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Alameda County
Environmental Health

Declaration from the Responsible Party

Workplan to Conduct Soilgas Investigation
2440 East Eleventh Street
Oakland CA
RO No. 29

Prepared by Streamborn, Dated 27 September 2010

I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge.

Signed

Dated 10/4/10

Jeffrey Eandi
Vice President
Eandi Metal Works
976 Twenty-Third Avenue
Oakland CA 94606

STREAMBORN

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Jeffrey M. Eandi
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27 September 2010

Project No. P279

Workplan to Conduct Soilgas Investigation
2440 East Eleventh Street
Oakland CA
RO No. 29

Dear Mr. Eandi (hardcopy):

This workplan describes proposed soilgas sampling at/near 2440 East Eleventh Street, Oakland CA. Soilgas sampling has been mandated by Alameda County Health Care Services Agency as a condition of case closure (ACHCSA 2010).

Streamborn has prepared this workplan with minimal “background” information. The reader is referred to the environmental chronology (Table 1) and the bibliography (Table 2) for background information on the site and reports that provide a context describing how soilgas sampling fit into the overall investigation, remediation, and case closure process.

OBJECTIVES

Objectives of the proposed soilgas investigation include the following:

- Measure soilgas concentrations in the area of greatest groundwater contamination - area of likely greatest soilgas contamination.
- Compare measured soilgas concentrations with environmental screening levels for vapor intrusion.
- Evaluate the risks associated with potential vapor intrusion.

SOILGAS INVESTIGAITON

The soilgas investigation has been designed to comply with the guidance documents listed in Attachment 3.

Soilgas Sampling Locations

Three soilgas sampling points are proposed at the locations shown on Figure 8. The rationale for each location is detailed in Table 7. In general, the locations correspond to accessible drilling locations within/near the area of greatest documented groundwater contamination and expected greatest soilgas contamination. As requested by the Alameda County Health Care Services Agency, one soilgas sampling point (SG3) will be installed adjacent to the original contaminant release location (location of the former 1,000-gallon underground gasoline tank). Depending on accessibility constraints (buried utilities, obstructions, etc.), the actual soilgas sample locations may be relocated a relatively small distance from the planned locations.

Installation of Temporary Soilgas Sampling Points

Prior to initiating fieldwork, the following activities will be conducted:

- A permit will be obtained from Alameda County for the soilgas borings.
- The proposed soilgas sampling locations will be marked in the field and USA/811 will be notified.

A direct-push (Geoprobe) drill rig will be used to install the soilgas implants. Soilgas implants will consist of SVPT91 polypropylene implants purchased from Environmental Service Products (www.envservprod.com/Polyethylene-Vapor-Implant-P9C5.aspx), or similar. These implants contain a porous tip upon which 1/4-inch outside diameter, 3/16-inch inside diameter, Teflon tubing will be attached. Figure 9 shows the proposed completion schematic for each soilgas sampling point.

The implant installation procedure is presented in Table 7 and the attached standard operating procedure.

Purging and sampling will be performed on the same day as installation of the soilgas implants - after waiting at least 2 hours.

Purge Test

Prior to performing soilgas sampling, a purge test will be conducted at location SG1. The purpose of the purge test will be to evaluate the relationship between purge volume and soilgas concentration - this will allow us to determine the purge volume producing the highest soilgas concentration. Location SG1 has been chosen because soilgas is expected to be near the highest concentration at this location.

During the purge test: 1, 2, 3, and 5 standard purge volumes of soilgas will be removed and tedlar bag samples will be collected at the designated intervals. The atmosphere in the tedlar bags will be measured in the field using an organic vapor monitor (photoionization device fitted with a 10.6 eV lamp, calibrated to 100 ppm v/v isobutylene).

The purge volume with the highest concentration will be used throughout the soilgas sampling program.

The purge test is summarized in Table 8 and the attached standard operating procedure. The purge test log is contained in the standard operating procedure.

Tracer Gas

During purging and sampling, a shroud will be placed over the top of the soilgas sampling point and a tracer gas will be maintained inside the shroud. The concentration of the tracer gas inside the shroud will be measured in the field using an organic vapor monitor. Using this approach, the theoretical "leakage" or "bypass" of air from above the ground/pavement surface to the sample may be quantified.

The shroud will consist of a rectangular plastic container fitted with weather stripping at the base and bulkhead fittings on opposite ends. The sample tubing will be threaded through one of the bulkhead fittings. The other bulkhead fitting will serve as a sampling port for the field organic vapor monitor (to ensure the appropriate tracer gas atmosphere exists beneath the shroud, also to measure the tracer gas concentration inside the shroud).

The tracer gas atmosphere will be created inside the shroud by placing a source of 2-propanol. The 2-propanol source will consist of a perforated metal liner containing a cloth saturated with 2-propanol.

The tracer gas procedures are summarized in Table 8 and the attached standard operating procedure. The tracer gas log is contained in the standard operating procedure.

Soilgas Purging and Sample Collection

Purging and sample collection will consist of the following steps:

- Place shroud over sampling point.
- Install the tracer gas source.
- Thread sample tubing through one of the bulkhead fittings in the shroud and connect the flow regulator ("Blue Box" regulator, providing a flowrate of 0.167 liters per minute, supplied by Air Toxics, Folsom CA).
- Connect the flow regulator to the vacuum pump.
- Perform purging with the vacuum pump (number of standard purge volumes determined during the previous "purge test").
- Disconnect vacuum pump from the flow regulator and connect Summa canister to the flow regulator.
- Collect sample using the Summa canister (collected at a flowrate of 0.167 liters per minute).

- Label Summa canister with sample location, time and vacuum at start of fill, time and vacuum at end of fill.

Samples will be transported to the laboratory (Air Toxics, Folsom CA). Samples will be analyzed for TPH-gasoline and volatile organic compounds by EPA Method TO-15 (including 2-propanol - the tracer gas).

Purging and sampling procedures are summarized in Table 8 and the attached standard operating procedure. The purge and sample log is contained in the standard operating procedure.

Leak Test

After collecting selected samples, a leak test will be performed to verify the integrity of the various tubing connections. The leak test will be performed by applying a vacuum to the connections for approximately 5 minutes and measuring any changes in vacuum. If no decrease in vacuum is observed, the integrity of the connections will have been verified. If any decrease in vacuum is observed, the sample will be discarded and a new sample will be collected (new purge and sample) after waiting at least 2 hours.

Leak test procedures are summarized in Table 8 and the attached standard operating procedure. The leak test log is contained in the standard operating procedure.

REPORTING

The results of the soilgas investigation will be summarized in a report.

SCHEDULE

Fieldwork will be conducted after the end of the rainy season - as soon as the groundwater table starts to drop - circa June or July 2011. The report will be submitted by September 2011.

INVESTIGATION-DERIVED WASTE

The activities described in this workplan will generate decontamination wastewater and hydrated bentonite. Decontamination wastewater may be discharged to the sanitary sewer. Hydrated bentonite may be placed inside plastic garbage bags and disposed of as municipal waste.

QUALITY ASSURANCE/QUALITY CONTROL

The laboratory will include appropriate quality assurance/quality control samples in the laboratory sample train. Field quality control samples will not be collected. Specific quality control procedures are also described in the attached standard operating procedure.

The field organic vapor monitor (Mini Rae 2000, fitted with a 10.6 eV photoionization detector) will be calibrated to 100 ppm v/v isobutylene gas prior to the beginning of each field day. Recalibration may be appropriate if unusual measurements are noticed.

HEALTH AND SAFETY

The attached Site Safety Plan presents the procedures to be followed to protect the safety of workers during planned fieldwork. Physical and chemical hazards are addressed, such as working around equipment and exposure to chemicals. Although the proposed fieldwork does not necessarily require adherence to safety protocols for hazardous waste sites, the procedures in the Site Safety Plan are intended to comply with the pertinent sections of 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response.

Please contact us with any questions or comments.

Sincerely,

STREAMBORN

Douglas W. Lovell, PE
Geoenvironmental Engineer

Attachments

Electronic Submission: This report was uploaded to Geotracker (http://geotracker.swrcb.ca.gov/) and the Alameda County server.

Table 1 (Page 1 of 2)

Environmental Chronology

2440 East Eleventh Street
Oakland CA

Date	Performed By	Event
Unknown	Unknown	• 1,000-gallon underground leaded gasoline tank was installed.
15 August 1991	Eandi Metal Works	• The 1,000-gallon tank was emptied of product. Use of the tank was discontinued.
11 May 1992	Unknown	• The 1,000-gallon tank was removed and soil and groundwater contamination was discovered.
10 July 1995	AGI Technologies	• Five soil borings were drilled. Soil samples were collected and analyzed for TPH-gasoline, BTEX, MtBE, and total metals. • Three of the borings were completed as monitoring wells (MW1, MW2, and MW3). The other two borings (E1 and E2) were grouted. • Water levels were measured in wells MW1, MW2, and MW3. • Wells MW1, MW2, and MW3 were developed and groundwater samples were collected. Samples were analyzed for TPH-gasoline, BTEX, MtBE, and total lead. • An elevation survey was conducted for wells MW1, MW2, and MW3.
17 July 1995	AGI Technologies	• Groundwater levels were measured in wells MW1, MW2, and MW3. • Groundwater samples were collected from wells MW1, MW2, and MW3. Samples were analyzed for TPH-gasoline, BTEX, MtBE, and total lead.
20 October 1995	AGI Technologies	• Groundwater levels were measured in wells MW1, MW2, and MW3. • Groundwater samples were collected from wells MW1, MW2, and MW3. Samples were analyzed for TPH-gasoline, BTEX, and total lead.
25 January 1996	AGI Technologies	• Groundwater levels were measured in wells MW1, MW2, and MW3. • Groundwater samples were collected from wells MW1, MW2, and MW3. Samples were analyzed for TPH-gasoline, BTEX, MtBE, and total lead.
25 April 1996	AGI Technologies	• Groundwater levels were measured in wells MW1, MW2, and MW3. • Groundwater samples were collected from wells MW1, MW2, and MW3. Samples were analyzed for TPH-gasoline, BTEX, MtBE, and total lead.
11 - 12 June 2001	Kleinfelder	• Groundwater levels were measured in wells MW1, MW2, and MW3. • Groundwater samples were collected from wells MW1, MW2, and MW3. Samples were analyzed for TPH-gasoline, BTEX, and total lead.
5 February 2002	Kleinfelder	• Groundwater levels were measured in wells MW1, MW2, and MW3. • Groundwater samples were collected from wells MW1, MW2, and MW3. Samples were analyzed for TPH-gasoline, BTEX, MtBE, and total lead.
9 June 2004	Streamborn	• Using a backhoe, the excavation for the former tank was partially re-excavated. • Soil samples were collected from the base (7.5-8 feet below ground surface) and each of the four sidewalls (5-5.5 feet below ground surface) by exposing native soil and driving a brass liner into the exposed soil. • Soil samples were analyzed for TPH-diesel/kerosene/stoddard solvent, TPH-gasoline, BTEX, fuel oxygenates, and total lead.
12 August 2004	Streamborn	• Groundwater levels were measured in wells MW1, MW2, and MW3. • Groundwater samples were collected from wells MW1, MW2, and MW3. Samples were analyzed for TPH-gasoline, BTEX, fuel oxygenates, and total lead. • Seven geoprobe borings (B1-B7) were drilled to depths between 20 and 32 feet. Soil samples were collected continuously in the borings. • Two soil samples were retained from each of the borings for chemical analysis. One soil sample approximately coincided with the depth of groundwater observed during drilling and the other soil sample coincided with the bottom of the boring. Soil samples were analyzed for TPH-gasoline, BTEX, fuel oxygenates, and total lead. • Temporary casings were installed in the borings and water levels allowed to stabilize for at least one hour. Water levels were measured. • Purged groundwater samples were collected from the temporary casings. Samples were analyzed for TPH-gasoline, BTEX, fuel oxygenates, and total lead. • The temporary casings were removed from the borings and the borings were grouted.
17-23 September 2004	Streamborn	• Using a backhoe, the excavation for the former tank was completely re-excavated. The excavated soil was air-dried and replaced in the excavation using ±2-foot lifts. Each lift was compacted using a whacker. 6 inches of imported Class II aggregate base was placed as the final lift of soil. • The pavement and sidewalk were repaved with reinforced concrete. The concrete thickness was 8 inches. The reinforcement was #5 rebar on 12-inch centers.
2 March 2005	Streamborn	• Groundwater levels were measured in wells MW1, MW2, and MW3. • Groundwater samples were collected from wells MW1, MW2, and MW3. Samples were analyzed for TPH-gasoline, BTEX, and fuel oxygenates.

Table 1 (Page 2 of 2)

Environmental Chronology

2440 East Eleventh Street
Oakland CA

Date	Performed By	Event
28 September 2006	Streamborn	• Two direct push borings were drilled to 17 feet. Soil samples were collected continuously during drilling and selected samples were analyzed for TPH-gasoline, BTEX, fuel oxygenates, total lead, and lead scavengers (1,2-dichloroethane and ethylene dibromide). • Each boring was subsequently overdrilled using a hollow-stem auger and completed as a two-inch diameter, 17-foot deep monitoring well (MW4 and MW5). • The elevations of wells MW4 and MW5 were surveyed.
2 October 2006	Streamborn	• Wells MW4 and MW5 were developed. • Groundwater levels were measured in wells MW1, MW2, MW3, MW4, and MW5. • Groundwater samples were collected from wells MW1, MW2, MW3, MW4, and MW5. Samples were analyzed for TPH-gasoline/BTEX/fuel oxygenates (EPA Method 8260), total lead, and lead scavengers (1,2-dichloroethane and ethylene dibromide).
20 March 2007	Streamborn	• Groundwater levels were measured in wells MW1, MW2, MW3, MW4, and MW5. • Groundwater samples were collected from wells MW1, MW2, MW3, MW4, and MW5. Samples were analyzed for TPH-gasoline/BTEX/fuel oxygenates (EPA Method 8260).
10 September 2007	Streamborn	• Groundwater levels were measured in wells MW1, MW2, MW3, MW4, and MW5. • Groundwater samples were collected from wells MW1, MW2, MW3, MW4, and MW5. Samples were analyzed for TPH-gasoline/BTEX/fuel oxygenates (EPA Method 8260).
10 March 2008	Streamborn	• Groundwater levels were measured in wells MW1, MW2, MW3, MW4, and MW5. • Groundwater samples were collected from wells MW1, MW2, MW3, MW4, and MW5. Samples were analyzed for TPH-gasoline/BTEX/fuel oxygenates (EPA Method 8260).
8 September 2008	Streamborn	• Groundwater levels were measured in wells MW1, MW2, MW3, MW4, and MW5. • Groundwater samples were collected from wells MW1, MW2, MW3, MW4, and MW5. Samples were analyzed for TPH-gasoline/BTEX/fuel oxygenates (EPA Method 8260).
3 March 2009	Streamborn	• Groundwater levels were measured in wells MW1, MW2, MW3, MW4, and MW5. • Groundwater samples were collected from wells MW1, MW2, MW3, MW4, and MW5. Samples were analyzed for TPH-gasoline/BTEX/fuel oxygenates (EPA Method 8260).
28 August 2009	Streamborn	• Virgil Chavez Land Surveying (Vallejo CA) surveyed wells MW1 through MW5 to the NAD83 horizontal datum and the NAVD88 vertical datum.
1 September 2009	Streamborn	• Groundwater levels were measured in wells MW1, MW2, MW3, MW4, and MW5. • Groundwater samples were collected from wells MW1, MW2, MW3, MW4, and MW5. Samples were analyzed for TPH-gasoline/BTEX/fuel oxygenates (EPA Method 8260).
8 March 2010	Streamborn	• Groundwater levels were measured in wells MW1, MW2, MW3, MW4, and MW5. • Groundwater samples were collected from wells MW1, MW2, MW3, MW4, and MW5. Samples were analyzed for TPH-gasoline/BTEX/fuel oxygenates (EPA Method 8260).
10 September 2010	Streamborn	• Groundwater levels were measured in wells MW1, MW2, MW3, and MW5. • Groundwater samples were collected from wells MW1, MW2, MW3, and MW5. Samples were analyzed for TPH-gasoline/BTEX/fuel oxygenates (EPA Method 8260).

General Notes

(a) TPH = total petroleum hydrocarbons.

(b) BTEX = benzene, toluene, xylenes, and total xylenes.

(c) MtBE = methyl tert-butyl ether.

Table 2 (Page 1 of 2)

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Oakland CA

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Oakland CA

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Table 3

Groundwater Level and Gradient Data

2440 East Eleventh Street
Oakland CA

Location	MW1		MW2		MW3		MW4		MW5		Groundwater Gradient	
Ground Surface Elevation	24.51		24.21		23.06		23.12		22.59			
Casing Diameter (inches)	2		2		2		2		2			
Surveyed Latitude and Longitude (NAD83)	37.7801530 -122.2358181		37.7800499 -122.2358522		37.7800410 -122.2361722		37.7799066 -122.2361136		37.7800613 -122.2363355			
Measuring Point (NAD88 datum)	**TOC N Side Elev = 24.14**		**TOC N Side Elev = 23.92**		**TOC N Side Elev = 22.69**		**TOC N Side Elev = 22.45**		**TOC N Side Elev = 21.94**			
Intercepted Interval	Depth	Elev	Depth	Elev	Depth	Elev	Depth	Elev	Depth	Elev		
	9 to 20	4.5 to 15.5	9 to 20	4.2 to 15.2	9 to 20	3.1 to 14.1	6 to 17	6.1 to 17.1	6 to 17	5.6 to 16.6	Direction	Magnitude
14 July 1995	9.72	14.42	10.74	13.18	10.95	11.74						
17 July 1995	11.11	13.03	10.93	12.99	11.04	11.65						
20 October 1995	11.96	12.18	11.92	12.00	12.11	10.58						
25 January 1996	8.14	16.00	8.23	15.69	8.83	13.86						
11-12 June 2001	10.35	13.79	11.50	12.42	11.08	11.61						
5 February 2002	11.00	13.14	11.10	12.82	11.30	11.39						
12 August 2004	10.95	13.19	11.17	12.75	11.77	10.92					N 115^o W	0.02
2 March 2005	8.25	15.89	8.44	15.48	9.36	13.33					N 120^o W	0.03
2 October 2006	11.08	13.06	11.15	12.77	11.79	10.90	11.48	10.97	11.28	10.66	N 126^o W	0.02
20 March 2007	10.96	13.18	10.78	13.14	10.91	11.78	10.57	11.88	10.41	11.53	N 127^o W	0.01
10 September 2007	11.24	12.90	11.54	12.38	12.20	10.49	11.91	10.54	11.68	10.26	N 128^o W	0.02
10 March 2008	10.74	13.40	10.89	13.03	10.60	12.09	10.28	12.17	10.16	11.78	N 114^o W	0.01
8 September 2008	11.73	12.41	11.42	12.50	12.09	10.60	11.77	10.68	11.57	10.37	N 124^o W	0.01
3 March 2009	8.31	15.83	8.22	15.70	9.30	13.39	8.98	13.47	8.93	13.01	N 117^o W	0.02
1 September 2009	10.99	13.15	11.29	12.63	11.97	10.72	11.68	10.77	11.45	10.49	N 114^o W	0.02
8 March 2010	9.00	15.14	8.98	14.94	9.84	12.85	9.48	12.97	9.43	12.51	N 116^o W	0.02
Total Depth (Last Measurement)	19.8		19.8		19.6		17.3		17.2			

General Notes

(a) Elevations are cited in units of feet, relative to the NAVD88 datum (NOT Mean Sea Level).

(b) TOC = top of PVC casing. N = north. Measuring points were the top of the PVC casing, north side.

(c) The intercepted intervals correspond to the sand pack interval. The depths of the intercepted intervals were measured relative to ground surface.

(d) On 28 August 2009, Virgil Chavez Land Surveying (Vallejo CA) surveyed wells MW1 through MW5. Horizontal coordinates were surveyed relative to the NAD83 datum. Elevations were surveyed relative to the NAVD88 datum. According to Virgil Chavez Land Surveying, subtract 2.726 feet from the NAVD88 elevations to convert to NGVD29 (Mean Sea Level) datum. Previous surveys had been conducted by HTT Engineering (Oakland CA) and Streamborn; however, the data in this table are based solely on the survey by Virgil Chavez Land Surveying.

Table 4

Well Purging and Sampling Information Since 2001

2440 East Eleventh Street
Oakland CA

Well No.	Sample Date	Sample Type	Purge Method	Purge Duration (minutes)	Approximate Volume Purged (gallons)	Volume Purged (static water casing volumes)	Purged Dry?	Dissolved Oxygen (mg/L)	pH	Specific Conductance (µS/cm)	Temp (˚C)	ORP (mV)	Turbidity/ Color
MW1	11 Jun 01	Grab	SPP	NM	20	NC	no	NM	6.8	310	21.4	NM	NM
	5 Feb 02	Grab	SPP	NM	4	NC	no	NM	6.6	290	18.8	NM	NM
	12 Aug 04	Grab	SPP	4	5	±3	no	1.1	7.0	230	18.8	-130	Clear/none
	2 Mar 05	Grab	SPP	7	6	±3	no	2.2	6.9	230	17.1	-160	Clear/none
	2 Oct 06	Grab	SPP	7	5	±3	no	1.0	6.6	380	17.7	-130	Translucent/gray
	20 Mar 07	Grab	SPP	25	5	±3	no	0.8	6.8	410	16.1	-130	Clear/none
	10 Sep 07	Grab	SPP	8	5	±3	no	0.9	6.7	480	18.0	-100	Clear/none
	10 Mar 08	Grab	SPP	11	5	±3	no	0.7	6.9	410	16.6	-110	Clear/none
	8 Sep 08	Grab	SPP	6	4	±3	no	1.0	6.9	530	18.4	-80	Clear/none
	3 Mar 09	Grab	SPP	11	6	±3	no	0.8	6.8	480	15.8	-60	Clear/none
	1 Sep 09	Grab	SPP	15	5	±3	no	0.8	6.8	500	19.2	-80	Clear/none
	8 Mar 10	Grab	SPP	23	7	±4	no	0.7	6.8	450	17.4	-90	Clear/none
MW2	12 Jun 01	Grab	SPP	NM	15	NC	no	NM	7.1	430	17.2	NM	NM
	5 Feb 02	Grab	SPP	NM	4	NC	no	NM	6.6	400	16.8	NM	NM
	12 Aug 04	Grab	SPP	4	5	±3	no	2.0	6.8	510	18.9	-170	Turbid/gray
	2 Mar 05	Grab	SPP	7	6	±3	no	2.2	6.7	490	17.7	-220	Clear/none
	2 Oct 06	Grab	SPP	7	5	±3	no	1.0	6.7	490	18.0	-110	Clear/none
	20 Mar 07	Grab	SPP	20	5	±3	no	1.0	6.9	490	16.7	-170	Clear/none
	10 Sep 07	Grab	SPP	7	4	±3	no	0.7	6.8	560	19.6	-110	Clear/none
	10 Mar 08	Grab	SPP	11	5	±3	no	0.9	7.1	520	17.1	-90	Clear/none
	8 Sep 08	Grab	SPP	7	5	±3	no	1.5	7.5	670	19.0	-50	Clear/none
	3 Mar 09	Grab	SPP	11	6	±3	no	0.9	6.9	690	15.9	-50	Clear/none
	1 Sep 09	Grab	SPP	14	5	±3	no	0.7	6.9	670	21.1	-60	Translucent/gray
	8 Mar 10	Grab	SPP	24	7	±4	no	0.8	6.8	630	17.4	-70	Clear/none
MW3	12 Jun 01	Grab	SPP	NM	12	NC	no	NM	7.4	440	17.2	NM	NM
	5 Feb 02	Grab	SPP	NM	4	NC	no	NM	6.6	410	17.8	NM	NM
	12 Aug 04	Grab	SPP	8	4	±3	no	1.7	6.6	440	19.0	-150	Clear/none
	2 Mar 05	Grab	SPP	6	5	±3	no	2.3	6.8	500	18.1	-200	Clear/none
	2 Oct 06	Grab	SPP	6	4	±3	no	1.0	6.8	490	18.8	-60	Clear/none
	20 Mar 07	Grab	SPP	25	4	±3	no	1.6	6.7	540	16.8	-60	Clear/none
	10 Sep 07	Grab	SPP	7	4	±3	no	0.9	6.7	530	18.8	-120	Clear/none
	10 Mar 08	Grab	SPP	10	5	±3	no	0.7	7.1	510	17.5	-100	Clear/none
	8 Sep 08	Grab	SPP	6	4	±3	no	1.0	7.0	600	19.3	-50	Clear/none
	3 Mar 09	Grab	SPP	7	5	±3	no	0.9	6.8	620	16.7	-50	Clear/none
	1 Sep 09	Grab	SPP	12	4	±3	no	0.8	6.8	570	19.6	-60	Clear/none
	8 Mar 10	Grab	SPP	15	5	±3	no	0.7	6.8	540	16.9	-70	Clear/none
MW4	2 Oct 06	Grab	SPP	24	14	±16	no	4.6	7.1	630	18.5	180	Translucent/brown
	20 Mar 07	Grab	SPP	15	3	±3	no	1.2	6.5	470	15.7	170	Clear/none
	10 Sep 07	Grab	SPP	7	3	±3	no	1.4	6.4	490	18.1	120	Translucent/gray
	10 Mar 08	Grab	SPP	9	4	±3	no	1.4	6.6	480	15.9	120	Clear/none
	8 Sep 08	Grab	SPP	4	3	±3	no	1.3	6.6	560	18.1	140	Clear/none
	3 Mar 09	Grab	SPP	7	4	±3	no	2.0	6.6	590	15.8	280	Clear/none
	1 Sep 09	Grab	SPP	9	3	±3	no	0.9	6.6	530	18.3	130	Clear/none
	8 Mar 10	Grab	SPP	10	4	±3	no	1.1	6.6	460	16.0	170	Clear/none
MW5	2 Oct 06	Grab	SPP	35	22	±24	no	3.4	7.0	600	19.1	30	Translucent/brown
	20 Mar 07	Grab	SPP	23	3	±3	no	0.9	6.9	580	16.6	-70	Clear/none
	10 Sep 07	Grab	SPP	7	3	±3	no	0.8	6.8	630	19.5	-90	Clear/none
	10 Mar 08	Grab	SPP	11	4	±3	no	1.0	7.1	570	16.6	-100	Clear/none
	8 Sep 08	Grab	SPP	4	3	±3	no	1.0	7.1	730	20.4	-80	Clear/none
	3 Mar 09	Grab	SPP	8	4	±3	no	0.8	6.9	670	16.1	-80	Clear/none
	1 Sep 09	Grab	SPP	9	3	±3	no	0.9	6.8	660	19.9	-70	Clear/none
	8 Mar 10	Grab	SPP	8	4	±3	no	0.7	6.9	570	15.9	-90	Clear/none

General Notes

(a) NM = not measured.

(b) NC = not calculated.

(c) ORP = oxidation-reduction potential.

(d) SPP = submersible purge pump.

(d) Measurements cited in this table correspond to the end of purging (time of sampling).

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Groundwater Analytical Data from Monitoring Wells

2440 East Eleventh Street
Oakland CA

Location	Sample Date	Sample Type	Total Lead (µg/L)	TPH-Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	1,2-Dichloro-ethane (µg/L)	Ethylene Dibromide (µg/L)	MtBE (µg/L)	Other Fuel Oxygenates (EPA Method 8260) (µg/L)
MW1	17 Jul 1995	Grab	<40	22,000	390	2,000	800	5,300	NM	NM	<125	NM
	20 Oct 1995	Grab	<40	14,000	270	540	360	1,800	NM	NM	NM	NM
	25 Jan 1996	Grab	<40	16,000	740	1,300	490	2,700	NM	NM	<500	NM
	25 Apr 1996	Grab	<40	4,600	180	450	190	1,000	NM	NM	<250	NM
	11 Jun 2001	Grab	14	7,100	14	35	240	720	NM	NM	NM	NM
	5 Feb 2002	Grab	3.7	9,300	6.3	11	230	560	NM	NM	<0.70	NM
	12 Aug 2004	Grab	<5.0	2,900	9.1	6.0	130	160	NM	NM	0.72	<0.50 to <50
	2 Mar 2005	Grab	NM	950	1.9	0.60	19	4.0	NM	NM	0.80	<0.50 to <50
	2 Oct 2006	Grab	<100	830	4.1	0.80	44	7.8	<0.50	<0.50	<0.50	<0.50 to <100
	20 Mar 2007	Grab	NM	470	2.1	<0.50	8.5	1.8	<0.50	NM	0.63	<0.50 to <100
	10 Sep 2007	Grab	NM	3,400	18	6.4	170	43	<0.50	NM	1.1	<0.50 to <100
	10 Mar 2008	Grab	NM	950	2.9	0.66	19	1.9	<0.50	NM	0.72	<0.50 to <100
	8 Sep 2008	Grab	NM	3,600	14	6.5	200	19	<0.50	NM	0.62	<0.50 to <100
	3 Mar 2009	Grab	NM	1,600	5.2	2.1	68	9.7	NM	NM	0.56	<0.50 to <5.0
	1 Sep 2009	Grab	NM	1,700	7.0	2.2	64	4.2	NM	NM	<0.50	<0.50 to <5.0
	8 Mar 2010	Grab	NM	400	1.0	<0.50	17	1.2	NM	NM	<0.50	<0.50 to <4.0
MW2	17 Jul 1995	Grab	56.4	21,000	370	1,700	930	5,100	NM	NM	<125	<0.50 to <5.0
	20 Oct 1995	Grab	<40	730	18	27	26	7.9	NM	NM	NM	NM
	25 Jan 1996	Grab	<40	14,000	74	660	1,000	2,600	NM	NM	670	NM
	25 Apr 1996	Grab	<40	13,000	370	440	1,000	2,900	NM	NM	<500	NM
	12 Jun 2001	Grab	7.7	3,200	11	6.2	170	270	NM	NM	NM	NM
	5 Feb 2002	Grab	3.5	2,900	7.6	3.8	220	160	NM	NM	<0.70	NM
	12 Aug 2004	Grab	<5.0	3,100	2.6	1.8	<0.50	13	NM	NM	<0.50	<0.50 to <5.0
	2 Mar 2005	Grab	NM	3,700	<5.0	<2.5	340	22	NM	NM	<2.5	<2.5 to <25
	2 Oct 2006	Grab	<100	7,200	<2.5	3.0	380	30	<2.5	<2.5	<2.5	<2.5 to <500
	20 Mar 2007	Grab	NM	7,000	<5.0	<5.0	370	34	<5.0	NM	<5.0	<5.0 to <1,000
	10 Sep 2007	Grab	NM	9,300	<2.5	3.8	530	38	<2.5	NM	<2.5	<2.5 to <500
	10 Mar 2008	Grab	NM	6,500	<2.5	<2.5	200	13	<2.5	NM	<2.5	<2.5 to <500
	8 Sep 2008	Grab	NM	7,300	<2.5	<2.5	290	12	<2.5	NM	<2.5	<2.5 to <500
	3 Mar 2009	Grab	NM	3,700	<0.50	1.1	<0.50	4.7	NM	NM	<0.50	<0.50 to <5.0
	1 Sep 2009	Grab	NM	5,100	1.4	1.8	140	9.2	NM	NM	<1.0	<1.0 to <10
	8 Mar 2010	Grab	NM	2,400	1.7	2.3	100	7.7	NM	NM	<1.0	<1.0 to <8.0
MW3	17 Jul 1995	Grab	153	8,400	1,200	150	1,000	1,700	NM	NM	<125	NM
	20 Oct 1995	Grab	<40	5,800	600	590	43	340	NM	NM	NM	NM
	25 Jan 1996	Grab	<40	10,000	1,200	290	870	1,300	NM	NM	<250	NM
	25 Apr 1996	Grab	<40	8,900	830	140	1,000	1,000	NM	NM	400	NM
	12 Jun 2001	Grab	7.4	1,800	37	4.5	98	19	NM	NM	NM	NM
	5 Feb 2002	Grab	4.4	1,100	32	2.1	76	9.5	NM	NM	<0.50	NM
	12 Aug 2004	Grab	<50	1,100	4.5	<0.50	6.0	1.8	NM	NM	1.4	<0.50 to <5.0
	2 Mar 2005	Grab	NM	3,000	27	3.0	76	22	NM	NM	<2.5	<2.5 to <25
	2 Oct 2006	Grab	<100	1,500	6.6	<0.50	5.0	2.5	<0.50	<0.50	<0.50	<0.50 to <100
	20 Mar 2007	Grab	NM	2,200	15	1.6	14	12	<0.50	NM	0.52	<0.50 to <100
	10 Sep 2007	Grab	NM	1,000	4.2	<0.50	<0.50	0.82	<0.50	NM	0.53	<0.50 to <100
	10 Mar 2008	Grab	NM	4,000	13	1.1	7.0	7.4	<0.50	NM	<0.50	TAME = 0.53 Others <0.50 to <100
	8 Sep 2008	Grab	NM	1,100	9.7	0.75	7.7	5.9	<0.50	NM	0.59	<0.50 to <100
	3 Mar 2009	Grab	NM	2,100	14	1.6	16	14	NM	NM	<0.50	<0.50 to <5.0
	1 Sep 2009	Grab	NM	1,400	4.7	<0.50	0.52	1.7	NM	NM	<0.50	<0.50 to <5.0
	8 Mar 2010	Grab	NM	2,500	13	1.1	6.8	15	NM	NM	<0.50	<0.50 to <4.0
MW4	2 Oct 2006	Grab	<100	<50	<0.50	<0.50	0.96	<0.50	<0.50	<0.5	<0.5	<0.50 to <100
	20 Mar 2007	Grab	NM	<50	<0.50	<0.50	<0.50	<0.50	<0.50	NM	<0.5	<0.50 to <100
	10 Sep 2007	Grab	NM	<50	<0.50	<0.50	<0.50	<0.50	<0.50	NM	<0.5	<0.50 to <100
	10 Mar 2008	Grab	NM	<50	<0.50	<0.50	<0.50	<0.50	<0.50	NM	<0.5	<0.50 to <100
	8 Sep 2008	Grab	NM	<50	<0.50	<0.50	<0.50	<0.50	<0.50	NM	<0.5	<0.50 to <100
	3 Mar 2009	Grab	NM	<50	<0.50	<0.50	<0.50	<1.0	NM	NM	<0.5	<0.50 to <5.0
	1 Sep 2009	Grab	NM	<50	<0.50	<0.50	<0.50	<1.0	NM	NM	<0.5	<0.50 to <5.0
	8 Mar 2010	Grab	NM	<50	<0.50	<0.50	<0.50	<1.0	NM	NM	<0.50	<0.50 to <4.0

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Groundwater Analytical Data from Monitoring Wells

2440 East Eleventh Street
Oakland CA

Location	Sample Date	Sample Type	Total Lead (µg/L)	TPH-Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	1,2-Dichloro-ethane (µg/L)	Ethylene Dibromide (µg/L)	MtBE (µg/L)	Other Fuel Oxygenates (EPA Method 8260) (µg/L)
MW5	2 Oct 2006	Grab	<100	3,000	20	0.97	69	130	<0.50	<0.50	2.6	<0.50 to <100
	20 Mar 2007	Grab	NM	2,800	13	1.5	27	35	<0.50	NM	1.6	<0.50 to <100
	10 Sep 2007	Grab	NM	1,900	11	0.78	10	9.2	<0.50	NM	2.5	<0.50 to <100
	10 Mar 2008	Grab	NM	4,900	7.8	1.4	13	12	<0.50	NM	1.2	<0.50 to <100
	8 Sep 2008	Grab	NM	2,300	9.7	0.75	7.7	5.9	<0.50	NM	2.3	<0.50 to <100
	3 Mar 2009	Grab	NM	2,600	11	4	60	30	NM	NM	<2.5	<2.5 to <25
	1 Sep 2009	Grab	NM	1,800	5.5	0.68	5.5	2.5	NM	NM	0.98	<0.50 to <5.0
	8 Mar 2010	Grab	NM	2,100	6.0	1.8	14	9.4	NM	NM	<0.50	<0.50 to <4.0

Environmental Screening Level - California Maximum Contaminant Levels (drinking water criteria)	15		1.0	150	300	1,750	0.5	0.050		
Environmental Screening Level - Risk-Based Drinking Water Equivalent for Carcinogens, 10-6 Excess Cancer Risk (drinking water criteria)			0.35		3.2		0.38	0.0097		
Environmental Screening Level - California Office of Environmental Health Hazard Assessment (OEHHA), Public Health Goal (PHG) (drinking water criteria)	2.0		0.15	150	300	1,800	0.4			
Environmental Screening Level - Taste and Odor Threshold (drinking water criteria)	50,000	100	170	40	30	20	700	50,000		
Environmental Screening Level - Volatilization from Groundwater and Subsequent Vapor Intrusion, Residential Use		Measure Soilgas	540	380,000	170,000	160,000	200	150		
Environmental Screening Level - Volatilization from Groundwater and Subsequent Vapor Intrusion, Commercial Use		Measure Soilgas	1,800	530,000	170,000	160,000	690	510		
Environmental Screening Level - Gross Contamination Ceiling Value for Groundwater (nuisance odors, etc.)	50,000	5,000	20,000	400	300	5,300	50,000	50,000		
Environmental Screening Level - Estuarine Surface Water - Chronic Habitat Aquatic Toxicity	2.5	210	46	130	43	100	2,000	1,400		
Environmental Screening Level - Estuarine Surface Water - Bioaccumulation/Human Consumption			71	200,000	29,000		99			

General Notes

(a) TPH = total petroleum hydrocarbons. MtBE = methyl tert-butyl ether. TAME = tert-amyl methyl ether.

(b) NM = not measured.

(c) Samples were collected using a Teflon bailer fitted with a bottom-emptying device.

(d) Environmental Screening Levels from: *Screening For Environmental Concerns at Sites With Contaminated Soil and Groundwater (Interim Final - November 2007, Revised May 2008).* Prepared by San Francisco Bay Regional Water Quality Control Board, Oakland CA. 27 May 2008. www.waterboards.ca.gov/sanfranciscobay/esl.shtml

Table 6

Soil Analytical Data

2440 East Eleventh Street
Oakland CA

Location	Sample Date	Sample Type	Sample Depth (feet)	TPH-Diesel (mg/kg)	TPH-Kerosene (mg/kg)	TPH-Stoddard Solvent (mg/kg)	TPH-Gasoline (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Total Xylenes (mg/kg)	MtBE (mg/kg)	Other Fuel Oxygenates (EPA Method 8260) (mg/kg)	Total Lead (mg/kg)
A-1	11 May 1992	Grab (liner)	9	NM	NM	NM	620	4.4	25	9.3	55	NM	NM	4.4
A-2	11 May 1992	Grab (liner)	9	NM	NM	NM	1,100	11	64	19	110	NM	NM	<2.5
A-PL	11 May 1992	Grab (liner)	3	NM	NM	NM	<1.0	0.023	0.006	<0.005	0.060	NM	NM	6.0
ASP-1,2	11 May 1992	Composite	NA	NM	NM	NM	10	0.033	0.320	0.051	1.4	NM	NM	3.9
E-1	10 Jul 1995	Grab (liner)	6	NM	NM	NM	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005 [1]	NM	15.9
		Grab (liner)	12.5	NM	NM	NM	1.4	0.058	0.15	0.059	0.30	0.017 [1]	NM	10.5
E-2	10 Jul 1995	Grab (liner)	12.5	NM	NM	NM	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005 [1]	NM	12.8
Base	9 Jun 2004	Grab (liner)	7.5-8	<1	<1	<1	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	43
Sidewall NW	9 Jun 2004	Grab (liner)	5-5.5	<1	<1	<1	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	5.5
Sidewall NE	9 Jun 2004	Grab (liner)	5-5.5	<1	<1	<1	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	22
Sidewall SW	9 Jun 2004	Grab (liner)	5-5.5	<1	<1	<1	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	7.9
Sidewall SE	9 Jun 2004	Grab (liner)	5-5.5	<1	<1	<1	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	42
MW1	10 Jul 1995	Grab (liner)	11	NM	NM	NM	45	<0.05	<0.05	0.33	1.5	<0.05	NM	15.6
		Grab (liner)	16	NM	NM	NM	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005	NM	10.8
MW2	10 Jul 1995	Grab (liner)	11	NM	NM	NM	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005	NM	10.7
		Grab (liner)	16	NM	NM	NM	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005	NM	11.2
MW3	10 Jul 1995	Grab (liner)	11	NM	NM	NM	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005	NM	13.5
		Grab (liner)	16	NM	NM	NM	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005	NM	9.1
MW4	28 Sep 2006	Grab (liner)	10-10.5	NM	NM	NM	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010 to <0.200	<10
		Grab (liner)	15-15.5	NM	NM	NM	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010 to <0.200	5.7
MW5	28 Sep 2006	Grab (liner)	10-10.5	NM	NM	NM	<0.200	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010 to <0.200	7.5
		Grab (liner)	13.5-14	NM	NM	NM	26.0 [2][3]	<0.010	<0.010	0.160	0.420	<0.010	<0.010 to <0.200	5.9
		Grab (liner)	16.5-17	NM	NM	NM	2.5	<0.010	<0.010	0.018	0.044	<0.010	<0.010 to <0.200	6.5
B1	12 Aug 2004	Grab (liner)	12-12.5	NM	NM	NM	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	2.0
		Grab (liner)	19.5-20	NM	NM	NM	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	3.8
B2	12 Aug 2004	Grab (liner)	11.5-12	NM	NM	NM	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	6.0
		Grab (liner)	31.5-32	NM	NM	NM	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	5.3
B3	12 Aug 2004	Grab (liner)	19.5-20	NM	NM	NM	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	4.7
		Grab (liner)	28.5-29	NM	NM	NM	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	10
B4	12 Aug 2004	Grab (liner)	16-16.5	NM	NM	NM	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	13
		Grab (liner)	19.5-20	NM	NM	NM	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	6.6
B5	12 Aug 2004	Grab (liner)	11.5-12	NM	NM	NM	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	5.0
		Grab (liner)	27.5-28	NM	NM	NM	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	5.9
B6	12 Aug 2004	Grab (liner)	11.5-12	NM	NM	NM	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	8.4
		Grab (liner)	23.5-24	NM	NM	NM	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	61
B7	12 Aug 2004	Grab (liner)	18-18.5	NM	NM	NM	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	11
		Grab (liner)	19.5-20	NM	NM	NM	<1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 to <0.01	5.1

	TPH-Diesel	TPH-Kerosene	TPH-Stoddard Solvent	TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MtBE	Other Fuel Oxygenates	Total Lead
Environmental Screening Level - Direct Exposure, Residential Use	110	370	370	110	0.12	63	2.3	31	30		260
Environmental Screening Level - Leaching to Groundwater (Drinking Water Resource)	83			83	0.044	2.9	3.3	2.3	0.023		

General Notes

(a) TPH = total petroleum hydrocarbons. MtBE = methyl tert-butyl ether.

(b) The 10 July 1995 samples were collected by AGI Technologies (Bellevue WA) and analyzed by Anametrix Laboratories (San Jose CA).

(c) The 2004 and 2006 samples were collected by Streamborn (Berkeley CA) and analyzed by STL San Francisco (Pleasanton CA).

(d) Depths were measured from the adjacent ground or pavement surface.

(e) NA = Not applicable. This sample was a stockpile sample.

(f) NM = not measured.

(g) Soil samples collected in 1992 represent samples collected when the 1,000-gallon underground gasoline tank was removed. These data no longer represent residual soil concentrations. Samples A-1 and A-2 were collected from the tank excavation, sample A-PL was collected below the product line, and sample ASP1,2 was a composite of two samples (ASP-1 and ASP-2) collected from the excavated and stockpiled soil that was subsequently spread out and allowed to aerate for nine months prior to being replaced in the excavation.

(h) The soil samples collected from locations MW4 and MW5 (28 September 2006) were analyzed for lead scavengers 1,2-dichloroethane (1,2-DCA) and ethylene dibromide (EDB). Results were all less than the laboratory reporting limit of 0.010 mg/kg (nondetect).

(i) Environmental Screening Levels from: *Screening For Environmental Concerns at Sites With Contaminated Soil and Groundwater (Interim Final - November 2007, Revised May 2008).* Prepared by San Francisco Bay Regional Water Quality Control Board, Oakland CA. March 2009. http://www.waterboards.ca.gov/sanfranciscobay/esl.shtml

Footnotes

(1) For the 10 July 1995 samples, MtBE was analyzed by EPA Method 8020 and other fuel oxygenates were not analyzed.

(2) This sample was originally analyzed within the recommended hold time. Re-analysis with dilution was performed past the recommended hold time.

(3) The concentration represents an estimated value - above the calibration range of the laboratory instrument.

Table 7

Requirements to Install the Soilgas Sampling Points

2440 East Eleventh Street
Oakland CA

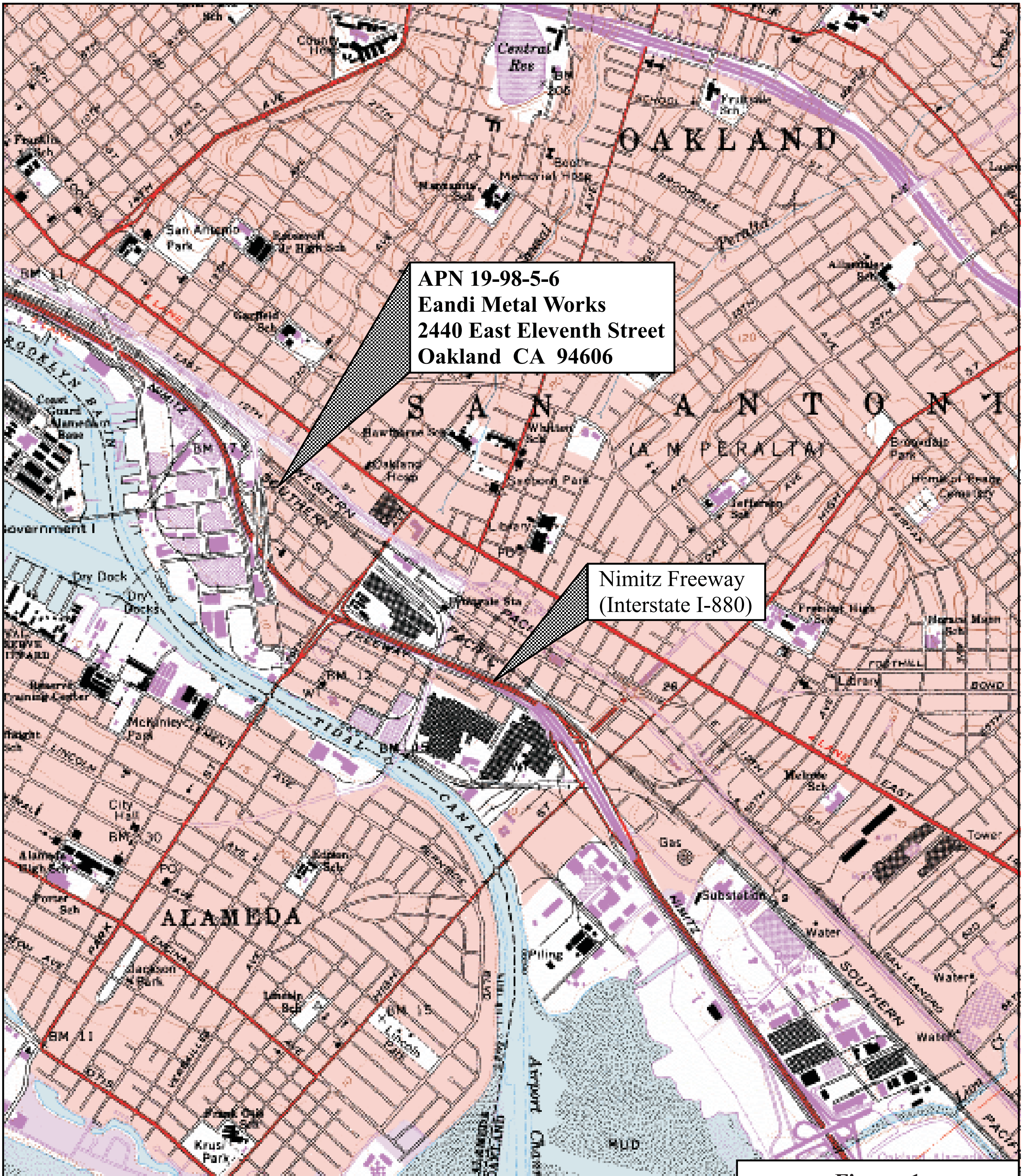
Item	Requirement
Number of Sampling Points	• Three (SG1 through SG3).
Permanent of Temporary Sampling Points	• The sampling points will be temporary. The sampling points will be installed, sampled, and abandoned in the same day.
Rationale for the Selected Locations	• SG1 is proposed adjacent to well MW3 where the highest benzene and TPH-gasoline concentrations have been recently measured in groundwater. SG1 is proposed approximately 8 feet outside of an occupied building (2440 East Eleventh Street). • SG2 is proposed adjacent to well MW5 where the second highest benzene and TPH-gasoline concentrations have been recently measured in groundwater. SG2 is proposed approximately 8 feet outside of an occupied building (976 23rd Avenue). • SG3 is proposed immediately downgradient of the former 1,000-gallon underground gasoline tank - where the former fuel hydrocarbon release occurred. SG3 is proposed at the specific request of Alameda County Environmental Health in order to evaluate vadose zone contamination at the source of the release. SG3 is proposed approximately 8 feet outside of an occupied building (2440 East Eleventh Street).
Prior to Drilling	• Depth to water will be measured in the nearby wells MW-1, MW-3, and MW-5 prior to installation of the soilgas sampling points.
Drill Rig	• A direct-push drill rig will be used to install the soilgas sampling points.
Soilgas Sampling Implant	• SVPT91 polypropylene implant (available from Environmental Service Products, www.envservprod.com).
Tubing	• 3/16-inch inside diameter, 1/4-inch outside diameter, Teflon.
Screened - Sandpack - Sample Interval	• The "screened" interval - sandpack interval - sampling interval, will extend from ±5.0-6.5 feet, with the implant installed at a depth of ±5.75 feet (in the middle of interval).
Implant Installation	• An uncased borehole to a depth of ±6.5 feet is not expected to remain open at this site. The drill rod will serve as the casing for constructing the soilgas sampling points. • A 2.375-inch outside diameter expendable tip (steel drive point) will be fitted to the base of ±2.25-inch outside diameter drill rod. • The drill rod (with expendable tip) will be pushed to a depth of ±6.5 feet. • The drill rods will be lifted (backed out) ±0.5 feet. The inside of the drill rods will be sounded to verify that the expendable tip has been released from the end of the drill rods and embedded in the soil. • Sand will be poured through the inside of the drill rods while the drill rods are simultaneously lifted, producing a plug of sandpack ±0.75 feet in vertical thickness. • A 1-inch diameter PVC pipe will be lowered inside the drill rods and the soilgas implant (with Teflon tubing attached) will be lowered inside the PVC pipe. A small amount of sand will be poured inside the drill rods to hold the implant in place. The PVC pipe will be removed. • Sand will be poured through the inside of the drill rods while the drill rods are simultaneously lifted, producing another plug of sandpack ±0.75 feet in vertical thickness.
Dry Bentonite Layer	• Dry granular bentonite will be poured through the inside of the drill rods while the drill rods are simultaneously lifted, producing a plug of dry bentonite ±0.5 feet in vertical thickness.
Hydrated Bentonite Seal	• Dry granular bentonite will be poured through the inside of the drill rods while the drill rods are simultaneously lifted, producing a layer of dry bentonite ±1 foot in vertical thickness. • ±1.5 pints of water will be poured through the inside of the drill rods. • The bentonite will be allowed to hydrate for 3 minutes. • This process will be repeated until hydrated bentonite has been placed even with the ground surface.
Abandon - Decommission	• Teflon tubing will be pulled from the borehole. • Using either a hand auger or the direct-push drill rig, ±3 feet of hydrated bentonite will be removed. • Cement-bentonite grout (94 pounds cement, 5 pounds bentonite, 6 gallons water) will be placed from ±3-foot depth to the ground surface.
Decontamination	• Wash downhole equipment between locations. Wash with soap (Alconox or similar), rinse with tap water, and rinse with distilled water.
Investigation-Derived Waste	• Place waste hydrated bentonite inside plastic trash bags. Dispose of waste hydrated bentonite as municipal waste. • Decontamination wastewater may be discharged to the sanitary sewer.

Table 8

Soilgas Sampling Requirements

2440 East Eleventh Street
Oakland CA

Item	Requirement
Equilibrate	• Wait at least 2 hours (after completing the soilgas borehole) before purging and sampling.
Purge Equipment	• Gast oil-less electric vacuum pump (Model DOA-9111-JH or similar). • Air Toxics (Folsom CA) "Blue Box" flow regulator (preset to provide 0.167 liters/minute soilgas flow).
One Standard Purge Volume	• "One Standard Purge Volume" is defined as the volume of the air voids in the sandpack interval (this neglects the volume inside the tubing - approximately 0.05 liters - which is negligible). • Volume of voids in the sandpack interval = 1.5-foot length x 2.25-inch diameter x 0.3 void ratio = 0.0124 cubic feet = 0.351 liters.
Purge Test (1, 2, 3, and 5 standard purge volumes)	• Conduct purge test at SG1. • Evacuate 1, 2, 3, and 5 standard purge volumes = 0.351 L, 0.702 L, 1.053 L, and 1.755 L. Evacuating 5 standard purge volumes may not be necessary if the concentration peaked at 1 or 2 standard purge volumes (it is typical to measure the peak concentration at 1 or 2 standard purge volumes). • During purge, control the flowrate using the flow regulator. Purge time for 1 standard purge volume = 0.351 L / 0.167 L/min = 2.10 minutes = 2 minutes-6 seconds. Purge time for 2 standard purge volumes = 4 minutes-12 seconds. Purge time for 3 standard purge volumes = 6 minues-18 seconds. Purge time for 5 standard purge volumes = 10 minutes-30 seconds. • Samples will be collected using a hand-held vacuum pump and 1-liter tedlar bag. Concentrations will be measured using an organic vapor monitor (photoionization device fitted with a 10.6 eV lamp, calibrated to 100 ppm v/v isobutylene). • The purge volume providing the highest concentration will be selected for all soilgas samples. • Wait at least 2 hours (after completing the purge test) before purging and sampling SG1.
Tracer Gas Atmosphere (2-propanol)	• A tracer gas atmosphere will be maintained over the top of the soilgas sampling point during the collection of each soilgas sample. • Tracer gas = 2-propanol (isopropyl alcohol, also known as "rubbing alcohol"). • A shroud (a plastic storage container) will be placed over the top of the soilgas sampling point. The shroud will be fitted with weather stripping at the base and bulkhead fittings on opposite ends. The sample tubing will be threaded through one of the bulkhead fittings. The other bulkhead fitting will serve as a sampling port for the field organic vapor monitor (to ensure the appropriate tracer gas atmosphere exists beneath the shroud, also to measure the tracer gas concentration inside the shroud). • The tracer gas atmosphere will be created inside the shroud by placing a source of 2-propanol. The 2-propanol source will consist a perforated metal liner containing a cloth saturated with 2-propanol. The liner will be placed beneath the shroud prior to purging.
Sample Equipment	• 1-liter Summa canister • Air Toxics (Folsom CA) "Blue Box" flow regulator (preset to provide 0.167 liters/minute soilgas flow).
Purging and Sampling Procedures	• Place shroud over sampling point. Thread sample tubing through bulkhead fitting. Create and verify tracer gas atmosphere inside shroud. • Connect sample tubing to flow regulator and connect flow regulator to vacuum pump. • Perform purging with the vacuum pump (number of standard purge volumes determined previously). • Disconnect vacuum pump from flow regulator and connect Summa canister to flow regulator. • Collect sample using the Summa canister. Sample time = 1 L / 0.167 L/min = 6 minutes. • Label Summa canister with sample location, time and vacuum at start of fill, time and vacuum at end of fill.
Leak Test After Collecting Each Sample	• A leak test will be performed to verify the integrity of the connections from the Summa canister to the flow regulator and from the flow regulator to the sample tubing. • Replace the Summa canister containing the sample with another Summa canister dedicated to leak testing. • Cut the sample tubing. • Block the sample tubing (hold one's thumb over the inlet). • Open the inlet to the Summa canister and record the time and initial vacuum. Maintain the configuration for 5 minutes and record the final time and final vacuum. • If no decrease in vacuum is observed, the integrity of the connections have been verified. • If any decrease in vacuum is observed, the sample should be discarded and a new sample should be collected (new purge and sample) after waiting at least 2 hours.
Field Observations and Measurements During Purging and Sampling	• Refer to field forms.
Sample Handling	• Do not refrigerate the Summa canisters. Ship the canisters to the laboratory via overnight courier.
Analytical Testing	• Analyze soilgas samples for TPH-gasoline and volatile organic compounds using EPA Method TO-15. Ensure that 2-propanol is included in the analytical scan (make request on chain-of-custody form).
Frequency of Sampling	• Soilgas samples will be collected one time and then the boreholes will be abandoned/decommissioned.



0 0.5 1.0

Approximate Scale in Miles

0 2,000 4,000

Approximate Scale in Feet

N

Basemap: U.S. Geological Survey, 7.5 Minute Quadrangle, Oakland East CA. 1959 (Photorevised 1980)

Figure 1

Location Map

2440 East Eleventh Street
Oakland CA

STREAMBORN

Basemap: Aerial photograph, flown 24 August 1998, photograph ALA-AV-6100-11-38. Pacific Aerial Surveys, Oakland CA.

Figure 2

Vicinity Map

2440 East Eleventh Street
Oakland CA

STREAMBORN

Basemap: Aerial photograph, flown 24 August 1998, photograph number ALA-AV-6100-11-38, original scale 1:12,000. Pacific Aerial Surveys, Oakland CA

Figure 3

Site Plan

2440 East Eleventh Street
Oakland CA

STREAMBORN

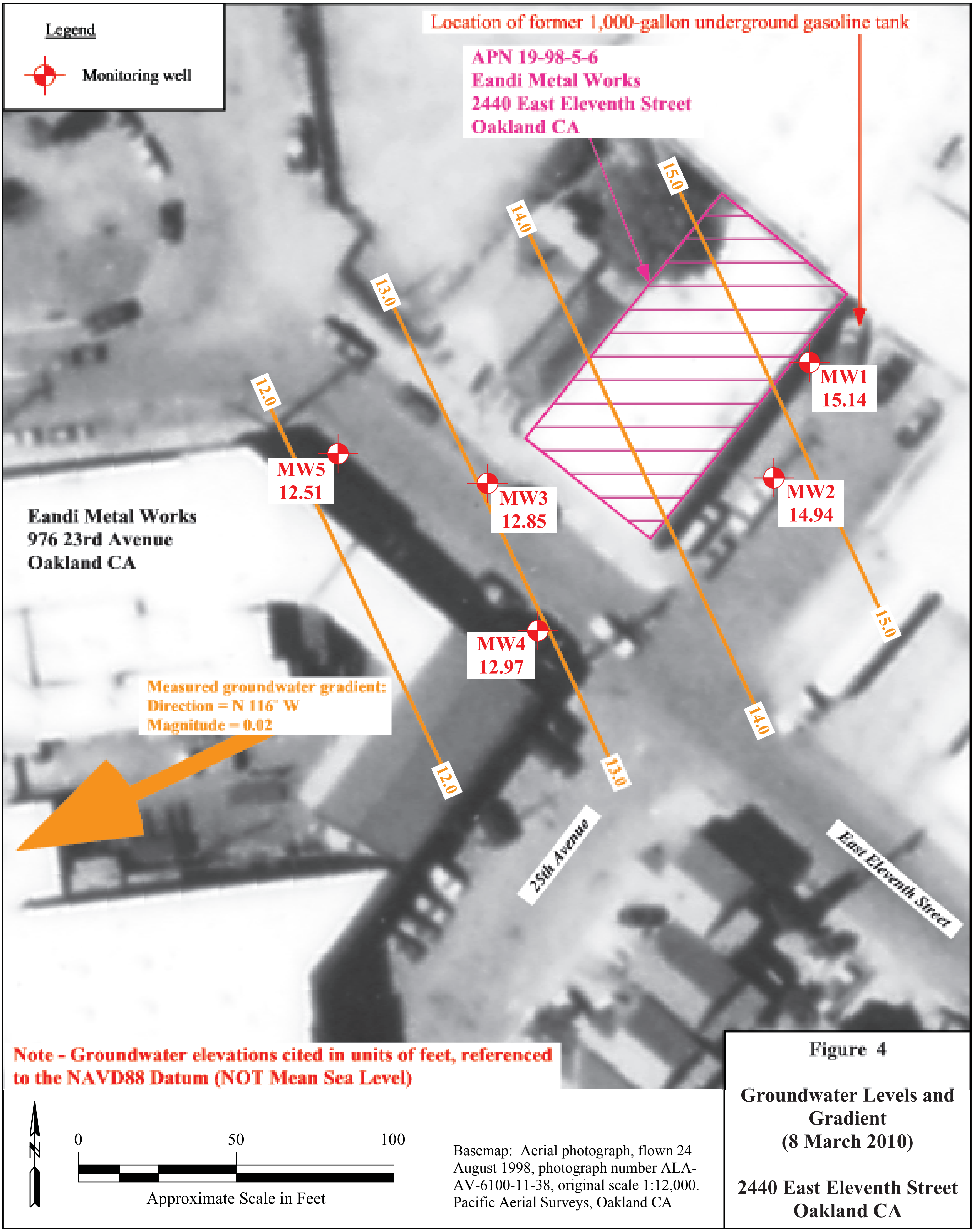


Figure 4

Groundwater Levels and Gradient
(8 March 2010)

2440 East Eleventh Street
Oakland CA

STREAMBORN

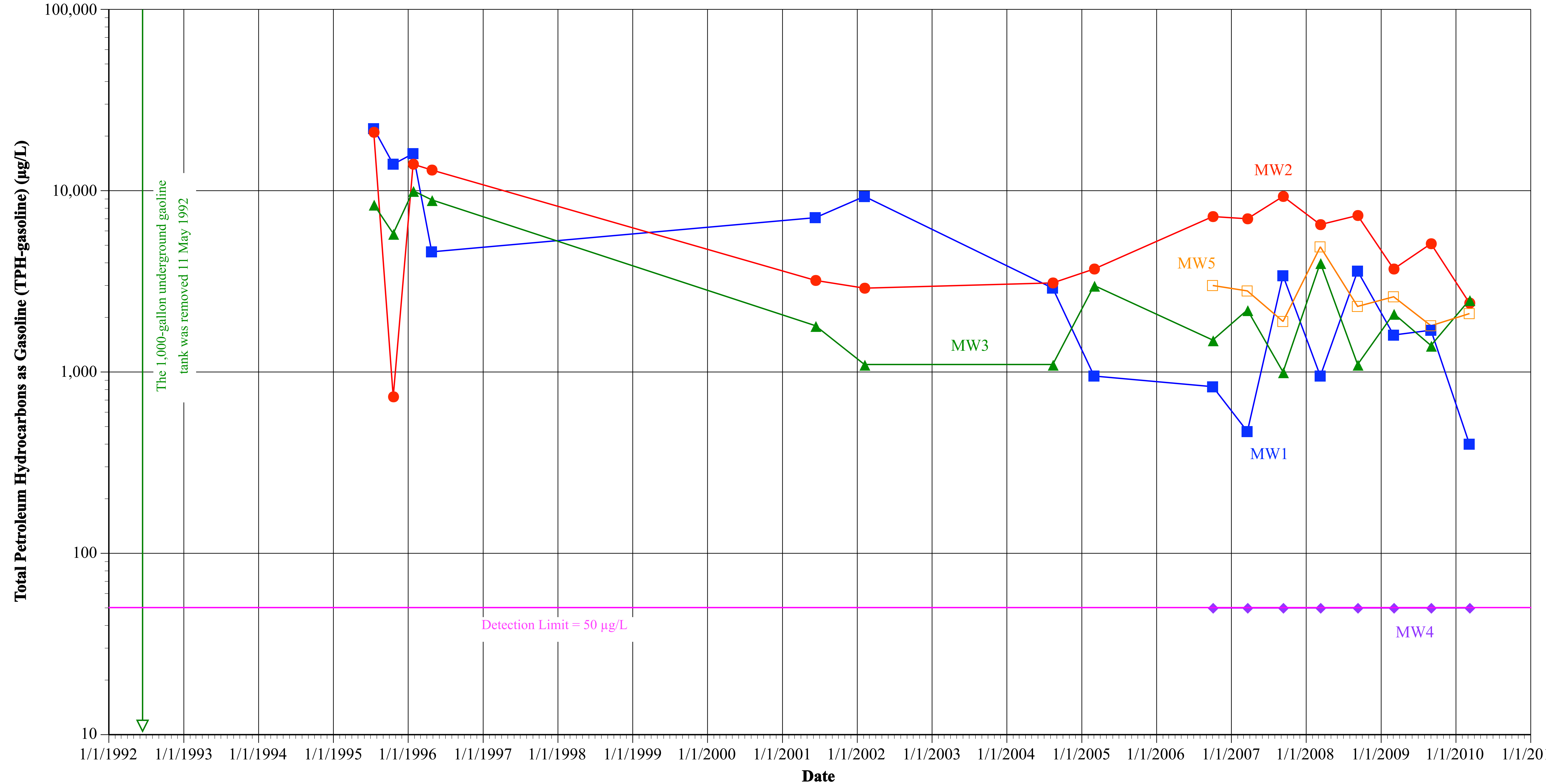


Figure 5

TPH-gasoline Versus Time in Monitoring Wells

2440 East Eleventh Street Oakland CA

Note: Nondetectable measurements have been plotted at the typical detection limit of 50 µg/L.

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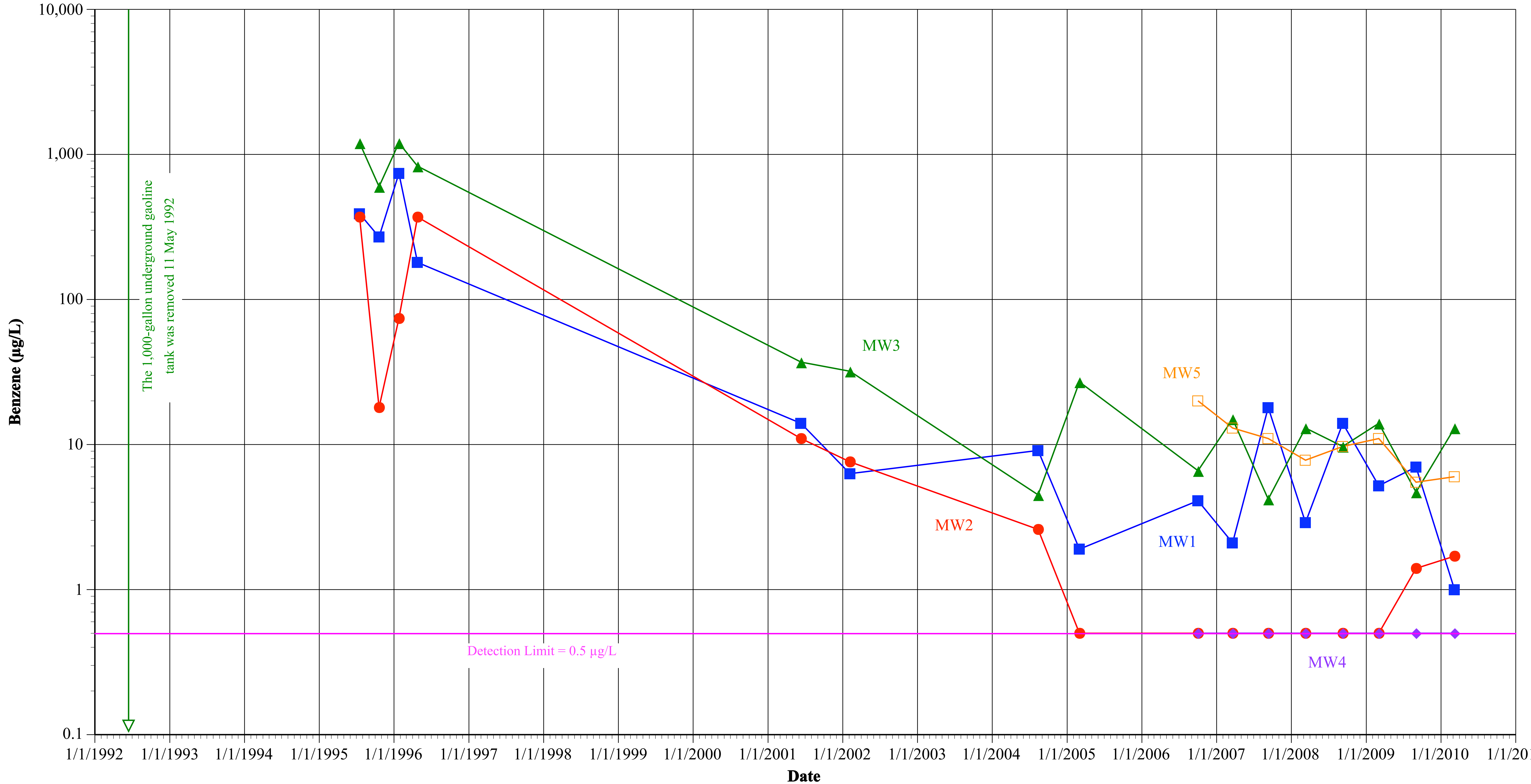

Note: Nondetectable measurements have been plotted at the typical detection limit of 0.5 µg/L.

Figure 6

Benzene Versus Time in Monitoring Wells

2440 East Eleventh Street Oakland CA

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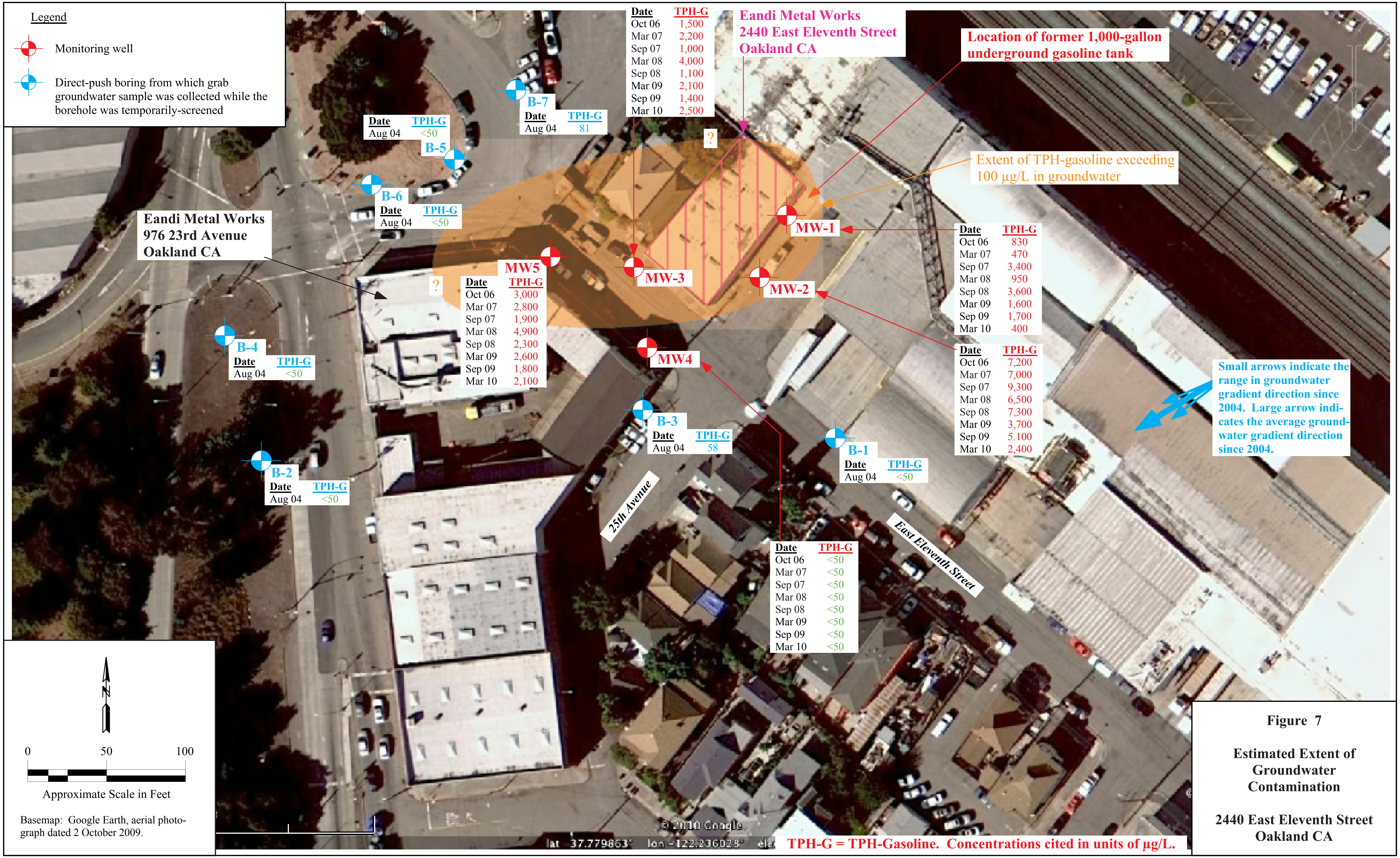

Figure 7

Estimated Extent of Groundwater Contamination

2440 East Eleventh Street
Oakland CA

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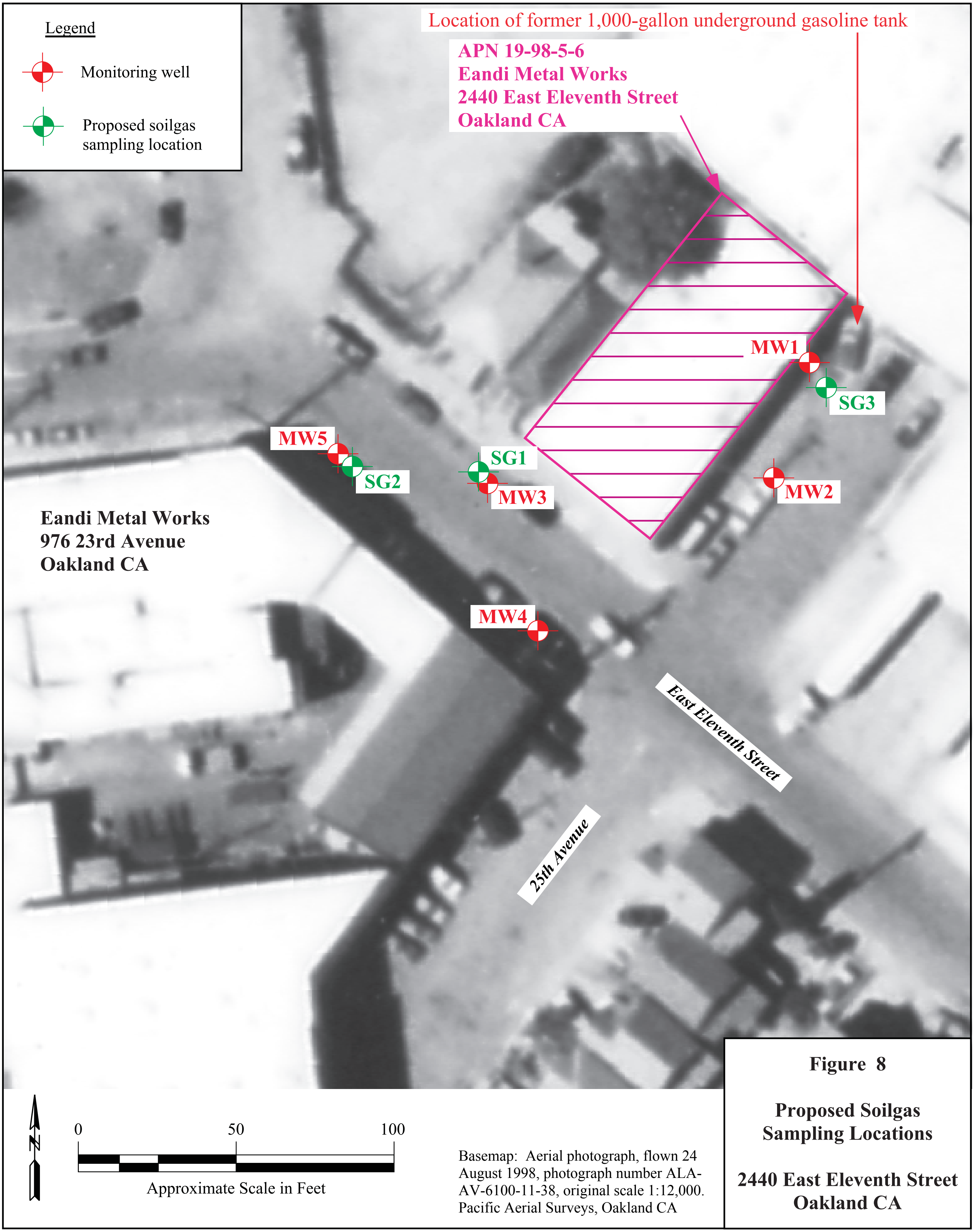


Basemap: Aerial photograph, flown 24 August 1998, photograph number ALA-AV-6100-11-38, original scale 1:12,000. Pacific Aerial Surveys, Oakland CA

Figure 8

Proposed Soilgas Sampling Locations

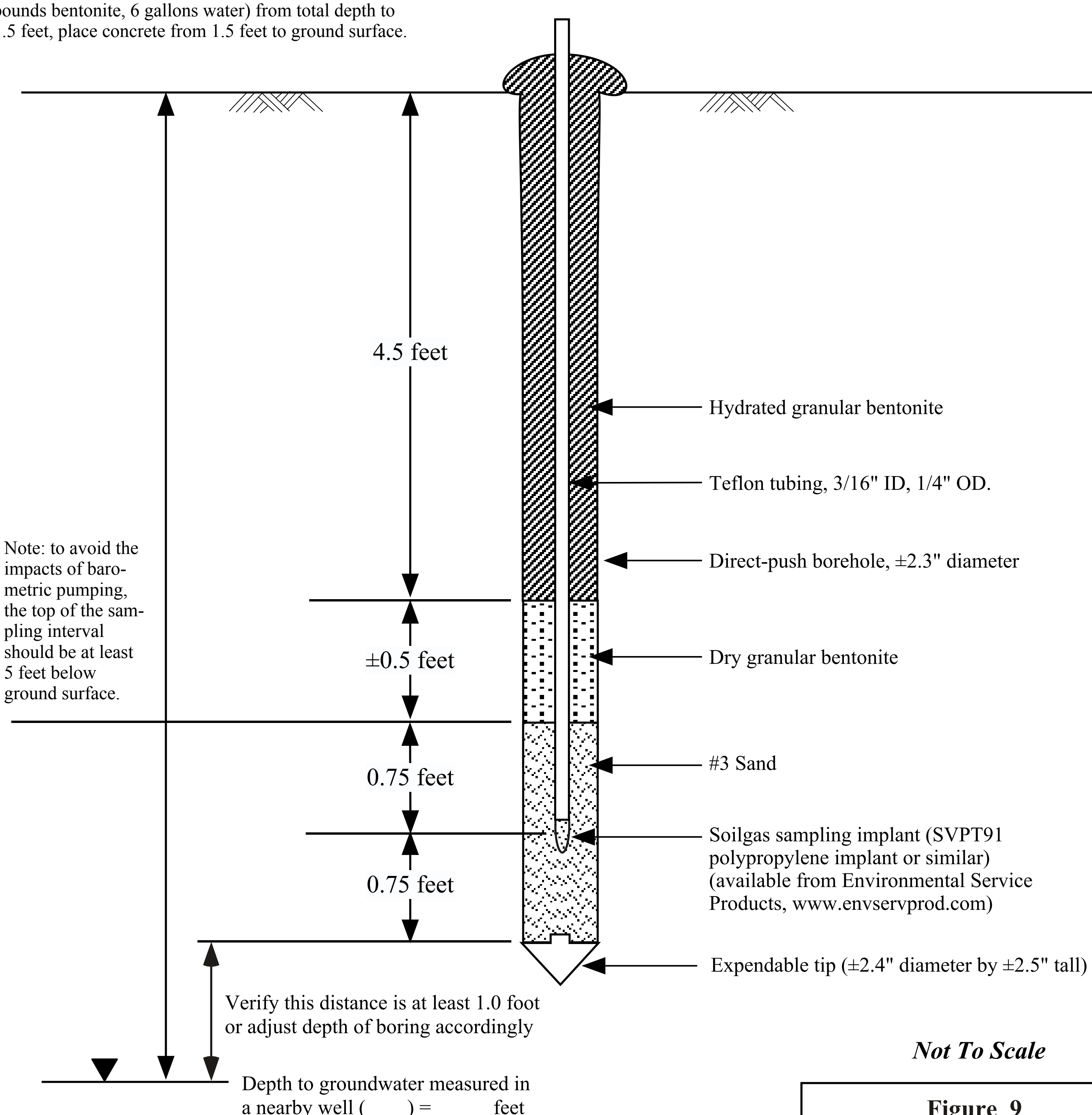
2440 East Eleventh Street
Oakland CA

STREAMBORN

GPS Coordinates N____________
W___________

Start Drilling ________________
Complete Borehole Construction ________________
Driller ________________

Abandon/Decommission: Extract (pull) tubing, push rods with 2.4-inch diameter conical tip to total depth, place cement-bentonite grout (94 pounds cement, 5 pounds bentonite, 6 gallons water) from total depth to 1.5 feet, place concrete from 1.5 feet to ground surface.



Not To Scale

Figure 9

Schematic of the Temporary Soilgas Sampling Points

2440 East Eleventh Street Oakland CAA

Measurements referenced from ground surface.

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ATTACHMENT 1

Site Safety Plan

Site Safety Plan

Installation and Abandonment of Soilgas Sampling Points and Soilgas Sampling

2440 East Eleventh Street
Oakland CA

Anticipated Field Work The anticipated fieldwork includes installation (and subsequent abandonment) of soilgas sampling points (similar to shallow well installation) and the collection of soilgas samples.

Chemical Hazard Evaluation Petroleum (gasoline) constituents have been released in the work area. Chemical hazards are summarized in Table 1.

Physical Hazard Evaluation Physical hazards that may be encountered include: heavy machinery, heavy lifting, slip-trip-fall, loud noise, and heat exposure.

Health and Safety Responsibilities This site safety plan will be implemented by the site safety officer under the supervision of the project manager and in coordination with an appropriate client representative. Safety personnel and their responsibilities are presented in Table 2.

Work Zone A work zone will be established around the area of work. The work zone is an area of sufficient size to allow safe completion of the work while maintaining control of access to the work area. The work zone will be restricted by requesting people not directly involved in the work to stay out, and/or by restricting access by other suitable means (such as with a work fence, traffic cones, or barricades).

No smoking, chewing of tobacco or gum, eating, or drinking will be allowed in the work zone.

Personal Protective Equipment Fieldwork will begin in modified Level-D personal protection (Table 3). If air monitoring within the breathing zone reveals organic vapor concentrations that exceed the action levels specified below, then personal protective equipment will be upgraded to modified Level-C (Table 3).

Monitoring Visual monitoring should be routinely conducted by the workers. Workers should evaluate themselves and co-workers for signs of fatigue as the work progresses. Work breaks should be taken as reasonably required to maintain safety and efficiency.

The breathing zone in the work area will be monitored using a field organic vapor monitor (Thermo Environmental Instruments Model 580B, 10.0 eV photoionization detector, calibrated to 100 ppm v/v isobutylene). If continual readings greater than 10 ppm above background are detected in the breathing zone, personal protection should be upgraded to modified Level-C from modified Level-D. 10 ppm was selected using the exposure criteria in Table 1.

If continual readings greater than 100 ppm above background are recorded in the breathing zone, work should stop. Work should be resumed after consultation with the project manager and possibly the client, and may include additional safety precautions.

Emergency Procedures These procedures are designed to allow rapid treatment of workers for injuries or exposure to hazardous substances occurring on the work site. A secondary purpose of these procedures is to allow documentation of emergencies.

Emergency information is summarized in Table 4. The location of the nearest hospital is shown on Figure 1.

If required, first aid will be provided for injured workers.

The site safety officer will be notified immediately of an emergency. It is the site safety officer's responsibility to document the emergency and report it to the project manager and client in a timely manner.

Decontamination Decontamination refers to removal of potential chemical contamination from worker's clothing and from health and safety monitoring equipment. In many instances, removal and thorough cleaning of work clothing is adequate for worker decontamination. However, if skin contact with chemical-containing material occurs during fieldwork, the affected area will be washed thoroughly with soap and water.

Monitoring equipment should be kept clean by wiping as required with a paper towel or other suitable material.

Site Safety Wastes Wastes generated by site safety activities may include disposable protective equipment such as gloves, tyvek-coveralls, and boot covers, as well as used paper towels. These items may be disposed of with normal municipal refuse.

Liquid wastes from washing may be disposed of in the sanitary sewer.

Table 1

Chemical Hazard Evaluation

2440 East Eleventh Street
Oakland CA

Chemical	Odor Threshold (ppm v/v)	Lower Explosive Limit (ppm v/v)	Threshold Limit Value - Time Weighted Average (ppm v/v)	Immediately Dangerous to Life and Health (ppm v/v)
Xylenes	20	10,000	100	1,000
Ethylbenzene	0.09 - 0.6	12,000	100	2,000
Benzene	34 - 119	13,000	1	500 - 1,000
Toluene	0.16 - 37	12,000	50	2,000
TPH-Gasoline	NA	14,000	300	NA
Lead	NA	NA	OSHA = 0.5 mg/m^3	100 mg/m^3
Methyl tert-butyl ether (MtBE)	0.053	16,000	40	NA

General Note

(a) Lower explosive limits from the MSDS sheets. Remaining criteria from: *3M, 1998 Respirator Selection Guide*. 3M, Occupational Health and Environmental Safety Division, St Paul MN. 2002.

Table 2

Safety Personnel and Responsibilities

2440 East Eleventh Street
Oakland CA

Personnel	Responsibilities
Project Manager (Douglas W. Lovell)	Development and overall implementation of Site Safety Plan, provide properly trained onsite personnel to complete the work, coordination of safety issues with client.
Site Safety Officer (Juli A. Brady)	Onsite implementation of Site Safety Plan, coordination and documentation of field safety procedures, communication of safety issues to project manager, delineate work zone, atmospheric monitoring, review site safety procedures with subcontractors, contact Underground Service Alert, clear underground utilities, maintain adequate supply of safety equipment onsite.
Subcontractor's Site Safety Officer (to be determined)	Understand and obtain subcontracting crews' compliance with Site Safety Plan, maintain onsite supply of safety equipment for subcontractor's personnel, relay safety concerns to Site Safety Officer.

Table 3

Personnel Protective and Monitoring Equipment

2440 East Eleventh Street
Hayward CA

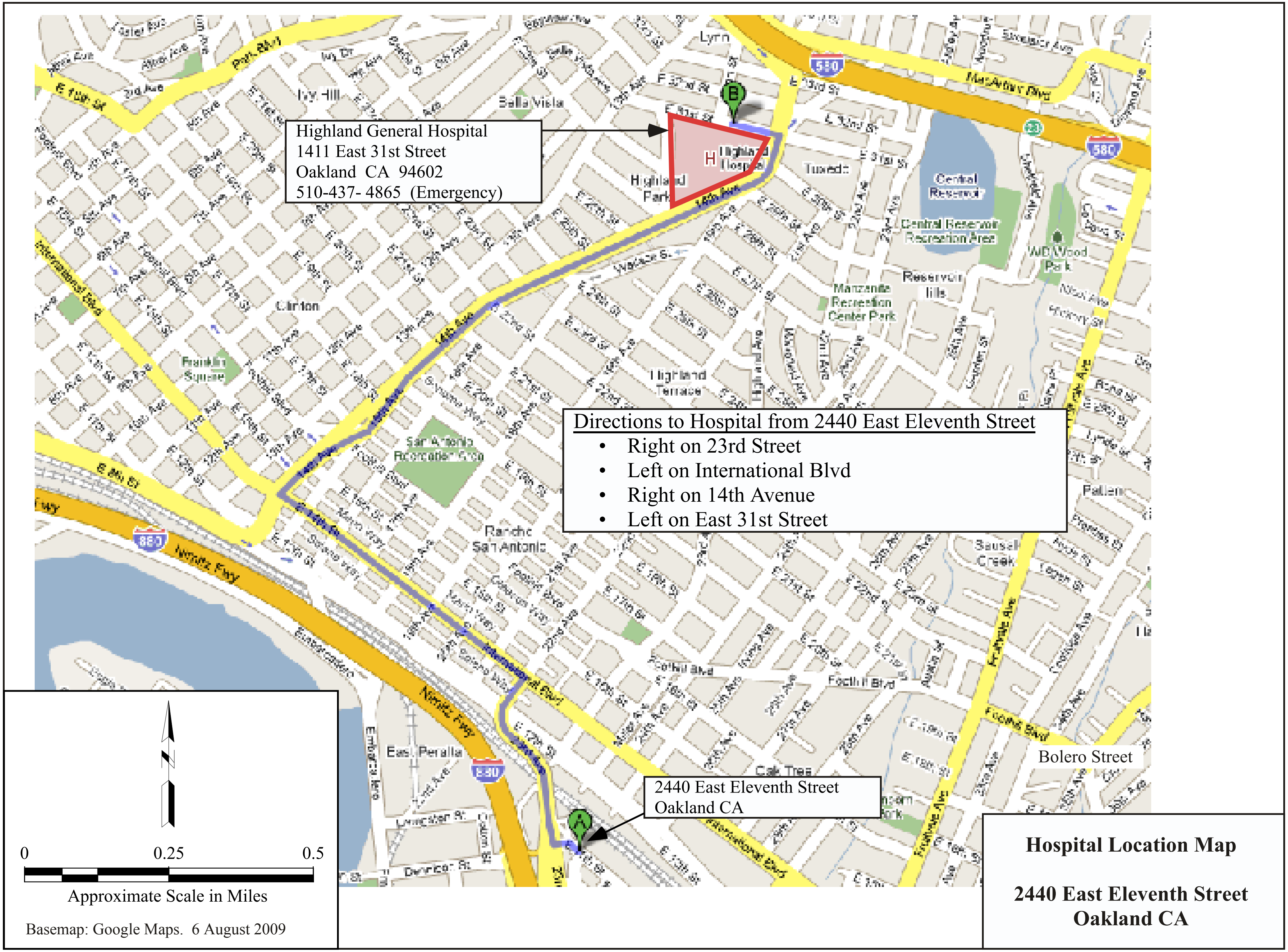
Item	Requirement
Modified Level-D Personal Protective Equipment	Hardhat, dedicated work clothing (cotton coveralls or tyveks), water repellent steel-toed boots, work gloves, latex gloves (as appropriate), nitrile gloves (as appropriate), first aid kit, fire extinguisher, warning tape, optional eye and hearing protection.
Modified Level-C Personal Protective Equipment	Add Half-face respirator with OV-HEPA cartridges and mandatory tyveks to modified Level-D protective equipment. Change respirator cartridges upon detection of breakthrough (by smell), increase in breathing resistance, or daily (whichever is more frequent).
Atmospheric Monitoring	Field organic vapor monitor capable of detecting organic vapor concentrations of 1 ppm (v/v). Field organic vapor monitor to be calibrated to known reference gas daily. Action levels (measurement in the breathing zone of work area): >10 ppm for 10 minutes: upgrade to modified Level C >100 ppm for 10 minutes: stop work, consult with project manager
Visual Monitoring	Evaluate yourself and co-workers for signs of fatigue and visual signs of distress (that may be caused by physical labor and possible chemical exposure).

Table 4

Emergency Information

2440 East Eleventh Street
Hayward CA

Emergency Service or Contact	Telephone	Address and Directions
Hospital	510-437-4865	• Highland Hospital 1411 East 31st Street (@ Stuart Street) Oakland CA 94602 • From the building at 2440 East Eleventh Street, northwest on East Eleventh for one block. • Bear right (northeast) on 23rd Avenue. Continue to travel up and over the railroad tracks. • Turn left at the end (bottom of sloe) of 23rd Avenue onto International Boulevard. • Travel approximately 0.6 miles on International Blvd and turn right onto 14th Avenue. • Travel approximately 1 mile on 14th Avenue and turn left on East 31st Street. Highland Hospital is located on the left. • See hospital location map attached.
Ambulance	911	
Fire Department	911	
Police Department	911	
Onsite Telephone	To be determined	
Site Safety Officer	Juli A. Brady 510-528-4234 (work) 510-520-3277 (mobile)	
Project Manager	Douglas W. Lovell 510/528-4234 (work) 510/520-3146 (mobile) 510/527-4180 (home)	
Facility Representative	Jeffrey M. Eandi 510-532-8311	
Subcontractors	To be determined	



Hospital Location Map

2440 East Eleventh Street
Oakland CA

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ATTACHMENT 2

Standard Operating Procedures

STANDARD OPERATING PROCEDURE (SOP) 39

SOILGAS PURGING AND SAMPLING USING IMPLANTS, SUMMA CANISTERS, VACUUM PUMP, AND FLOWRATE = 0.167 L/MIN

1.0 INTRODUCTION AND SUMMARY

This SOP describes procedures to purge and sample soilgas from boreholes using SVPT91 polypropylene implants, flow regulators set for 0.167 L/min provided by Air Toxics (Folsom CA), Summa canisters, an electric vacuum pump, and a shroud with tracer gas.

When conducting soilgas sampling, the following protocols should followed:

- Soilgas samples should below a depth of 5 feet (to reduce the effects of barometric pumping).
- Sampling should not be conducted following a significant rain event (significant being ≥1 inch/hour).
- Purging and sampling should be conducted flowrates < 0.20 L/min.
- The same flowrate should be used for purging and sampling.

Typical activities include: purging stagnant air from the sandpack interval and downhole tubing, measuring volatile organic compound levels using an organic vapor meter (OVM), measuring/calculating the optimal purge volume, conducting leak tests, and collecting soilgas samples.

2.0 EQUIPMENT AND MATERIALS

- Water level meter.
- Cooler (samples should be kept cool and dark but should not be placed on ice).
- Field organic vapor monitor. The make, model, and calibration information of the field organic vapor monitor (including compound and concentration of calibration gas) should be documented.
- Shroud (and bricks to keep it weighted down).
- Stainless steel soil sample tubes with holes drilled, caps, rags, 2-Propanol (isopropyl alcohol, aka “rubbing” alcohol), mason jars for soaking.
- Laboratory supplied Summa canisters (typically 1-liter).
- Air Toxics (Folsom CA) “Blue Box” flow regulator preset for a flow of 0.167 L/min.

- Electric vacuum pump: Vacuum pump (GAST Vacuum Pump DOA-V502-JH, 1/8 HP or equivalent), with flow throttle valve, sample port and vacuum gauges.
- 12-volt battery for vacuum pump.
- New tedlar bags for collecting samples during the purge test.
- Hand pump for collecting samples during the purge test.
- Tubing and connectors: ¼ -inch ID Teflon tubing (Downhole tubing is typically supplied by driller).
- Soilgas sampling toolbox.
- SVPT91 polypropylene implants (or similar, driller will supply these on request).
- Field Forms: borehole installation log, borehole construction schematic, purge volume test form, purge/sample log and vacuum test/leak test log.

3.0 TYPICAL PROCEDURES

The following procedures are intended to cover the majority of purging and sampling conditions. However, reevaluation of these procedures and implementation of alternate procedures may be appropriate upon encountering unusual or unexpected conditions. Deviations from the following procedures may be expected and should be documented.

Upon arriving at the site, measure the static water level in nearby monitoring wells, if available. Record water levels on the purge and sample form.

The borehole may or may not stay open to the target depth of ±6.5 feet. Accordingly, the driller shall be prepared to construct the soilgas sampling points using the drill rod as casing.

3.1 Soilgas Probe Installation Method - Using drill rods as “temporary casings”

A drive rod with expendable tip should be driven to a predetermined depth and then pulled back approximately 0.5 feet. The drill rod should then be sounded to verify that the expendable tip released from the end of the drill rod and it is embedded in the soil.

Sand should be poured through the inside of the drill rod while the drill rod is simultaneously lifted producing a plug of sandpack to the predetermined thickness.

A 1-inch diameter PVC pipe should then be lowered into the drill rod and the soilgas implant (with tubing attached) should be lowered inside the PVC pipe. A small amount of sand should then be poured inside the drill rod to hold the implant in place and then the PVC pipe should be removed. Sand should then be poured through the inside of the drill rod while the drill rod is simultaneously lifted, producing another plug of sandpack to the predetermined thickness (the implant should be placed midway in the sandpack interval, the minimum height of sandpack should be 1 foot).

At least 1 foot of dry granular bentonite should be placed above the sandpack. The dry granular bentonite should be poured through the inside of the drill rod while the drill rod is simultaneously lifted, producing a plug of dry bentonite.

Above the dry granular bentonite, dry granular bentonite should continue to be poured through the inside of the drill rod (±1 foot lifts) while the drill rod is simultaneously lifted. Water (approximately 1.5 pints) should be poured through the inside of the drill rods to hydrate the bentonite. The bentonite should be allowed to hydrate for three minutes. This process should be repeated until hydrated bentonite has been placed to the ground surface (see attached schematic).

<u>For Permanent Completion</u>

The upper ±1-foot of the borehole shall be drilled to a diameter of ±12 inches. A 2-inch diameter x 9-inch long SCH40 PVC shall be set in grout, with the top of the casing ±3 inches below ground/pavement surface. A traffic-rated box shall be set in grout.

The driller shall construct the sampling points with at least 2 feet of Teflon tubing extending above the PVC casing. The driller shall custom-drill a hole in the top cap to pass the Teflon tubing through. The driller shall provide a nail of suitable size to "cap" the Teflon tubing. (See additional schematic if performing permanent completions).

<u>Equilibration</u>

The purge volume test, leak test, and soil gas sampling should not be conducted for at least 2 hours following installation.

Installation time should be recorded in the *Purge/Sample Log* (attached).

<u>Decontamination</u>

After each use, drive rods and other reusable components should be decontaminated.

3.2 Purge Volume Test

A test should be conducted to measure purge volume versus contaminant concentration.

<u>Purge Test Location</u>

The purge test location should be in an area where the soilgas concentrations are expected to be greatest.

<u>Purge Volume</u>

The purge volume can be estimated based on a summation of the internal volume of tubing and void space of the sandpack.

<u>Step Purge Test</u>

The purge test should be conducted at the same flowrate as the sampling and purging flowrate (0.167 L/min) using the “Blue Box” flow regulator and the Gast oil-less electric vacuum pump (Model DOA-9111-JH). The shroud is not necessary.

The sample tubing exiting the ground surface should be attached to the inlet of the “Blue Box” flow regulator. The outlet of the regulator should be attached to the electric vacuum pump via a short section of tubing. A sample port (a tee and Swagelok fitting) should be located immediately upstream of the vacuum pump to allow sample collection. Sample collection should be conducted using a hand-held vacuum pump and 1-liter tedlar bag. Purge volume concentrations should be measured by attaching the tedlar bags to the field organic vapor meter.

One, three, and five purge volumes should be extracted as a means to determine the purge volume to be applied at all sampling points. The appropriate purge volume should be selected based on the highest concentration detected by the organic vapor meter. If no volatile organic compounds are detected during the step purge test, a default of three purge volumes should be extracted prior to sampling.

The purge test data (calculated purge volume, flow rate, duration of each purge step) should be recorded on the *Purge Volume Test Log* (attached).

Additional Purge Volume Test

Additional purge volume tests should be performed if (1) widely variable or different site soils are encountered or (2) the default purge volume is used and a VOC is newly detected (reference: DTSC 2003 Guidance Documents page 10).

3.3 Tracer Gas Atmosphere, Purging, and Soilgas Sample Collection

Review Air Toxics. Guide to Air Sampling and Analysis” section 3.0 “Sampling with Canisters” prior to sampling with the Summa Canisters.

Prior to purging and sampling, an airtight shroud (clear plastic storage container with weather stripping) should be placed over the borehole and downhole sample tubing. The shroud should have two bulkhead fittings, one on each end (see attached schematic).

A tracer gas atmosphere, of concentration greater than laboratory detection limits, should be maintained inside the shroud by placing a source of 2-propanol (isopropyl alcohol, also known as “rubbing alcohol”) beneath the shroud.

(Note: Tracer compounds such as pentane, isobutane, propane, and butane may also be used. 2-Propanol [rubbing alcohol, Isopropyl alcohol, sec-propyl alcohol, isopropanol, sec-propanol, dimethylcarbinol] is easily obtained, detected using an OVM meter, and typically included in the TO-15 analytical suite, as opposed to some of the other compounds).

The 2-propanol source should consist of a cloth that has been saturated with 2-propanol and placed inside a metal liner. The metal liner should be perforated with multiple holes. A short section of Teflon tubing should then be inserted through one of the bulkhead fittings and the atmosphere inside the shroud should be monitored using the organic vapor monitor. Concentrations measured should be recorded periodically on the *Leak Test and Tracer Gas Log (attached)*.

Tubing from the soilgas implant should be threaded through the second bulkhead fitting on the shroud. The tubing should then be connected to the inlet of the “Blue Box” flow regulator (preset at a flowrate of 0.167 liter/minute). The outlet of the “Blue Box” flow regulator should be connected to the vacuum pump with a short section of tubing.

The vacuum pump should be operated for the pre-determined duration (from the purge test). Then the vacuum pump should be shut off and the tubing disconnected from the outlet of the “Blue Box” flow regulator. A 1-liter Summa canister (the sample container) should be quickly connected to the outlet of the “Blue Box” regulator. The valve on the 1-liter Summa canister can then be opened for the predetermined sampling time (sample time should correspond to a sample volume of approximately one liter at a flowrate of 0.167 liters/minute). The valve on the 1-liter Summa canister should then be closed and the sample canister disconnected from the “Blue Box” regulator. All observations and measurements should be recorded on the *Purge/Sample Log* (attached). It is important to record the starting and ending vacuum of the sample container for each sampling event. Note: Tedlar bags should not be used for collecting volatile organic compounds.

3.4 Leak Test on Sampling Train

A leak test should be conducted at every soilgas sampling location after sample collection to verify the integrity of the connection between the implant and the “Blue Box” flow regulator, along with the integrity of the regulator itself. The test should be conducted after completing the sampling.

A Summa canister (under vacuum) should be connected to the outlet of the “Blue Box” regulator and the implant tubing should be cut near the ground surface. The valve for the Summa canister should be opened while simultaneously blocking the implant tubing (holding one’s thumb over the exposed end of the tubing). The initial vacuum should be observed and, after five minutes, the final vacuum should be observed. In all cases, no loss in vacuum should be observed. Vacuum observations and time should be recorded on the *Vacuum Leak Test and Tracer Gas Log* (attached).

3.5 Sample Handling

- Samples should not be exposed to light, changes in temperature and pressure. All of these will accelerate sample degradation.
- Do not chill samples.
- Do not ship samples by air carrier.
- If condensation is observed in the sample container, the container should be discarded.

4.0 BOREHOLE ABANDONMENT (Temporary Soilgas Points)

The tubing and soilgas implants should be extracted (pulled) from the boreholes. Drill rods with a 2.4-inch diameter conical tip should then be pushed to total depth and the voidspace/borehole should be backfilled with cement-bentonite grout (94 pounds cement, 5 pounds bentonite, 6 gallons water).

4.0 LABORATORY

Reference section 2.7 “Analysis of Soil Gas Samples” from the DTSC and LARWQCB *Advisory - Active Soil Gas Investigations* (DTSC 2003). It is paramount that necessary detection limits be confirmed based prior to sample submittal.

List the tracer gas on the chain-of-custody form to ensure the laboratory analyzes for that compound.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

The OVM meter should be calibrated at least once per day. Recalibration may be appropriate if unusual measurements are noticed.

6.0 DECONTAMINATION

All downhole equipment should be decontaminated prior to boring other holes. New tubing should be used for each well.

7.0 SAFETY

Primary chemical hazards during soil vapor purging and sampling are associated with inhalation exposure. Primary protection against inhalation exposure includes avoiding all exhaust ports and maintaining proper ventilation.

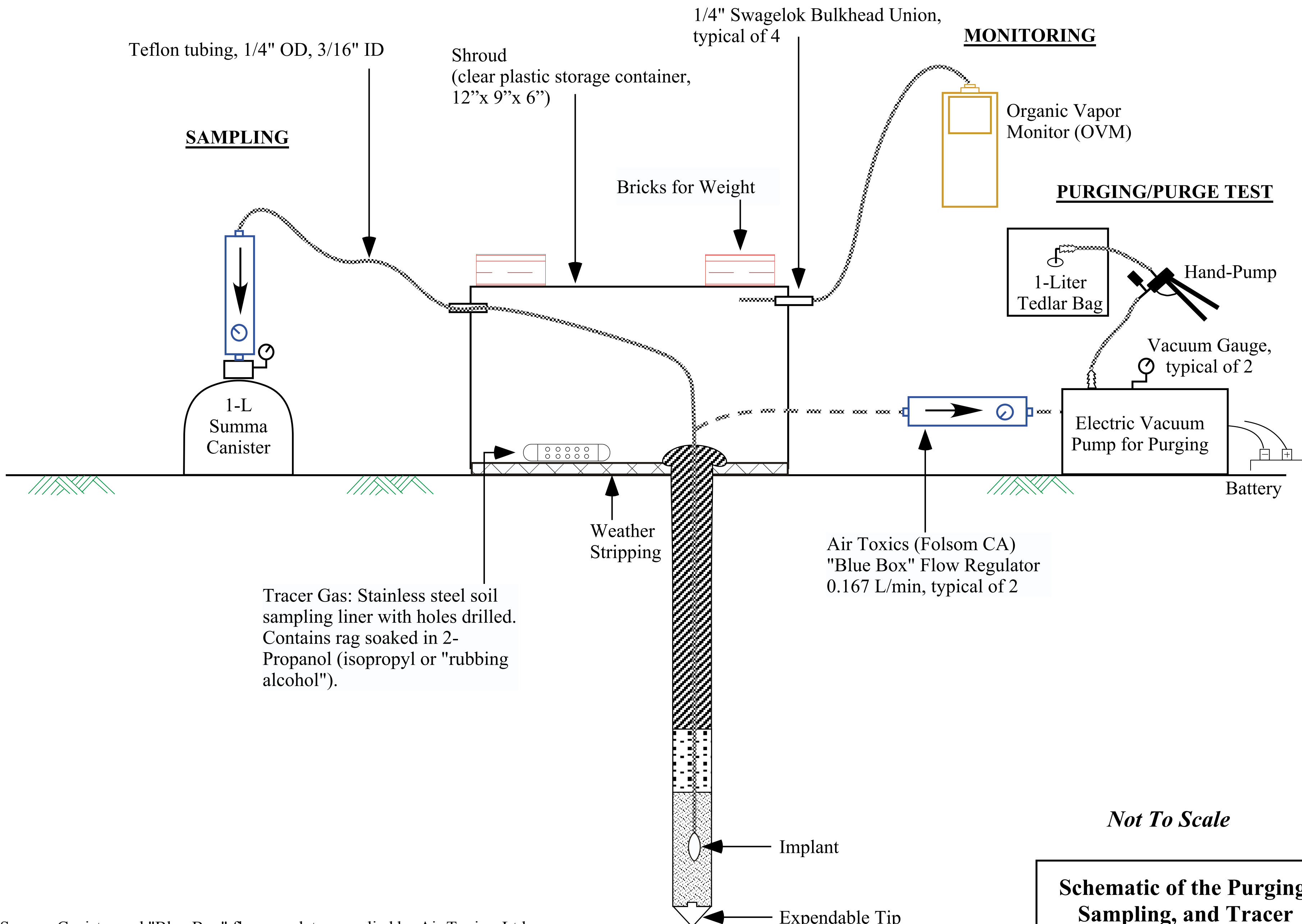
Other specific site safety guidance is provided in the Site Safety Plan.

9.0 REFERENCES

Air Toxics (Folsom CA). *Guide to Air Sampling and Analysis.*

Department of Toxic Substances Control and Los Angeles Regional Water Quality Control Board (2003). *Advisory - Active Soil Gas Investigations*. Prepared by the Department of Toxic Substances Control and the Los Angeles Regional Water Quality Control Board, Glendale CA and Los Angeles CA. 28 January 2003.

Department of Toxic Substances Control (2005). *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Interim Final - 15 December 2004, Revised 7 February 2005)*. Prepared by the Department of Toxic Substances Control, California Environmental Protection Agency, Sacramento CA. 7 February 2005.



Summa Canister and "Blue Box" flow regulator supplied by Air Toxics, Ltd. (Folsom CA). All fittings from Air Toxics are 1/4" Swagelok.

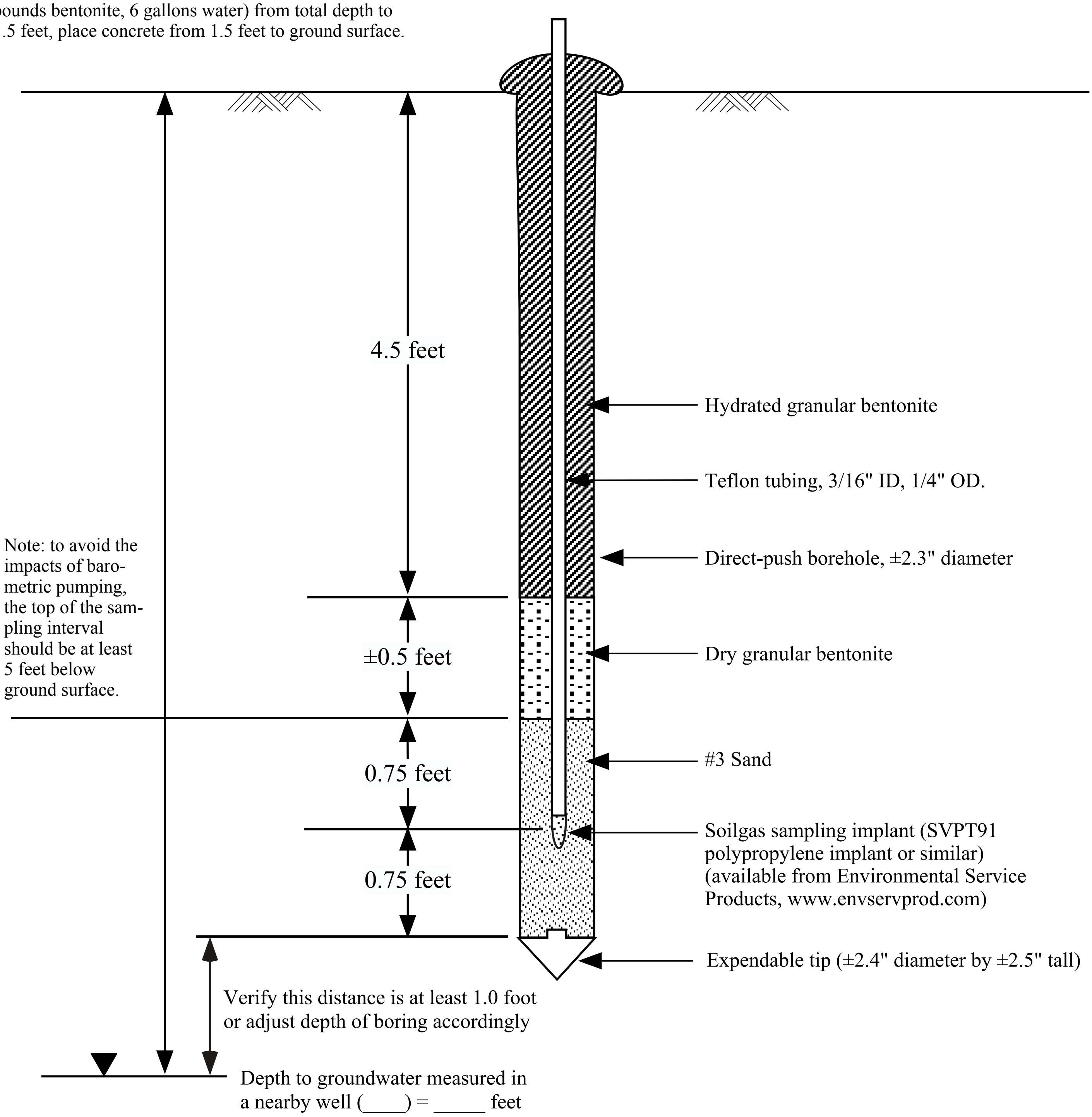
Schematic of the Purging, Sampling, and Tracer Gas Components

STREAMBORN

GPS Coordinates N____________
W____________

Start Drilling ____________
Complete Borehole Construction ____________
Driller ____________

Abandon/Decommission: Extract (pull) tubing, push rods with 2.4-inch diameter conical tip to total depth, place cement-bentonite grout (94 pounds cement, 5 pounds bentonite, 6 gallons water) from total depth to 1.5 feet, place concrete from 1.5 feet to ground surface.



Not To Scale

Temporary Soilgas Sampling Point Schematic

Measurements referenced from ground surface.

STREAMBORN

SOILGAS PURGE VOLUME TEST LOG (IMPLANT, FLOWRATE = 0.167 L/MIN)

Project Name/Number:	Logged By:
Project Address:	Date:
Location/Borehole ID:	Approximate Date of Last Rain Event:
Odors from Borehole:	Approximate Depth to Water at Site (ft):
Borehole Sandpack Description:	Borehole Diameter (in):
OVM Meter:	Total Depth Borehole (ft):
Implant Description:	Depth to Top of Sandpack Interval (ft):
Purge Equipment Description:	Length of Sandpack Interval (ft):
Flow Regulator Description:	Time When Borehole Const. Completed:
Comments:	Time When Purge Volume Test Began:

Total Depth (feet)	-	Depth to Top of Sandpack (feet)	x	0.005 ft^2 for 1-inch borehole 0.022 ft^2 for 2-inch borehole 0.0276 ft^2 for 2.25-inch borehole	x	28.32 L per cubic foot	x	0.3 (porosity)	=	"Standard Purge Volume" (L)
	-		x		x		x		=	

Purge time for 1 standard purge volume = 0.351 / 0.167 = 2.10 min (2 min, 6 sec). Purge time for 2 volumes = 0.702 / 0.167 = 4.20 min (4 min, 12 sec).
Purge time for 3 volumes = 1.053 / 0.167 = 6.30 min (6 min, 18 sec). Purge time for 5 volumes = 1.755 / 0.167 = 10.50 min (10 min, 30 sec).

Purge Volume (L)	Time	Purge Vacuum Applied Downstream of Flow Regulator (inches of Hg)	Regulated Flow Rate (L/min)	OVM (ppm v/v)	Comments
					Start purge volume test

Sample time for 1-liter Summa canister = 1.0 / 0.167 = 4.0 minutes.
Standard Purge Volume = volume of the void space of the sandpack.
All depths measured from ground/pavement surface.
OVM = Organic Vapor Monitor, Photoionization Device, 10.6 eV lamp, calibrated to 100 ppm v/v isobutylene.
Typical air volume inside the Teflon tubing (3/16-inch ID, 1/4-inch OD, ±8 feet long) = ±0.05 liters. This may be neglected.

STREAMBORN

SOILGAS PURGE/SAMPLE LOG (IMPLANT, SUMMA CANISTER, FLOWRATE = 0.167 L/MIN)

Project Name/Number:		Logged By:	
Project Address:		Date:	
Location/Borehole ID:		Approximate Date of Last Rain Event:	
Odors from Borehole:		Approximate Depth to Water at Site (ft):	
Borehole Sandpack Description:		Borehole Diameter (in):	
OVM Meter:		Total Depth Borehole (ft):	
Implant Description:		Depth to Top of Sandpack Interval (ft):	
Purge Equipment Description:		Length of Sandpack Interval (ft):	
Flow Regulator Description:		Time When Borehole Const. Completed:	
Comments:		Time When Purge Began:	

Total Depth (feet)	-	Depth to Top of Sandpack (feet)	x	$0.005\ ft^2$ for 1-inch borehole $0.022\ ft^2$ for 2-inch borehole $0.0276\ ft^2$ for 2.25-inch borehole	x	28.32 L per cubic foot	x	0.3 (porosity)	=	"Standard Purge Volume" (L)			Target Purge (L)
	-		x		x		x		=		x	2	

Purge time (minutes) = Target purge (L) / 0.167 L/min. Sample Container = 1 L Summa. Sample time = 1.0 / 0.167 = 5.99 min (6 min, 0 sec).

Purge Volume (L)	Time	Purge Vacuum Applied Downstream of Flow Regulator (inches of Hg)	Sample Vacuum Applied Downstream of Flow Regulator - Sample Canister Vacuum (inches of Hg)	Regulated Flow Rate (L/min)	OVM (ppm v/v)	Comments
0						Start purge
						End purge
						Begin sample
						End sample

Standard Purge Volume = volume of the void space of the sandpack.
All depths measured from ground/pavement surface.
OVM = Organic Vapor Monitor, Photoionization Device, 10.6 eV lamp, calibrated to 100 ppm v/v isobutylene.
Typical air volume inside the Teflon tubing (3/16-inch ID, 1/4-inch OD, ±8 feet long) = ±0.05 liters. This may be neglected.

STREAMBORN

VACUUM LEAK TEST AND TRACER GAS LOG

Project Name/Number:	Logged By:
Project Address:	Date:
Location/Borehole ID:	Comments:

Vacuum Leak Test of Sample Train

Description of Test Setup:	
Initial Vacuum (inches Hg):	
Duration of Test:	
Final Vacuum (inches Hg):	
Comments:	

Shroud and Tracer Gas Covering Borehole

Description of Shroud:	12" x 9" x 6" plastic box. Weather stripping has been placed along the edge of the box that contacts the ground.
Tracer Gas:	2-propynol (isopropyl alcohol)
Method of Tracer Gas Introduction:	Alcohol-soaked rag inside perforated metal soil liner
OVM Meter:	MiniRAE 2000
Comments:	

Time	OVM (ppm v/v)	Time	OVM (ppm v/v)

Shroud and Tracer Gas Covering Sample Container (Summa Canister)

Description of Shroud:	
Tracer Gas:	
Method of Tracer Gas Introduction:	
OVM Meter:	
Comments:	

Time	OVM (ppm v/v)	Time	OVM (ppm v/v)

OVM = Organic Vapor Monitor, Photoionization Device, 10.6 eV lamp, calibrated to 100 ppm v/v isobutylene.

ATTACHMENT 3

Bibliography of Guidance Documents for Soilgas Investigation and the Evaluation of Vapor Intrusion

Bibliography - Soilgas Investigations and Vapor Intrusion Evaluations

Air Toxics (2008). *Guide to Air Sampling and Analysis.* Prepared by Air Toxics, Ltd., Folsom CA. 2008.

DTSC and LARWQCB (2003). *Advisory - Active Soil Gas Investigations*. Prepared by the California Department of Toxic Substances Control and the Los Angeles Regional Water Quality Control Board. 28 January 2003. www.dtsc.ca.gov/LawsRegsPolicies/Policies/SiteCleanup/upload/SMBR_ADV_activesoilgasinvst.pdf

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