**Control Limits**	
o-Terphenyl (sur)	112			%	55 - 200	
8021B BTEX + MTBE						
Benzene	19	1	0.3	ug/L	12/13/03	LZ
Ethyl benzene	26	1	0.3	ug/L	12/13/03	LZ
Methyl t - butyl ether	ND	1	5	ug/L	12/13/03	LZ
Toluene	1.5	1	0.3	ug/L	12/13/03	LZ
Xylene (total)	36	1	0.6	ug/L	12/13/03	LZ
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	182			%	70 - 130	
8015M - Gasoline						
Gasoline	485	1	50	ug/L	12/13/03	LZ
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	182			%	55 - 200	

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 483721
Matrix: WATER
Date Sampled: 12/10/2003
Time Sampled: 13:20
Sampled By:

Client: Stellar Environmental Solutions
Client Sample ID: MW-9

Analyte	Result	DF	DLR	Units	Date/Analyst	
300.0 Nitrate as NO3 by Ion Chromatography						
Nitrate (as NO3)	ND	1	0.44	mg/L	12/11/03	GP
Sulfate	71	1	1.0	mg/L	12/11/03	GP
8015 TEPH Diesel						
TEPH Diesel	0.7	1	0.1	mg/L	12/16/03	AF
Surrogates				**Units**	**Control Limits**	
o-Terphenyl (sur)	104			%	55 - 200	
8021B BTEX + MTBE						
Benzene	287	10	3.0	ug/L	12/13/03	LZ
Ethyl benzene	901	20	6.0	ug/L	12/13/03	LZ
Methyl t - butyl ether	60	1	5	ug/L	12/13/03	LZ
Toluene	31	1	0.3	ug/L	12/13/03	LZ
Xylene (total)	255	10	6.0	ug/L	12/13/03	LZ
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	131			%	70 - 130	
8015M - Gasoline						
Gasoline	7080	10	500.0	ug/L	12/13/03	LZ
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	141			%	55 - 200	

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 483722
Matrix: WATER
Date Sampled: 12/10/2003
Time Sampled: 12:30
Sampled By:

Client: Stellar Environmental Solutions
Client Sample ID: MW-10

Analyte	Result	DF	DLR	Units	Date/Analyst
300.0 Nitrate as NO3 by Ion Chromatography					
Nitrate (as NO3)	ND	1	0.44	mg/L	12/11/03 GP
Sulfate	66	1	1.0	mg/L	12/11/03 GP
8015 TEPH Diesel					
TEPH Diesel	ND	1	0.1	mg/L	12/17/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	93			%	55 - 200
8021B BTEX + MTBE					
Benzene	6.9	1	0.3	ug/L	12/13/03 LZ
Ethyl benzene	8.0	1	0.3	ug/L	12/13/03 LZ
Methyl t - butyl ether	9.9	1	5	ug/L	12/13/03 LZ
Toluene	ND	1	0.3	ug/L	12/13/03 LZ
Xylene (total)	ND	1	0.6	ug/L	12/13/03 LZ
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	114			%	70 - 130
8015M - Gasoline					
Gasoline	162	1	50	ug/L	12/13/03 LZ
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	114			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 483723 **Client:** Stellar Environmental Solutions

Matrix: WATER **Client Sample ID:** MW-11

Date Sampled: 12/10/2003

Time Sampled: 13:55

Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
300.0 Nitrate as NO3 by Ion Chromatography						
Nitrate (as NO3)	ND	1	0.44	mg/L	12/11/03	GP
Sulfate	4.0	1	1.0	mg/L	12/11/03	GP
8015 TEPH Diesel						
TEPH Diesel	1.1	1	0.1	mg/L	12/17/03	AF
Surrogates				**Units**	**Control Limits**	
o-Terphenyl (sur)	104			%	55 - 200	
8021B BTEX + MTBE						
Benzene	314	20	6.0	ug/L	12/13/03	LZ
Ethyl benzene	1070	20	6.0	ug/L	12/13/03	LZ
Methyl t - butyl ether	173	20	100.0	ug/L	12/13/03	LZ
Toluene	60	20	6.0	ug/L	12/13/03	LZ
Xylene (total)	802	20	12.0	ug/L	12/13/03	LZ
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	165			%	70 - 130	
8015M - Gasoline						
Gasoline	15000	20	1000.0	ug/L	12/13/03	LZ
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	165			%	55 - 200	

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 483724 **Client:** Stellar Environmental Solutions
Matrix: WATER **Client Sample ID:** Laboratory Method Blank
Date Sampled:
Time Sampled:
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
300.0 Nitrate as NO3 by Ion Chromatography						
Nitrate (as NO3)	ND	1	0.44	mg/L	12/11/03	GP
Sulfate	ND	1	1.0	mg/L	12/11/03	GP
8015 TEPH Diesel						
TEPH Diesel	ND	1	0.1	mg/L	12/16/03	AF
Surrogates				**Units**	**Control Limits**	
o-Terphenyl (sur)	120			%	55 - 200	
8021B BTEX + MTBE						
Benzene	ND	1	0.3	ug/L	12/13/03	LZ
Ethyl benzene	ND	1	0.3	ug/L	12/13/03	LZ
Methyl t - butyl ether	ND	1	5	ug/L	12/13/03	LZ
Toluene	ND	1	0.3	ug/L	12/13/03	LZ
Xylene (total)	ND	1	0.6	ug/L	12/13/03	LZ
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	162			%	70 - 130	
8015M - Gasoline						
Gasoline	ND	1	50	ug/L	12/13/03	LZ
Surrogates				**Units**	**Control Limits**	
a,a,a-Trifluorotoluene	162			%	55 - 200	

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

ASSOCIATED LABORATORIES
QA REPORT FORM

QC Sample : LR 121260

Matrix: WATER

Prep.Date: 12/11/03

Analysis Date: 12/11/03

Lab ID#'s in Batch: LR 121180, 121278, 121259, 121260, 121215, 121227, 121243,

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RESULT

REPORTING UNITS = mg/L

Test	Method	Sample Result	Spike Added	Matrix Spike	Matrix Spike Dup	%Rec MS	%Rec MSD	RPD
CL	300.0	36	200	235	236	100	100	0
SO4	300.0	64	200	273	278	105	107	2
NO3	300.0	37.0	100	141	138	104	101	2
NO2	300.0	ND	100	103	104	103	104	1

RPD = Relative Percent Difference of Matrix Spike and Matrix Spike Dup

%REC-MS & MSD = Percent Recovery of Matrix Spike & Matrix Spike Duplicate

%Rec Limits = 80 - 120
RPD Limits = 20

PREPARATION BLANK / LAB CONTROL SAMPLE RESULTS

Test	Method	PREP BLK	LCS				
		Value	Result	True	%Rec	L.Limit	H.Limit
CL	300.0	ND	49.0	50	98	90%	110%
SO4	300.0	ND	50.1	50	100	90%	110%
NO3	300.0	ND	24.3	25	97	90%	110%
NO2	300.0	ND	5.0	5	100	90%	110%

VALUE = Preparation Blank Value; ND = Not-Detected

LCS = Lab Control Sample Result

TRUE = True Value of LCS

L.LIMIT / H.LIMIT = LCS Control Limits

ASSOCIATED LABORATORIES
QA REPORT FORM

QC Sample: LCS/LCSD

Matrix: WATER

Extraction Method : 3510 B

Prep. Date: 12/16/03

Analysis Date: 12/16/03

ID#'s in Batch: LR 121444, 121461, 121278, 121511

Reporting Units = mg/L

PREPARATION BLANK / LAB CONTROL SAMPLE RESULTS

			PREP BLK					
			Value	Result	True	%Rec	L.Limit	H.Limit
Test	Method	LCS	ND	0.70	1	70	70%	130%
DIESEL	8015D	LCSD	ND	0.83	1	83	70%	130%

LCS Result = Lab Control Sample Result
True = True Value of LCS
L.Limit / H.Limit = LCS Control Limits

SURROGATE RECOVERY

Sample No.	O-Terphenyl
QC Limit	55-200
Method Blank	120
LCS	133
LCSD	149

ASSOCIATED LABORATORIES

LCS REPORT FORM

QC Sample: LCS / LCSD

Matrix: WATER

Prep. Date: 12/12/03

Analysis Date: 12/12/03-12/13/03

LAB ID#'s in Batch: LR 121278

REPORTING UNITS = mg/L

PREPARATION BLANK / LAB CONTROL SAMPLE RESULTS

Test	Method	PREP. BLK	LCS			LCSD	
		Value	Result	TRUE	%Rec	Result	%Rec
Benzene	8021	ND	18.3	20	92	21.2	106
Toluene	8021	ND	18.3	20	92	21.0	105
Ethylbenzene	8021	ND	18.3	20	92	20.9	105
Xylenes	8021	ND	53.5	60	89	62.2	104

L.Limit	*H.Limit*
80%	*120%*

LCS = Lab Control Sample Result

TRUE = True Value of LCS

L.LIMIT / H.LIMIT = LCS Control Limits

SURROGATE RECOVERY

Sample No.	AAA-TFT
QC Limit	55-200
Method Blank	162
LCS	62
LCSD	194

AAA-TFT = a,a,a-Trifluorotoluene

ASSOCIATED LABORATORIES
QA REPORT FORM

QC Sample: LCS / LCSD

Matrix: WATER

Prep. Date: 12/12/03

Analysis Date: 12/12/03-12/13/03

ID#'s in Batch: LR 121278, 121204, 121196, 121329, 121091

Reporting Units = mg/L

PREPARATION BLANK / LAB CONTROL SAMPLE RESULTS

			PREP BLK					
			Value	Result	True	%Rec	L.Limit	H.Limit
Test	**Method**	LCS	ND	575	500	115	80%	120%
TPH	8015M-G	LCSD	ND	554	500	111	80%	120%

LCS Result = Lab Control Sample Result
True = True Value of LCS
L.Limit / H.Limit = LCS Control Limits

SURROGATE RECOVERY

Sample No.	AAA-TFT
QC Limit	55-200
Method Blank	162
LCS	180
LCSD	184

AAA-TFT = a,a,a-Trifluorotoluene

Chain of Custody Record

171278

Lab job no. _____
Date _____
Page _____ of _____

Laboratory Curtis & Tompkins
Address 2323 Fifth St.
Berkeley, CA

Method of Shipment Golden State Overnight
Shipment No. —
Airbill No. —
Cooler No. —
Project Manager Bruce Rueker
Telephone No. (510) 644-3123
Fax No. (510) 644-3859
Samplers: (Signature) Aaron Costa

CLIENT ~~Project Owner~~ Stellar Env.
Site Address 2198 Sixth St.
Berkeley, CA
Project Name Redwood Regional Park
Project Number 2003-02

Field Sample Number	Location/ Depth	Date	Time	Sample Type	Type/Size of Container	Preservation: Cooler	Preservation: Chemical	Filtered	No. of Containers	Analysis Required: TPH-G, BTEX, MTBE	Analysis Required: TPH-D	Analysis Required: * Nitrate, Sulfate	Remarks
MW-2		12/10	1415	H_2O	Various	✓	HCl for VOAs			X	X		
MW-3			945									X	
MW-4			1405							X	X	X	
MW-7			1340							X	X	X	
MW-8			1250							X	X	X	
MW-9			1330							X	X	X	
MW-10			1230							X	X	X	
MW-11		↓	1355	↓	↓	↓				X	X	X	

Relinquished by:	Date	Received by:	Date	Relinquished by:	Date	Received by:	Date
Signature Aaron Costa	12/10/03	Signature B.M. Rueker	12/10/03	Signature		Signature	12/11
Printed Aaron Costa	Time	Printed B. M. Rueker	Time	Printed	Time	Printed Duncan	Time
Company Blaine Tech	1500	Company Stellar Env. Solutions	1500	Company		Company Associated Lab	940

Turnaround Time: _____
Comments: * Nitrates have short hold times

Relinquished by:	Date	Received by:	Date
Signature		Signature	
Printed	Time	Printed	Time
Company		Company	

2000-00-01

— 12-11-03 1:30

★ Stellar Environmental Solutions

2198 Sixth Street #201, Berkeley, CA 94710

ASSOCIATED LABORATORIES
806 North Batavia - Orange, California 92868 - 714/771-6900 FAX 714/538-1209

CLIENT Stellar Environmental Solutions (10503)
ATTN: Bruce Rucker
2198 Sixth Street
#201
Berkeley, CA 94710

LAB REQUEST 121363
REPORTED 12/16/2003
RECEIVED 12/12/2003

PROJECT #2003-02
Redwood Regional Park Service Yard

SUBMITTER Client

COMMENTS

This laboratory request covers the following listed samples which were analyzed for the parameters indicated on the attached Analytical Result Report. All analyses were conducted using the appropriate methods as indicated on the report. This cover letter is an integral part of the final report.

Order No.	Client Sample Identification
484139	SW-3
484140	SW-2
484141	Laboratory Method Blank

Thank you for the opportunity to be of service to your company. Please feel free to call if there are any questions regarding this report or if we can be of further service.

ASSOCIATED LABORATORIES by,

Edward S. Behare, Ph.D.
Vice President

NOTE: Unless notified in writing , all samples will be discarded by appropriate disposal protocol 30 days from date reported.

TESTING & CONSULTING
Chemical
Microbiological
Environmental

Order #: 484139 **Client:** Stellar Environmental Solutions

Matrix: WATER **Client Sample ID:** SW-3

Date Sampled: 12/10/2003

Time Sampled: 08:10

Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	ND	1	0.1	mg/L	12/15/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	75			%	55 - 200
8021B BTEX + MTBE					
Benzene	ND	1	0.3	ug/L	12/13/03 LZ
Ethyl benzene	ND	1	0.3	ug/L	12/13/03 LZ
Methyl t - butyl ether	ND	1	5	ug/L	12/13/03 LZ
Toluene	ND	1	0.3	ug/L	12/13/03 LZ
Xylene (total)	ND	1	0.6	ug/L	12/13/03 LZ
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	92			%	70 - 130
8015M - Gasoline					
Gasoline	60	1	50	ug/L	12/13/03 LZ
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	92			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 484140
Matrix: WATER
Date Sampled: 12/10/2003
Time Sampled: 08:20
Sampled By:

Client: Stellar Environmental Solutions
Client Sample ID: SW-2

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	ND	1	0.1	mg/L	12/15/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	86			%	55 - 200
8021B BTEX + MTBE					
Benzene	ND	1	0.3	ug/L	12/13/03 LZ
Ethyl benzene	ND	1	0.3	ug/L	12/13/03 LZ
Methyl t - butyl ether	ND	1	5	ug/L	12/13/03 LZ
Toluene	ND	1	0.3	ug/L	12/13/03 LZ
Xylene (total)	ND	1	0.6	ug/L	12/13/03 LZ
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	93			%	70 - 130
8015M - Gasoline					
Gasoline	86	1	50	ug/L	12/13/03 LZ
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	93			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 484141
Matrix: WATER
Client: Stellar Environmental Solutions
Client Sample ID: Laboratory Method Blank
Date Sampled:
Time Sampled:
Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst
8015 TEPH Diesel					
TEPH Diesel	ND	1	0.1	mg/L	12/15/03 AF
Surrogates				**Units**	**Control Limits**
o-Terphenyl (sur)	82			%	55 - 200
8021B BTEX + MTBE					
Benzene	ND	1	0.3	ug/L	12/13/03 LZ
Ethyl benzene	ND	1	0.3	ug/L	12/13/03 LZ
Methyl t - butyl ether	ND	1	5	ug/L	12/13/03 LZ
Toluene	ND	1	0.3	ug/L	12/13/03 LZ
Xylene (total)	ND	1	0.6	ug/L	12/13/03 LZ
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	92			%	70 - 130
8015M - Gasoline					
Gasoline	ND	1	50	ug/L	12/13/03 LZ
Surrogates				**Units**	**Control Limits**
a,a,a-Trifluorotoluene	92			%	55 - 200

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

ASSOCIATED LABORATORIES

LCS REPORT FORM

QC Sample: LCS / LCSD

Matrix: WATER

Prep. Date: 12/12/03

Analysis Date: 12/12/03-12/13/03

LAB ID#'s in Batch: LR 121157, 121363

REPORTING UNITS = mg/L

PREPARATION BLANK / LAB CONTROL SAMPLE RESULTS

Test	Method	PREP. BLK	LCS			LCSD	
		Value	Result	TRUE	%Rec	Result	%Rec
Benzene	8021	ND	22.1	20	111	22.4	112
Toluene	8021	ND	22.2	20	111	23.0	115
Ethylbenzene	8021	ND	23.5	20	118	24.0	120
Xylenes	8021	ND	69.0	60	115	70.1	117

L.Limit	*H.Limit*
80%	*120%*

LCS = Lab Control Sample Result

TRUE = True Value of LCS

L.LIMIT / H.LIMIT = LCS Control Limits

SURROGATE RECOVERY

Sample No.	AAA-TFT
QC Limit	55-200
Method Blank	92
LCS	103
LCSD	107

AAA-TFT = a,a,a-Trifluorotoluene

ASSOCIATED LABORATORIES
QA REPORT FORM

QC Sample: LCS/LCSD

Matrix: WATER

Extraction Method : 3510 B

Prep. Date: 12/15/03

Analysis Date: 12/15/03

ID#'s in Batch: LR 121363, 121279, 121116, 121219, 121292

Reporting Units = mg/L

PREPARATION BLANK / LAB CONTROL SAMPLE RESULTS

			PREP BLK					
			Value	Result	True	%Rec	L.Limit	H.Limit
Test	Method	LCS	ND	0.76	1	76	70%	130%
DIESEL	8015D	LCSD	ND	0.84	1	84	70%	130%

LCS Result = Lab Control Sample Result
True = True Value of LCS
L.Limit / H.Limit = LCS Control Limits

SURROGATE RECOVERY

Sample No.	O-Terphenyl
QC Limit	55-200
Method Blank	82
LCS	109
LCSD	117

ASSOCIATED LABORATORIES
QA REPORT FORM

QC Sample: LCS / LCSD

Matrix: WATER

Prep. Date: 12/12/03

Analysis Date: 12/12/03-12/13/03

ID#'s in Batch: LR 121157, 121194, 121363, 121284, 121344

Reporting Units = mg/L

PREPARATION BLANK / LAB CONTROL SAMPLE RESULTS

			PREP BLK					
			Value	Result	True	%Rec	L.Limit	H.Limit
Test	Method	LCS	ND	469	500	94	80%	120%
TPH	8015M-G	LCSD	ND	540	500	108	80%	120%

LCS Result = Lab Control Sample Result
True = True Value of LCS
L.Limit / H.Limit = LCS Control Limits

SURROGATE RECOVERY

Sample No.	AAA-TFT
QC Limit	55-200
Method Blank	92
LCS	157
LCSD	168

AAA-TFT = a,a,a-Trifluorotoluene

Chain of Custody Record

121363

Lab job no. ______ Date ______ Page ___ of ___

Laboratory: Associated Laboratories
Address: 806 N. Batavia, Orange CA

Method of Shipment: Golden State Overnight
Shipment No. —
Airbill No. —
Cooler No. —

Project Owner: East Bay Regional Park District
Site Address: 7867 Redwood Rd. Oakland CA
Project Name: Redwood Regional Park Service Yard
Project Number: 2003-02

Project Manager: Bruce Rucker
Telephone No. (510) 644-3123
Fax No. (510) 644-3859
Samplers: (Signature) B.M. Rucker

Analysis Required

Field Sample Number	Location/Depth	Date	Time	Sample Type	Type/Size of Container	Preservation: Cooler	Preservation: Chemical	Filtered	No. of Containers	TEH-diesel (8015)	TVH-gasoline (8015)	BTEX+MTBE (8021)	Remarks
SW-3	—	12/10/03	810	H_2O	1-L amber	✓	no		1	X			
		↓			40ml VOAs	↓	HCl		3		X	X	
SW-2	—	↓	820	H_2O	1-L amber	↓	no		1	X			
					40ml VOAs	↓	HCl		3		X	X	

Relinquished by:	Date	Received by:	Date	Relinquished by:	Date	Received by:	Date
Signature: B.M. Rucker	12/10/03	Signature: [signature]	12/10/03	Signature:		Signature: [signature]	12/12/03
Printed: B.M. Rucker	Time	Printed: JOSEPH DINAN	Time: 1200	Printed:	Time	Printed: Ryan Lewis	Time: 8:50
Company: Stellar Env. Solutions		Company: Stellar Env. Solutions		Company:		Company: Assoc. Labs	

Turnaround Time: 5 Day

Comments:

Relinquished by:	Date	Received by:	Date
Signature:		Signature:	
Printed:	Time	Printed:	Time
Company:		Company:	

★ Stellar Environmental Solutions

2198 Sixth Street #201, Berkeley, CA 94710

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-6633 Jaques Yoo
FAX (510) 782-1939
APPLICANTS: PLEASE ATTACH A SITE MAP FOR ALL DRILLING PERMIT APPLICATIONS
DESTRUCTION OF WELLS OVER 45 FEET REQUIRES A SEPARATE PERMIT APPLICATION

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT Redwood Regional Park
7867 Redwood Road
Oakland CA

CLIENT
Name EBRPD
Address P.O. Box 5381 Phone
City OAKLAND Zip 94605

APPLICANT
Name Stellar Environmental Solutions Inc
2198 Sixth St. #201 Fax 510/644-3859
Address Phone 510/644-3123
City BERKELEY Zip 94710

TYPE OF PROJECT
Well Construction • Geotechnical Investigation
Cathodic Protection • General •
Water Supply • (Contamination) •
Monitoring • Well Destruction •

PROPOSED WATER SUPPLY WELL USE
New Domestic • Replacement Domestic •
Municipal • Irrigation •
Industrial • Other ____ •

DRILLING METHOD:
Mud Rotary • Air Rotary • Auger •
Cable • (Other) GeoProbe •

DRILLER'S NAME EnTech Environmental Probing

DRILLER'S LICENSE NO. 777007

WELL PROJECTS
Drill Hole Diameter ____ in. Maximum
Casing Diameter ____ in. Depth ____ ft.
Surface Seal Depth ____ ft. Owner's Well Number ____

GEOTECHNICAL PROJECTS
Number of Borings 8 Maximum
Hole Diameter 2 in. Depth 25 ft.

STARTING DATE 9-25-03

COMPLETION DATE 9-26-03

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE [signature] RG#6814 DATE 9/19/03

PLEASE PRINT NAME Bruce Rucker Rev.9-18-02
Stellar Environmental Solutions

FOR OFFICE USE

PERMIT NUMBER W03-0872
WELL NUMBER
APN

PERMIT CONDITIONS
Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted original Department of Water Resources- Well Completion Report.
3. Permit is void if project not begun within 90 days of approval date

B. WATER SUPPLY WELLS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.

C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

(D.) GEOTECHNICAL /Contamination
Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind, ~~or with compacted cuttings.~~

E. CATHODIC
Fill hole anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
Send a map of work site. A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

NOTE: One application must be submitted for each well or well destruction. Multiple borings on one application are acceptable for geotechnical and contamination investigations.

APPROVED [signature] DATE 9-24-03

Subject: GeoProbe rig at borehole BH-22.	
Site: 7867 Redwood Road, Oakland, California	
Date Taken: September 26, 2003	Project No.: SES 2003-02
Photographer: Bruce Rucker	Photo No.: 01

Subject: GeoProbe rig at BH-21.	
Site: 7867 Redwood Road, Oakland, California	
Date Taken: September 26, 2003	Project No.: SES 2003-02
Photographer: Bruce Rucker	Photo No.: 02

Subject: Boreholes (marked with orange cones, left to right) BH-22, BH-20, BH-23 and BH-21.	
Site: 7867 Redwood Road, Oakland, California	
Date Taken: September 26, 2003	Project No.: SES 2003-02
Photographer: Bruce Rucker	Photo No.: 03

Subject: Boreholes (marked with orange cones, left to right) BH-18, BH-17, BH-19 and BH-16.	
Site: 7867 Redwood Road, Oakland, California	
Date Taken: September 26, 2003	Project No.: SES 2003-02
Photographer: Bruce Rucker	Photo No.: 04

Stellar Environmental Solutions, Inc.
2198 Sixth Street, Berkeley, CA 94710
Geoscience & Engineering Consulting

Soil Boring Log

BORING NUMBER BH-16 Page 1 of 2

PROJECT Redwood Reg. Park Serv. Yard
OWNER East Bay Regional Park District
LOCATION 7867 Redwood Rd., Oakland
PROJECT NUMBER 2003-02
TOTAL DEPTH 31 feet
BOREHOLE DIA. 2-inch
SURFACE ELEV. ____
WATER FIRST ENCOUNTERED ~17 ft.
DRILLING COMPANY EnProb
DRILLING METHOD GeoProbe
DRILLER Jeff
GEOLOGIST B. Rucker
DATE DRILLED 9/25/03

DEPTH (feet)	GRAPHIC LOG	SAMPLE INTERVAL/ RECOVERY	BLOW COUNTS	INSTRUMENT READING	DESCRIPTION/SOIL CLASSIFICATION	REMARKS
0					Asphalt roadway	"Instrument" is a photo ionization detector.
2					Light brown clayey silt (ML), dry, friable, no cohesion, stiff, dense	"Readings" are in parts per million per volume air (ppmv)
4				<1		Continuous core soil sampling & 100% sample recovery, unless noted otherwise.
				6		
6				<1		
				13	7' Becomes sl. cohesive	
8				3		
				<1	Brown silty clay (CL), sl. soft to sl. stiff, moist, cohesive, sl. friable	
10				2		
				11	11' Becomes sl. stiff	
12	BH-16-11.5'			30	12' Becomes mod. stiff	
				no data		
14				28	Brown clayey silt (ML), minor sm. gravel, dry, friable, not cohesive	
				45		
16				5	Brown silty clay (CL), with blue-grey discoloration, moist, mod. stiff, cohesive	
				20		
18				11	17' V. moist, sl. stiff	
	BH-16-19'			44	19' Becomes red-brown with blue-grey discoloration	
20				23		

2003-02-14

Stellar Environmental Solutions, Inc.
2198 Sixth Street, Berkeley, CA 94710
Geoscience & Engineering Consulting

Soil Boring Log

BORING NUMBER BH-16 Page 2 of 2

PROJECT Redwood Reg. Park Serv. Yard
OWNER East Bay Regional Park District
LOCATION 7867 Redwood Rd., Oakland
PROJECT NUMBER 2003-02
TOTAL DEPTH 31 feet
BOREHOLE DIA. 2-inch
SURFACE ELEV. ____
WATER FIRST ENCOUNTERED ~17 ft.
DRILLING COMPANY EnProb
DRILLING METHOD GeoProbe
DRILLER Jeff
GEOLOGIST B. Rucker
DATE DRILLED 9/25/03

DEPTH (feet)	GRAPHIC LOG	SAMPLE INTERVAL/ RECOVERY	BLOW COUNTS	INSTRUMENT READING	DESCRIPTION/SOIL CLASSIFICATION	REMARKS
20				15		
22				31		
				14		
24				5	24' Sample color fully blue-grey	
				5	25' Becomes light brown	
26						
28						"BH-16-GW" sample collected (VOAs only) on 9/25/03.
30						
	Bedrock				Yellow-brown weathered siltstone, dense, dry, friable, angular fractures	Extremely slow recharge.
32						Diesel container filled on 9/26/03.
					Bottom of borehole = 31'	
34						Water level = 17' on 9/26/03
36						
38						
40						

2003-02-15

Stellar Environmental Solutions, Inc.
2198 Sixth Street, Berkeley, CA 94710
Geoscience & Engineering Consulting

Soil Boring Log

BORING NUMBER BH-17 Page 1 of 2

PROJECT Redwood Reg. Park Serv. Yard
OWNER East Bay Regional Park District
LOCATION 7867 Redwood Rd., Oakland
PROJECT NUMBER 2003-02
TOTAL DEPTH 27.5 feet
BOREHOLE DIA. 2-inch
SURFACE ELEV. ____
WATER FIRST ENCOUNTERED ~16 ft.
DRILLING COMPANY EnProb
DRILLING METHOD GeoProbe
DRILLER Jeff
GEOLOGIST B. Rucker
DATE DRILLED 9/25/03

DEPTH (feet)	GRAPHIC LOG	SAMPLE INTERVAL/ RECOVERY	BLOW COUNTS	INSTRUMENT READING	DESCRIPTION/SOIL CLASSIFICATION	REMARKS
0					Light brown clayey silt ([redacted]), dry, friable, no cohesion, stiff, dense	"Instrument" is a photo ionization detector.
2						"Readings" are in parts per million per volume air (ppmv)
4				<1		Continuous core soil sampling & 100% sample recovery, unless noted otherwise.
				<1		
6				<1	6' Becomes sl. cohesive	
				<1		
8				<1		
	BH-17-10'			66	Brown silty clay ([redacted]), sl.-mod. stiff, cohesive, sl. friable, moist	This borehole drilled at 20° angle (off vertical). "Depths" herein represent vertical depth, not core length, except that depth reference in soil samples is core length, not depth.
10				214	9.5' Not friable, fully cohesive	
				273		
12	BH-17-13'			390	12.5' V. moist, blue-grey discoloration begins	
				264		
14				9		Depth = (0.93) (core length)
				<1		
16				63	16' Becomes soft-sl. stiff, v. moist, silt is minor	
				78		
18				14		
				3		
20				23	20' Becomes stiff	

2003-02-24

Stellar Environmental Solutions, Inc.
2198 Sixth Street, Berkeley, CA 94710
Geoscience & Engineering Consulting

Soil Boring Log

BORING NUMBER BH-17 Page 2 of 2

PROJECT Redwood Reg. Park Serv. Yard
OWNER East Bay Regional Park District
LOCATION 7867 Redwood Rd., Oakland
PROJECT NUMBER 2003-02
TOTAL DEPTH 27.5 feet
BOREHOLE DIA. 2-inch
SURFACE ELEV. ____
WATER FIRST ENCOUNTERED ~16 ft.
DRILLING COMPANY EnProb
DRILLING METHOD GeoProbe
DRILLER Jeff
GEOLOGIST B. Rucker
DATE DRILLED 9/25/03

DEPTH (feet)	GRAPHIC LOG	SAMPLE INTERVAL/ RECOVERY	BLOW COUNTS	INSTRUMENT READING	DESCRIPTION/SOIL CLASSIFICATION	REMARKS
20				24	21.5' Weathered siltstone fragments, dry, friable	
				17		
22				no reading	22' Light brown clayey silty (ML), saturated, soft	
				5	Brown silty clay (CL), cohesive, sl. friable, stiff, sl. moist, v. minor small gravel	
24					23.5' Becomes gravelly (~30%), sl. stiff	
26					Blue grey-light brown, silty clay (CH), sl.-mod. stiff, v. moist	
28					27' Becomes gravelly (~40%, sm.-med., subangular), sl. moist, sl. cohesive	Sampling deeper than 27.5' due to saturated cores
30					Bottom of borehole = 27'	Water level = 12' after 10 min.
32						
34						
36						
38						
40						

2003-02-25

Stellar Environmental Solutions, Inc.
2198 Sixth Street, Berkeley, CA 94710
Geoscience & Engineering Consulting

Soil Boring Log

BORING NUMBER BH-18 Page 1 of 2

PROJECT Redwood Reg. Park Serv. Yard
OWNER East Bay Regional Park District
LOCATION 7867 Redwood Rd., Oakland
PROJECT NUMBER 2003-02
TOTAL DEPTH 30.5 feet
BOREHOLE DIA. 2-inch
SURFACE ELEV. ____
WATER FIRST ENCOUNTERED unknown
DRILLING COMPANY EnProb
DRILLING METHOD GeoProbe
DRILLER Jeff
GEOLOGIST B. Rucker
DATE DRILLED 9/25/03

DEPTH (feet)	GRAPHIC LOG	SAMPLE INTERVAL/ RECOVERY	BLOW COUNTS	INSTRUMENT READING	DESCRIPTION/SOIL CLASSIFICATION	REMARKS
0					Light brown clayey silt (ML), friable, no cohesion, stiff, dry	"Instrument" is a photo ionization detector.
2						"Readings" are in parts per million per volume air (ppmv)
4				22		Continuous core soil sampling & 100% sample recovery, unless noted otherwise.
				16		
6				8	Brown silty clay (CL), sl. stiff, cohesive, sl. friable, sl. moist	
				18		
				27	6.5' Blue-grey mottling (minor)	
8	BH-18-8'			no reading		
				7	8.5' Becomes soft-sl. stiff, moist	
10				78	9.5' Becomes mod. stiff 10' Silt content increases	This borehole drilled at 20° angle (off vertical). "Depths" herein represent vertical depth, not core length, except that depth reference in soil samples is core length, not depth.
				[illegible]		
	BH-18-12'			17	12' Weathered siltstone fragments	
12				[illegible]		
				[illegible]	13.5' Becomes stiff, silt decreases to minor	
14				15		
				[illegible]		
16				22	16.5' Becomes sl. stiff, moist	
				25		
18				14	Brown clayey silt (ML), mod. cohesive, mod. friable, med. stiff, sl. moist	Depth = (0.93) (core length)
				18		
20					Brown silty clay (CL), sl. stiff, moist, cohesive	

2003-02-26

Stellar Environmental Solutions, Inc.
2198 Sixth Street, Berkeley, CA 94710
Geoscience & Engineering Consulting

Soil Boring Log

BORING NUMBER BH-18 Page 2 of 2

PROJECT Redwood Reg. Park Serv. Yard
OWNER East Bay Regional Park District
LOCATION 7867 Redwood Rd., Oakland
PROJECT NUMBER 2003-02
TOTAL DEPTH 30.5 feet
BOREHOLE DIA. 2-inch
SURFACE ELEV. ____
WATER FIRST ENCOUNTERED unknown
DRILLING COMPANY EnProb
DRILLING METHOD GeoProbe
DRILLER Jeff
GEOLOGIST B. Rucker
DATE DRILLED 9/25/03

DEPTH (feet)	GRAPHIC LOG	SAMPLE INTERVAL/ RECOVERY	BLOW COUNTS	INSTRUMENT READING	DESCRIPTION/SOIL CLASSIFICATION	REMARKS
20				21	21' Becomes yellowish-brown, moist, rootlets and organics 22' Becomes gravelly (~20%, small, angular)	
22						
24					Yellowish-brown silty clay (CH), soft, v. moist, high plasticity, cohesive 24'-25' Sl. stiff, mod. plasticity 26' Minor small gravel	
26						
28					Yellow-brown clayey silt (ML), mod. stiff, cohesive, sl. friable, sl. moist 27' Sample saturated, minor small-med. gravel 28' Weathered siltstone fragments	Water level = 14.5' after 10 min.
30					Weathered siltstone, dry, friable Bottom of borehole = 30.5 feet	
32						
34						
36						
38						
40						

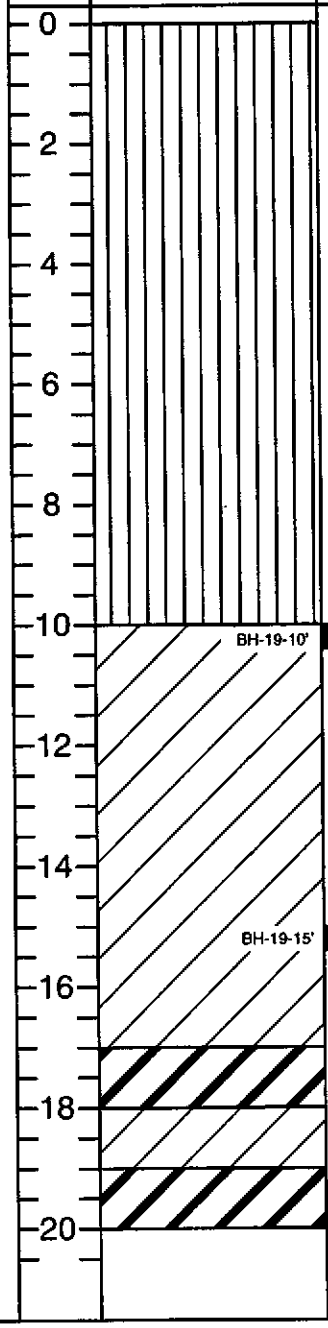
2003-02-27

Stellar Environmental Solutions, Inc.
2198 Sixth Street, Berkeley, CA 94710
Geoscience & Engineering Consulting

Soil Boring Log

BORING NUMBER BH-19 Page 1 of 2

PROJECT Redwood Reg. Park Serv. Yard
OWNER East Bay Regional Park District
LOCATION 7867 Redwood Rd., Oakland
PROJECT NUMBER 2003-02
TOTAL DEPTH 26 feet
BOREHOLE DIA. 2-inch
SURFACE ELEV. ____
WATER FIRST ENCOUNTERED ~17 ft.
DRILLING COMPANY EnProb
DRILLING METHOD GeoProbe
DRILLER Jeff
GEOLOGIST B. Rucker
DATE DRILLED 9/25/03



DEPTH (feet)	SAMPLE INTERVAL/ RECOVERY	BLOW COUNTS	INSTRUMENT READING	DESCRIPTION/SOIL CLASSIFICATION	REMARKS
0				Asphalt roadway	"Instrument" is a photo ionization detector.
2				Light brown clayey silt (ML), dry, friable, no cohesion, stiff, dense	"Readings" are in parts per million per volume air (ppmv)
4			1		
			8		Continuous core soil sampling & 100% sample recovery, unless noted otherwise.
6			11		
			8		
8			2		
			8		
10			128	Brown silty clay (CL), sl. stiff, moist, cohesive, sl. friable	
			268		
12			206	11' Becomes mod. stiff	
			116		
				14' Minor small gravel	
14			230		
			295	15' Becomes sl. stiff	
16			58	16' Becomes red-brown with blue-grey discoloration	
			74		
18			62	Clay (CH), soft, wet, cohesive	
			15	Silty clay (CL)	
			7	Clay (CH)	
20					

2003-02-16

Stellar Environmental Solutions, Inc.
2198 Sixth Street, Berkeley, CA 94710
Geoscience & Engineering Consulting

Soil Boring Log

BORING NUMBER BH-19 Page 2 of 2

PROJECT Redwood Reg. Park Serv. Yard
OWNER East Bay Regional Park District
LOCATION 7867 Redwood Rd., Oakland
PROJECT NUMBER 2003-02
TOTAL DEPTH 26 feet
BOREHOLE DIA. 2-inch
SURFACE ELEV. _____
WATER FIRST ENCOUNTERED ~17 ft.
DRILLING COMPANY EnProb
DRILLING METHOD GeoProbe
DRILLER Jeff
GEOLOGIST B. Rucker
DATE DRILLED 9/25/03

DEPTH (feet)	GRAPHIC LOG	SAMPLE INTERVAL/ RECOVERY	BLOW COUNTS	INSTRUMENT READING	DESCRIPTION/SOIL CLASSIFICATION	REMARKS
20					20.5' Minor small gravel	
				36		
22				14	22' Very wet 22.5'-23' Fragments of siltstone	
				6		
24				23	24.5' Sample saturated	
26	Bedrock				Yellow-brown weathered siltstone, dense, dry, friable	
					Bottom of borehole = 26'	
28						Borehole swelled shut at 16'. Couldn't get a water level reading.
30						
32						
34						
36						
38						
40						

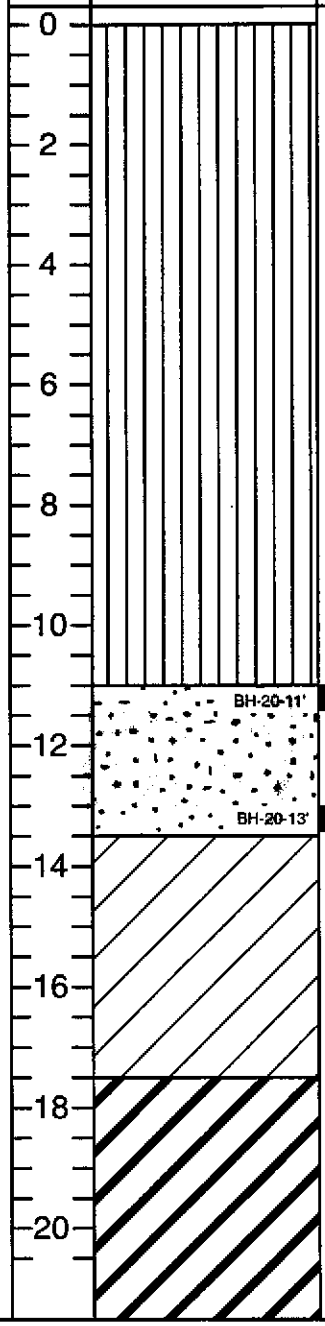
2003-02-17

Stellar Environmental Solutions, Inc.
2198 Sixth Street, Berkeley, CA 94710
Geoscience & Engineering Consulting

Soil Boring Log

BORING NUMBER BH-20 Page 1 of 2

PROJECT Redwood Reg. Park Serv. Yard
OWNER East Bay Regional Park District
LOCATION 7867 Redwood Rd., Oakland
PROJECT NUMBER 2003-02
TOTAL DEPTH 27 feet
BOREHOLE DIA. 2-inch
SURFACE ELEV. ____
WATER FIRST ENCOUNTERED 17.5 ft.
DRILLING COMPANY EnProb
DRILLING METHOD GeoProbe
DRILLER Jeff
GEOLOGIST B. Rucker
DATE DRILLED 9/25/03



DEPTH (feet)	SAMPLE INTERVAL/ RECOVERY	BLOW COUNTS	INSTRUMENT READING	DESCRIPTION/SOIL CLASSIFICATION	REMARKS
0				Brown clayey silt (ML), dry, friable, no cohesion, stiff, dense	"Instrument" is a photo ionization detector.
4			27		"Readings" are in parts per million per volume air (ppmv)
			21		
6			18		Continuous core soil sampling & 100% sample recovery, unless noted otherwise.
			15		
8			11		
			11		
10			9	10' Becomes sandy and gravelly (v. small gravel)	
			10		
12			86	Red-brown gravelly, clayey sand (SW), dry, friable, sl. cohesive, dense	
			533	11' Blue-grey and fuel odor	
				13' Becomes sl. stiff, mod. plasticity	
14			61		
			311	Light brown silty clay (CL), sl.-med. stiff, cohesive, not friable, sl. moist	
16			160		
			76	14.5' Becomes gravelly, mod. stiff 16' Gravel absent	
18				Brown clay (CH), soft and wet	
20					

2003-02-18

Stellar Environmental Solutions, Inc.
2198 Sixth Street, Berkeley, CA 94710
Geoscience & Engineering Consulting

Soil Boring Log

BORING NUMBER BH-20 Page 2 of 2

PROJECT Redwood Reg. Park Serv. Yard
OWNER East Bay Regional Park District
LOCATION 7867 Redwood Rd., Oakland
PROJECT NUMBER 2003-02
TOTAL DEPTH 27 feet
BOREHOLE DIA. 2-inch
SURFACE ELEV. ____
WATER FIRST ENCOUNTERED 17.5 ft.
DRILLING COMPANY EnProb
DRILLING METHOD GeoProbe
DRILLER Jeff
GEOLOGIST B. Rucker
DATE DRILLED 9/25/03

DEPTH (feet)	GRAPHIC LOG	SAMPLE INTERVAL/ RECOVERY	BLOW COUNTS	INSTRUMENT READING	DESCRIPTION/SOIL CLASSIFICATION	REMARKS
20						
22					22.5'-23' Fragments of siltstone	
24						
26	Bedrock				Grey weathered siltstone, dry, dense	
28					Bottom of borehole = 27'	Collect "BH-20-GW" at 1605.
30						Water level = 18' (and rising)
32						
34						
36						
38						
40						

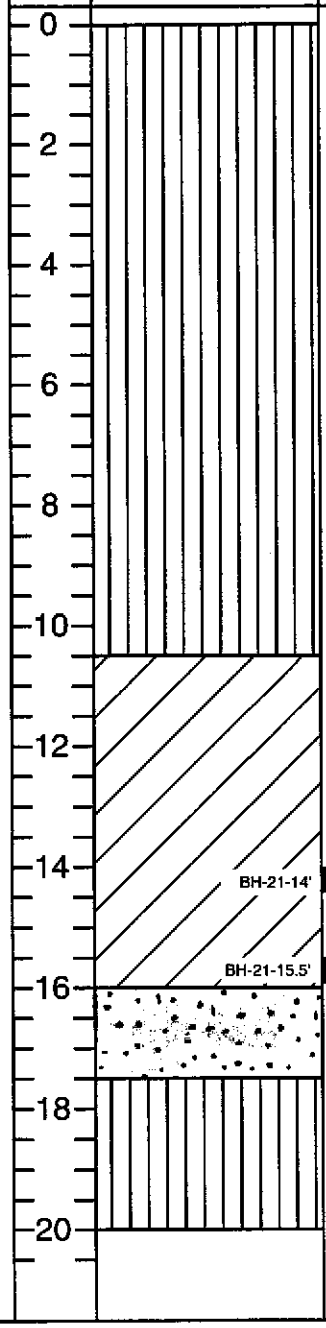
2003-02-19

Stellar Environmental Solutions, Inc.
2198 Sixth Street, Berkeley, CA 94710
Geoscience & Engineering Consulting

Soil Boring Log

BORING NUMBER BH-21 Page 1 of 1

PROJECT Redwood Reg. Park Serv. Yard
OWNER East Bay Regional Park District
LOCATION 7867 Redwood Rd., Oakland
PROJECT NUMBER 2003-02
TOTAL DEPTH 20 feet
BOREHOLE DIA. 2-inch
SURFACE ELEV.
WATER FIRST ENCOUNTERED 16 ft.
DRILLING COMPANY EnProb
DRILLING METHOD GeoProbe
DRILLER Jeff
GEOLOGIST B. Rucker
DATE DRILLED 9/26/03



DEPTH (feet)	SAMPLE INTERVAL/ RECOVERY	BLOW COUNTS	INSTRUMENT READING	DESCRIPTION/SOIL CLASSIFICATION	REMARKS
0–10			21 9 12 13 9 6 8	Brown clayey silt (ML), dry, friable, no cohesion, stiff, dense	"Instrument" is a photo ionization detector. "Readings" are in parts per million per volume air (ppmv) Continuous core soil sampling & 100% sample recovery, unless noted otherwise.
10–16			11 1 <1 3 73	Red-brown silty clay (CL), mod. stiff, cohesive, not friable, sl. moist 12' Silty decreases to minor 13' Becomes sl. stiff and moist 13.5' Blue-grey discoloration begins 15.5' Becomes gravelly, v. moist, fuel odor. Gravel is small	No measurable water in borehole immed. after drilling
16–18			564	Brown gravelly sand (SW), saturated, fully friable	
18–20				Blue-grey clayey silt (ML) 19' Becomes gravelly (~30%) 19.5' Gravel absent	
20				Bottom of borehole = 20'	

2003-02-20

Stellar Environmental Solutions, Inc.
2198 Sixth Street, Berkeley, CA 94710
Geoscience & Engineering Consulting

Soil Boring Log

BORING NUMBER BH-22 Page 1 of 2

PROJECT Redwood Reg. Park Serv. Yard
OWNER East Bay Regional Park District
LOCATION 7867 Redwood Rd., Oakland
PROJECT NUMBER 2003-02
TOTAL DEPTH 23 feet
BOREHOLE DIA. 2-inch
SURFACE ELEV. ____
WATER FIRST ENCOUNTERED 18 ft.
DRILLING COMPANY EnProb
DRILLING METHOD GeoProbe
DRILLER Jeff
GEOLOGIST B. Rucker
DATE DRILLED 9/26/03

DEPTH (feet)	GRAPHIC LOG	SAMPLE INTERVAL/ RECOVERY	BLOW COUNTS	INSTRUMENT READING	DESCRIPTION/SOIL CLASSIFICATION	REMARKS
0					Brown clayey silt (ML), dry, sl. cohesive, friable, stiff	"Instrument" is a photo ionization detector.
2						"Readings" are in parts per million per volume air (ppmv)
4				<1		Continuous core soil sampling & 100% sample recovery, unless noted otherwise.
				<1		
6				<1		
				<1		
8				<1	8'-8.5' Gravelly silt lens, color change to red-brown	
				<1		
10				<1		
				<1	11' Minor blue-grey discoloration	
12	BH-22-12'			<1	Brown silty clay (CL), blue-grey discoloration, cohesive, sl. friable, sl. moist, stiff	No measurable water in borehole immed. after drilling
				92		
14				68	13' Mod. stiff	
	BH-22-15'			234	14' Sl. stiff	
16				41	15' Silt decreases to minor	
					16' Silt increases to ~30%	
18					16.5' Sample v. moist-wet	
					18' Sample saturated	
					18.5' Becomes gravelly	
20					19.5' Becomes dry	

2003-02-21

Stellar Environmental Solutions, Inc.
2198 Sixth Street, Berkeley, CA 94710
Geoscience & Engineering Consulting

Soil Boring Log

BORING NUMBER BH-22 Page 2 of 2

PROJECT Redwood Reg. Park Serv. Yard
OWNER East Bay Regional Park District
LOCATION 7867 Redwood Rd., Oakland
PROJECT NUMBER 2003-02
TOTAL DEPTH 23 feet
BOREHOLE DIA. 2-inch
SURFACE ELEV. ____
WATER FIRST ENCOUNTERED 18 ft.
DRILLING COMPANY EnProb
DRILLING METHOD GeoProbe
DRILLER Jeff
GEOLOGIST B. Rucker
DATE DRILLED 9/25/03

DEPTH (feet)	GRAPHIC LOG	SAMPLE INTERVAL/ RECOVERY	BLOW COUNTS	INSTRUMENT READING	DESCRIPTION/SOIL CLASSIFICATION	REMARKS
20					20' Sample moist	No measureable water in borehole after drilling to 23' (no time allowed for recharge)
22	Bedrock				Weathered siltstone, dry, dense	
24					Bottom of borehole = 23'	
26						
28						
30						
32						
34						
36						
38						
40						

2003-02-22

Stellar Environmental Solutions, Inc.
2198 Sixth Street, Berkeley, CA 94710
Geoscience & Engineering Consulting

Soil Boring Log

BORING NUMBER BH-23 Page 1 of 1

PROJECT Redwood Reg. Park Serv. Yard
OWNER East Bay Regional Park District
LOCATION 7867 Redwood Rd., Oakland
PROJECT NUMBER 2003-02
TOTAL DEPTH 20 feet
BOREHOLE DIA. 2-inch
SURFACE ELEV. ____
WATER FIRST ENCOUNTERED 17.5 ft.
DRILLING COMPANY EnProb
DRILLING METHOD GeoProbe
DRILLER Jeff
GEOLOGIST B. Rucker
DATE DRILLED 9/26/03

DEPTH (feet)	GRAPHIC LOG	SAMPLE INTERVAL/ RECOVERY	BLOW COUNTS	INSTRUMENT READING	DESCRIPTION/SOIL CLASSIFICATION	REMARKS
0					Brown clayey silt (ML), dry, dense, sl. cohesive, friable	"Instrument" is a photo ionization detector.
2				<1		"Readings" are in parts per million per volume air (ppmv)
				<1		
4				<1		Continuous core soil sampling & 100% sample recovery, unless noted otherwise.
				<1		
6				<1		
				<1		
8				<1	8' Color change to red-brown	
				<1		
10				<1		
				<1	Red-brown silty clay (CL), sl. moist-dry, cohesive, sl. stiff	
12	BH-23-12'			<1	11.5' Blue-grey discoloration begins	
				284		
				[illegible]	13' Soft-sl. stiff, fuel odor	
14				278	14.5' Silt decreases to minor, mod. stiff, sl. moist	Water level = 12.5' 10 mins. after drilling to 20'
				260		
16	BH-23-15.5'			[illegible]	16' Minor small gravel, v. moist	
				112	16.5' Gravel absent, soft, cohesive	
18					17.5' Minor small gravel, sample wet 18.5' Gravel increases to 40%	
20					Blue-grey clayey, sandy gravel (GC), moist	
					Bottom of borehole = 20 feet	

2003-02-23