STREAMBORN

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Jeffrey M. Eandi
Eandi Metal Works
976 Twenty-Third Avenue
Oakland CA 94606

28 June 2002

Project No. P279

Workplan
Soil and Groundwater Investigation
2440 East Eleventh Street
Oakland CA

Dear Mr. Eandi:

This workplan describes soil and groundwater investigation activities designed to evaluate the lateral extent of groundwater contamination associated with releases from a former tank at the subject property. This workplan has been prepared in response to correspondence from Alameda County Environmental Health 30 May 2002. Planned activities include (1) sampling of existing monitoring wells, and (2) drilling borings and collecting soil and groundwater samples downgradient of the monitoring wells.

BACKGROUND

A chronology of environmental activities associated with the former underground gasoline tank is summarized in Table 1.

2440 East Eleventh Street contains a one-story building that is operated by Eandi Metal Works (Figures 1-3).)n 11 May 1992, a 1,000-gallon underground leaded gasoline tank was removed from the property and contamination was discovered.

In July 1995, five borings were drilled and three of the borings were completed as monitoring wells (MW-1, MW-2, and MW-3). Groundwater monitoring has been conducted periodically since well installation. Soil and groundwater data are summarized in Table 2-5. Exploration locations and the location of the former tank are shown on Figure 3. The existing monitoring wells show elevated concentrations of total petroleum hydrocarbons as gasoline (TPH-gasoline) and benzene, toluene, ethylbenzene, and xylenes (BTEX) and the downgradient extent of contamination has not yet been determined.

Alameda County Environmental Health mandated further exploration to determine the lateral and vertical extent on contamination in their correspondence dated 30 May 2002.

HYDROGEOLOGY

Subsurface conditions encountered in previous borings typically consisted of lenses and layers of sandy gravel, gravelly sand, clayey sand and gravel, clayey sand, and sandy clay. The dominant soil type was clayey sand.

Groundwater has typically been measured in the wells at depths of approximately 8 to 12 feet. The groundwater gradient in the vicinity of the site is generally west-southwest (AGI Technologies 1995).

PURPOSE AND APPROACH

The purpose of out proposed soil and groundwater investigation will be to evaluate the downgradient extent of contamination. Although Alameda County Environmental Health has requested evaluation of the vertical extent of contamination, we do not believe deeper exploration is warranted; the released petroleum hydrocarbons were lighter-than-water non-aqueous phase liquids and there is little reason to believe the contamination has migrated vertically downward.

Our proposed approach includes the following:

- We will monitor the three existing onsite wells. The wells will be monitored twice annually, during the dry season (circa August) and during the wet season (circa February). Groundwater samples will be analyzed for TPH-gasoline, BTEX, fuel oxygenates by EPA Method 8260, and total lead.
- We will drill six borings; five of the borings will be west and southwest of the existing monitoring wells (in the perceived downgradient direction) and one of the borings will be southeast of the existing monitoring wells (in the perceived upgradient direction).

  We will collect soil and groundwater samples from the borings. Groundwater samples will be collected from temporary well casings. The samples will be analyzed for TPH-gasoline, BTEX, fuel oxygenates by EPA Method 8260, and total lead. After sampling, the borings will be backfilled with grout.

SCOPE OF WORK

Groundwater Monitoring

Groundwater monitoring will be performed during the dry season (circa August) and during the wet season (circa February).

Groundwater samples will be collected from existing wells MW1, MW2, and MW3. Prior to purging and sampling, water levels will be measured.

Groundwater samples will be analyzed for TPH-gasoline, BTEX, fuel oxygenates by EPA Method 8260, and total lead.

Groundwater sampling will be performed in accordance with the attached standard operating procedure. Groundwater sampling and testing requirements are summarized in Table 6.

Borings

Six borings will be drilled at the locations shown on Figure 3. Prior to drilling, permits will be obtained from Alameda County Public Works Agency (drilling permit) and the City of Oakland (encroachment permit). Underground Service Alert (USA) will be notified to mark buried utilities in the vicinity of the proposed drilling locations. A private utility locator will also be retained to mark buried utilities in the vicinity of the proposed drilling locations.

Borings will be drilled using direct push technology to a depth of approximately 20-feet. During drilling, soil samples will be collected continuously. Soil samples will be classified in the field according to ASTM Standard 2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Samples will be screened in the field using an organic vapor meter. Samples will also be examined in the field for chemical staining and chemical odor.

Upon completion of drilling, a 2-inch diameter slotted PVC temporary well screen will be inserted in each boring. The depth to water will be measured after waiting 10 minutes. A purged grab groundwater sample will then be collected from each boring. Each boring will then be backfilled with grout.

If contamination is not observed during drilling, two soil samples from each boring will be selected for chemical analysis; one sample from a depth coincident with the groundwater table and one sample from the bottom of the boring. If field observations indicate the presence of contamination, then additional samples will be collected to define the top and bottom of the contaminated horizon, as well as the most-contaminated soil.

Soil and groundwater samples will be analyzed for TPH-gasoline, BTEX, fuel oxygenates by EPA Method 8260, and total lead.

Drilling, soil sampling, and grab groundwater sampling will be performed in accordance with the attached standard operating procedures. Drilling, sampling, and testing requirements are summarized in Tables 7 and 8.

Investigation-Derived Waste

Field activities for this workplan will generate the following wastes: (1) soil cuttings and excess soil samples, (2) purge water, and (3) decontamination wastewater. Decontamination wastewater will be discharged to the sanitary sewer. Soil wastes will be containerized pending receipt of analytical results and will be disposed of or discharged onsite accordingly. Purge water will be containerized pending receipt of analytical results and will be disposed of accordingly.

Reporting

A report will be prepared summarizing the results of the borings. Data submittals will be provided for each groundwater monitoring event.

QUALITY ASSURANCE/QUALITY CONTROL

Quality Control Samples

The laboratory will include laboratory blank, laboratory replicate, and laboratory spike quality control samples during soil and groundwater analysis. Field quality control samples will not be collected or analyzed.

Field Meter Quality Control Procedures

Meters for measurement of field parameters will be calibrated daily. Calibration standards should generally approximate or span the anticipated range of measurements. Recalibration may be appropriate if unusual measurements are noticed.

The field organic vapor monitor (used for site safety and to screen soil samples) will be calibrated using a standard 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, such as working around equipment and exposure to chemicals, are addressed. Although the proposed field work 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.

BIBLIOGRAPHY

ACEH (2002). *Notice of Violation, Property at 976 23rd Avenue, Oakland CA.* Correspondence to Jeffrey M. Eandi, Eandi Metal Works, Oakland CA. Correspondence from Amir K. Gholami, Alameda County Environmental Health, Alameda CA. 30 May 2002.

AGI Technologies (1995). *Monitoring Well Installations and Quarterly Groundwater Monitoring, Eandi Metal Works, Oakland, California.* Prepared for Eandi Metal Works, Oakland CA. Prepared by AGI Technologies, Bellevue WA. 25 September 1995.

AGI Technologies (1996). *Quarterly Groundwater Monitoring, Third Event January 1996,Eandi Metal Works, Oakland California.* Prepared for Eandi Metal Works, Oakland CA. Prepared by AGI Technologies, Bellevue WA. 22 May 1996.

Kleinfelder (2001). *Monitoring Well Sampling Results for MW-1, MW-2, and MW-3 at the Eandi Facility, Oakland, California.* Prepared for Jeff Eandi, Oakland CA. Prepared by Kleinfelder, Oakland CA. 14 June 2001.

Kleinfelder (2002). *Monitoring Well Sampling Results for MW-1, MW-2, and MW-3 at the Eandi Metal Works Facility, Oakland, California.* Prepared for Jeff Eandi, Oakland CA. Prepared by Kleinfelder, Oakland CA. 15 March 2002.

If you have any questions or comments, please call.

Sincerely,

STREAMBORN

Douglas W. Lovell, PE
Geoenvironmental Engineer

Expires 12/31/04

Attachments

cc: Chuck Hedley/San Francisco Bay RWQCB, Oakland, CA
Amir Gholami/Alameda County Environmental Health, Alameda, CA

Table 1

Environmental Chronology
2440 East Eleventh Street
Oakland CA

Date	Performed By	Event
Unknown	Unknown	• 1,000-gallon underground leaded gasoline tank 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. • Contamination was discovered.
10 July 1995	AGI Technologies	• Five soil borings were drilled. Soil samples were collected and analyzed for total petroleum hydrocarbons as gasoline (TPH-gasoline); benzene, toluene, ethylbenzene, and xylenes (BTEX); MtBE (by EPA Method 8020); and total metals. • Three of the borings were completed as monitoring wells (MW-1, MW-2, and MW-3) • Water levels were measured in wells MW-1, MW-2, and MW-3. • MW-1, MW-2, and MW-3 were developed and groundwater samples were collected Samples were analyzed for TPH-gasoline, BTEX, MtBE (by EPA Method 8020), and total lead. • Elevation survey was conducted for MW-1, MW-2, and MW-3.
17 July 1995	AGI Technologies	• Groundwater levels were measured in MW-1, MW-2, and MW-3. • Groundwater samples were collected from MW-1, MW-2, and MW-3. Samples were analyzed for TPH-gasoline, BTEX, MtBE (by EPA Method 8020), and total lead.
20 October 1995	AGI Technologies	• Groundwater levels were measured in MW-1, MW-2, and MW-3. • Groundwater samples were collected from MW-1, MW-2, and MW-3. Samples were analyzed for TPH-gasoline, BTEX, and total lead.
25 January 1996	AGI Technologies	• Groundwater levels were measured in MW-1, MW-2, and MW-3. • Groundwater samples were collected from MW-1, MW-2, and MW-3 Samples were analyzed for TPH-gasoline, BTEX, MtBE (by EPA Method 8020), and total lead
25 April 1996	AGI Technologies	• Groundwater levels were measured in MW-1, MW-2, and MW-3. • Groundwater samples were collected from MW-1, MW-2, and MW-3 Samples were analyzed for TPH-gasoline, BTEX, MtBE (by EPA Method 8020), and total lead
11 - 12 June 2001	Kleinfelder	• Groundwater levels were measured in MW-1, MW-2, and MW-3. • Groundwater samples were collected from MW-1, MW-2, and MW-3. Samples were analyzed for TPH-gasoline, BTEX, and total lead.
5 February 2002	Kleinfelder	• Groundwater levels were measured in MW-1, MW-2, and MW-3. • Groundwater samples were collected from MW-1, MW-2, and MW-3. Samples were analyzed for TPH-gasoline, BTEX, MtBE (by EPA Method 8020), and total lead

General Notes:

(a) AGI Technologies = AGI Technologies (Bellevue WA).

(b) Kleinfelder = Kleinfelder (Oakland CA).

(c) TPH-gasoline = total petroleum hydrocarbons as gasoline.

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

(e) MtBE = methyl tert-butyl ether.

Table 2

Groundwater Level and Gradient Data
2440 East Eleventh Street
Oakland CA

Location	MW-1		MW-2		MW-3		Groundwater Gradient	
Ground Surface Elevation	NM		NM		NM			
Measuring Point GPS Coordinates	NM		NM		NM			
Measuring Point Elevation	TOC N Side = 99.90		TOC N Side = 99.57		TOC N Side = 98.45			
	Depth	Elev	Depth	Elev	Depth	Elev		
Intercepted Interval	10 to 20	NM	10 to 20	NM	10 to 20	NM	Direction	Magnitude
14 July 1995	9.72	90.18	10.74	88.83	10.95	87.50	-	-
17 July 1995	11.11	88.79	10.93	88.64	11.04	87.41	-	-
20 October 1995	11.96	87.94	11.92	87.65	12.11	86.34	-	-
25 January 1996	8.14	91.76	8.23	91.34	8.83	89.62	-	-
11-12 June 2001	10.35	89.55	11.50	88.07	11.08	87.37	-	-
5 February 2002	11.00	88.90	11.10	88.47	11.30	87.15		
Total Depth (Last Measurement)	NM		NM		NM			

<u>General Notes</u>

(a) Measurements cited in units of feet.

(b) NM = not measured.

(c) TOC = top of PVC casing. N = north. Measuring points are the tops of PVC casing, north side.

(d) Depth to groundwater and total depth measured from the measuring point.

(e) Groundwater levels measured in 1995 through 1996 and elevation surveying performed by AGI Technologies (Bellevue WA).

(f) Groundwater levels measured in 2001 and 2002 performed by Kleinfelder (Oakland CA).

(g) Elevations referenced to site-specific datum. Assumed elevation = 100 feet.

(h) Intercepted intervals correspond to the sand pack interval. Depths of intercepted intervals measured relative to the adjacent pavement or ground surface.

Table 3

Soil Analytical Data
2440 East Eleventh Street
Oakland CA

Location	Sample Date	Sample Depth (feet)	Total Lead (mg/kg)	TPH-Gasoline (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Total Xylenes (mg/kg)	MtBE (mg/kg)
E-1	10 July 1995	6	15.9	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005
		12.5	10.5	1.4	0.058	0.15	0.059	0.3	0.017
E-2	10 July 1995	12.5	12.8	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005
MW-1	10 July 1995	11	15.6	45	<0.05	<0.05	0.33	1.5	<0.05
		16	10.8	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005
MW-2	10 July 1995	11	10.7	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005
		16	11.2	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005
MW-3	10 July 1995	11	13.5	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005
		16	9.1	<0.5	<0.005	<0.005	<0.005	<0.005	<0.005

General Notes

(a) TPH = total petroleum hydrocarbons.

(b) Samples collected by AGI Technologies, Inc. (Bellevue WA).

(c) Samples analyzed by Anametrix Labs (San Jose CA).

(d) MtBE analysis performed by EPA Method 8020.

(e) NM = not measured.

Table 4

Well Purging and Sampling Information Since 2001
2440 East Eleventh Street
Oakland CA

Well No.	Sample Date	Sample Time	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	NM	Purge Pump	NM	20	NC	no	NM	6.8	310	21.4	NM	Not Observed
	5 Feb 02	NM	Purge Pump	NM	4	NC	no	NM	6.6	290	18.8	NM	Not Observed
MW2	12 Jun 01	NM	Purge Pump	NM	15	NC	no	NM	7.1	430	17.2	NM	Not Observed
	5 Feb 02	NM	Purge Pump	NM	4	NC	no	NM	6.6	400	16.8	NM	Not Observed
MW3	12 Jun 01	NM	Purge Pump	NM	12	NC	no	NM	7.4	440	17.2	NM	Not Observed
	5 Feb 02	NM	Purge Pump	NM	4	NC	no	NM	6.6	410	17.8	NM	Not Observed

General Notes

(a) NM = not measured.

(b) NC = not calculated.

(c) ORP = oxygen-reduction potential.

(d) Sampling performed by Kleinfelder (Oakland CA).

Table 5

Groundwater Analytical Data
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)	MtBE (µg/L)	Other Fuel Oxygenates (EPA Method 8260) (µg/L)
MW-1	17 Jul 1995	Grab	<40	22,000	390	2,000	800	5,300	<125	NM
	20 Oct 1995	Grab	<40	14,000	270	540	360	1,800	NM	NM
	25 Jan 1996	Grab	<40	16,000	740	1,300	490	2,700	<500	NM
	25 Apr 1996	Grab	<40	4,600	180	450	190	1,000	<250	NM
	11 Jun 2001	Grab	14	7,100	14	35	240	720	NM	NM
	5 Feb 2002	Grab	3.7	9,300	6.3	11	230	560	<0.7	NM
MW-2	17 Jul 1995	Grab	56.4	21,000	370	1,700	930	5,100	<125	NM
	20 Oct 1995	Grab	<40	730	18	27	26	7.9	NM	NM
	25 Jan 1996	Grab	<40	14,000	74	660	1,000	2,600	670	NM
	25 Apr 1996	Grab	<40	13,000	370	440	1,000	2,900	<500	NM
	12 Jun 2001	Grab	7.7	3,200	11	6.2	170	270	NM	NM
	5 Feb 2002	Grab	3.5	2,900	7.6	3.8	220	160	<0.7	NM
MW-3	17 Jul 1995	Grab	153	8,400	1,200	150	1,000	1,700	<125	NM
	20 Oct 1995	Grab	<40	5,800	600	590	43	340	NM	NM
	25 Jan 1996	Grab	<40	10,000	1,200	290	870	1,300	<250	NM
	25 Apr 1996	Grab	<40	8,900	830	140	1,000	1,000	400	NM
	12 Jun 2001	Grab	7.4	1,800	37	4.5	98	19	NM	NM
	5 Feb 2002	Grab	4.4	1,100	32	2.1	76	9.5	<0.5	NM

General Notes

(a) TPH = total petroleum hydrocarbons.

(b) 1995-1996 samples collected by AGI Technologies (Bellevue WA).

(c) 2001 and 2002 samples collected by Kleinfelder, Inc (Oakland CA).

(d) NM = not measured

(e) 2002 MtBE samples analyzed by EPA Method 8260. Prior MtBE samples were analyzed by EPA Method 8020.

(f) 1995-1996 samples analyzed by 2001 samples analyzed by Anametrix Labs (San Jose CA). McCampbell Analytical (Pacheco CA). 2002 samples analyzed by Curtis and Tompkins (Berkeley CA).

Table 6

Groundwater Sampling and Testing Requirements
2440 East Eleventh Street
Oakland CA

Item	Specification
Monitoring Wells to be Sampled	• MW-1, MW-2, and MW-3.
Sampling Frequency	• Twice per year: during the dry season (circa August) and during the wet season (circa February).
Purge Equipment	• Submersible pump or bailer.
Purge Equipment Decontamination	• Wash with Alconox or other low-phosphate soap, rinse with tap water, rinse with distilled water.
Purge Criteria	• Wells that recharge in a timely manner will be purged of at least 3 standing water casing volumes and sampled after field parameters stabilize. If field parameters have not stabilized by the time 10 standing water casing volumes have been purged, sampling will be conducted anyway. • Wells that recharge slowly will be purged dry once and sampled after recharge is sufficient to submerge the sampler.
Field Measurements and Observations	• Water level in well prior to purging, turbidity (qualitative clarity and color), pH, oxidation-reduction potential, temperature, specific conductivity, dissolved oxygen, and purge volume.
Sampler	• Bailer with bottom-emptying device.
Sampler Decontamination	• Wash with Alconox or other low-phosphate soap, rinse with tap water, rinse with distilled water.
Natural Sample Collection	• Sample from the midpoint of standing water column.
Sample Filtration	• None.
Sample Analysis and Containers	• Three 40-milliliter glass vials preserved with HCl for TPH-gasoline/BTEX/fuel oxygenates by EPA Method 8260. • One 250-milliliter plastic container preserved with HNO_3 for Total Lead.
Sample Handling and Storage During Transport to Laboratory	• Verify no headspace. Label containers, place in Ziplock bag, store on ice in cooler, enter onto chain-of-custody, and maintain sample custody until sent to laboratory.
Field Quality Control Samples	• None.

Table 7

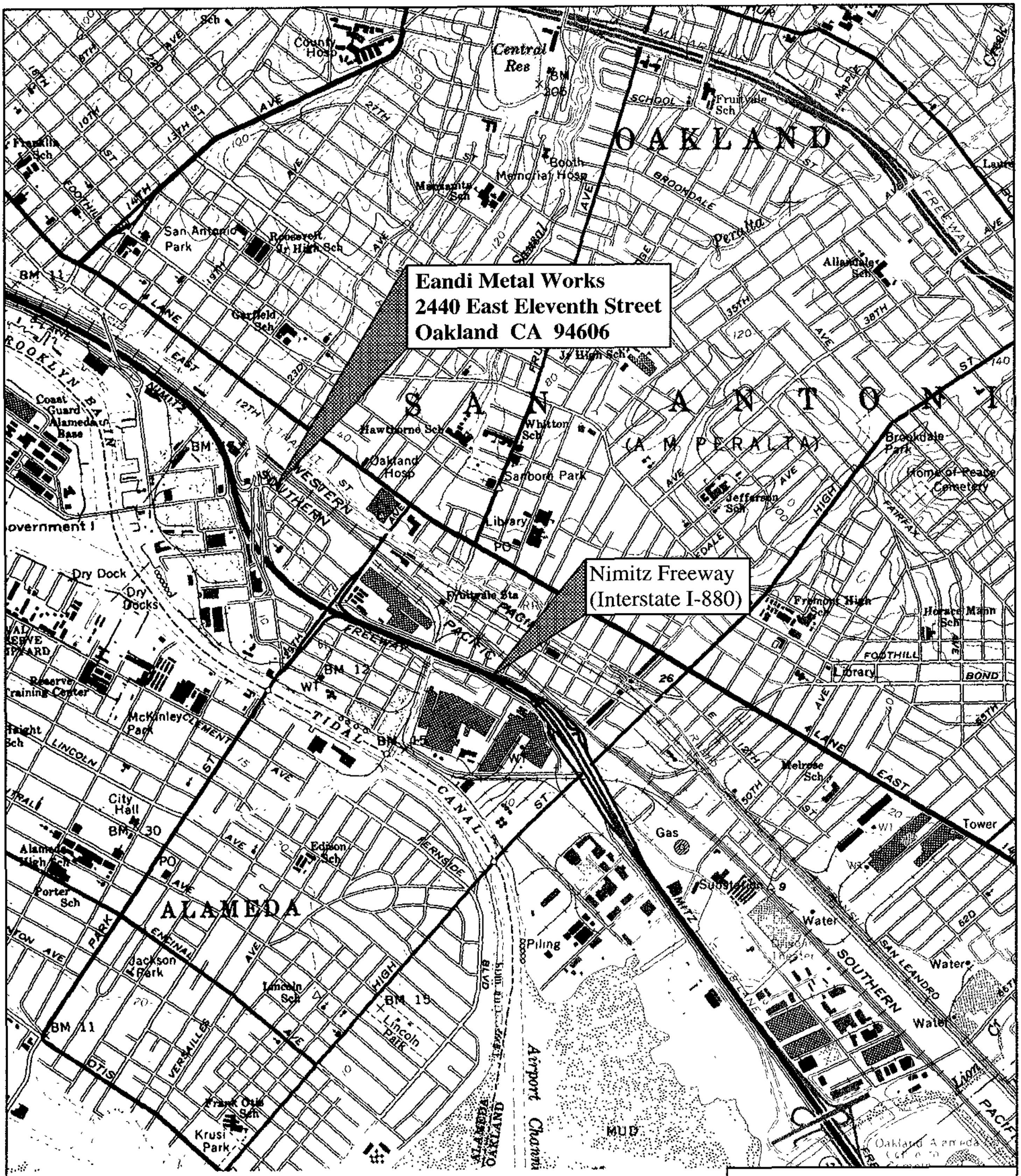
Soil Sampling and Testing Requirements
2440 East Eleventh Street
Oakland CA

Item	Requirement
Number of Borings	B-1, B-2, B-3, B-4, B-5, and B-6
Depth	Advance borings to total depth of ±20 feet.
Sampling Interval and Sample Type	Collect grab samples continuously.
Sampler	Direct push sampler.
Liners	4-foot long plastic liner (direct push).
Rods, Sampler, and Liner Decontamination	Wash auger and rods between borings. Wash sampler between samples. Wash each liner prior to use. Wash with soap (Alconox or similar), rinse with tap water, rinse with distilled water.
Field Observations and Measurements	Screen samples with field organic vapor monitor. Note chemical staining and chemical odor. Visually classify samples according to ASTM D 2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
Samples Retained for Physical Testing	None.
Samples Retained for Chemical Testing	If contamination is not observed during drilling, two soil samples will be retained for chemical analysis from each boring; one sample from a depth coincident with the groundwater table (expected at a depth of ±10 feet) and one sample from the bottom of the boring (± 20 feet). If field observations indicate the presence of contamination, then additional samples will be collected to define the top and bottom of the contaminated horizon, as well as the most-contaminated soil.
Analytical Testing	Analyze soil samples for TPH-gasoline, BTEX, fuel oxygenates by EPA Method 8260, and total lead.
Sample Handling for Chemical Testing	Cap liner with Teflon sheet, plastic cap, and duct tape (do not use electrical tape). Label liner, place in ziplock bag, and store on ice in cooler until delivery to the laboratory. Log samples on chain-of-custody form and maintain sample security.
Field Quality Control Samples for Chemical Testing	None.
Completion	Backfill boreholes with cement-bentonite grout (1 sack/94-pounds cement and 5 pounds bentonite to 7.5-gallons water).

Table 8

Groundwater Sampling and Testing Requirements from Temporarily-Cased Boreholes
2440 East Eleventh Street
Oakland CA

Item	Requirement
Sampling Locations	One sample from each boring (B-1, B-2, B-3, B-4, B-5, and B-6).
Casing	1-inch slotted PVC temporary casing.
Casing Decontamination	Wash with soap (Alconox or similar), rinse with tap water, rinse with distilled water.
Measurement of Depth to Groundwater	Install temporary PVC slotted casing in each boring immediately after drilling and soil sampling are completed. Measure depth to groundwater approximately 10 minutes after the temporary casing has been installed.
Sample Purging	Use a peristaltic pump or bailer for purging. During purging, measure field parameters (temperature, pH, specific conductance, dissolved oxygen, and ORP). For borings that recharge in a timely manner, purge until at least 3 standing water borehole volumes have been removed and field parameters have stabilized. Even if field parameters have not stabilized, terminate purging after 5 standing water borehole volumes have been removed. For borings that do not recharge in a timely manner, purge dry once and sample after recharge is sufficient to submerge the bailer.
Purge Equipment Decontamination	Wash with soap (Alconox or similar), rinse with tap water, rinse with distilled water.
Sample Collection	Teflon bailer with bottom emptying device.
Sampler Decontamination	Wash with soap (Alconox or similar), rinse with tap water, rinse with distilled water.
Analytical Testing	TPH-gasoline, BTEX, fuel oxygenates (EPA Method 8260) and total lead.
Sample Containers	Three 40-milliliter glass vials preserved with HCl for TPH-gasoline, BTEX, and fuel oxygenates by EPA Method 8260. One 250 milliliter plastic container preserved with HNO_3 for total lead.
Sample Handling and Preservation	Verify no headspace in 40-milliliter glass vials. Label containers, place in ziplock bag, and store on ice in cooler until delivery to the laboratory. Log samples on chain-of-custody form and maintain sample security.
Field Quality Control Samples	None.
Investigation-Derived Waste	Containerize purge water in 5-gallon plastic bucket. Label bucket with contents and accumulation date. Discharge decontamination wastewater to the sanitary sewer.



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

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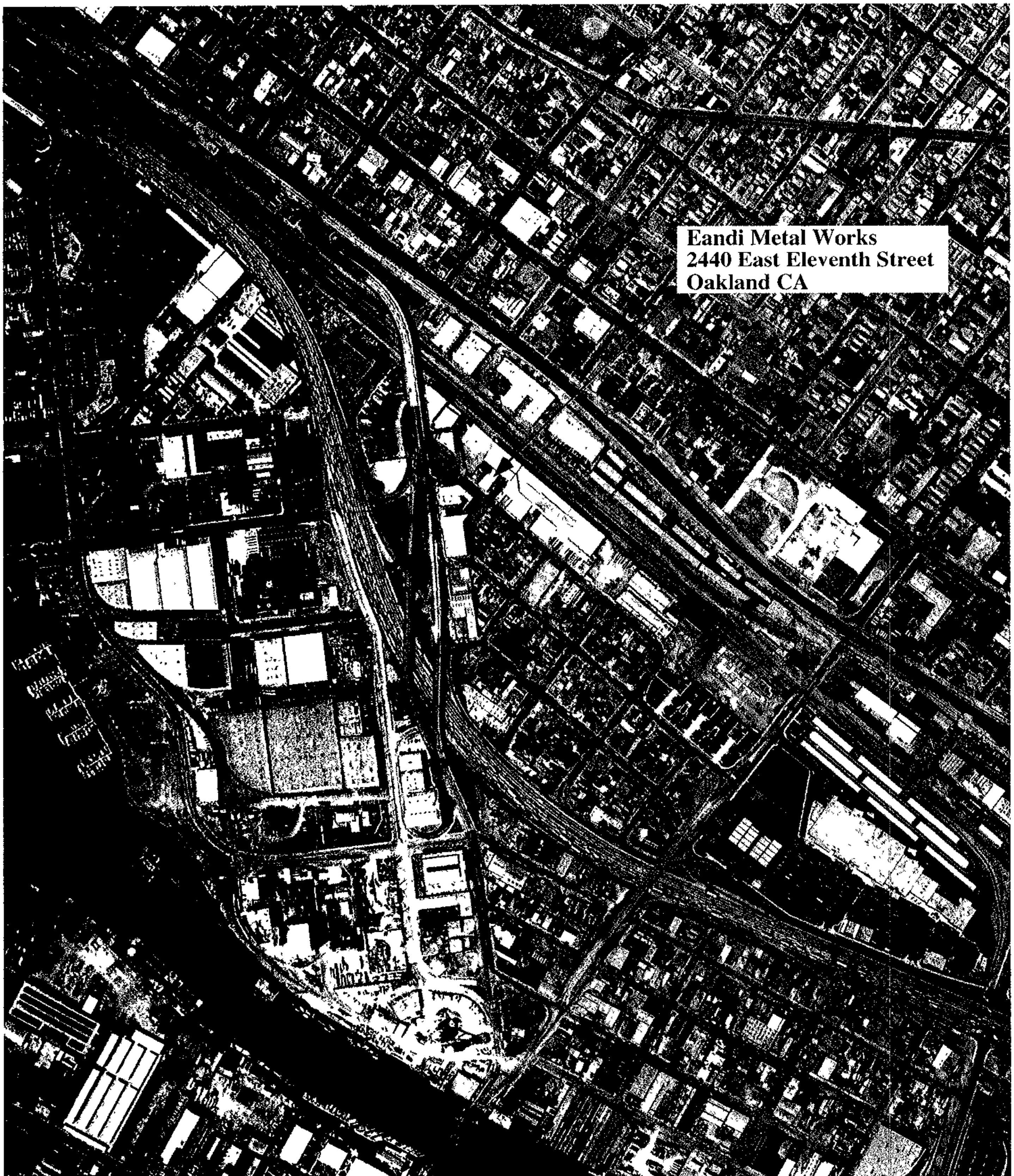

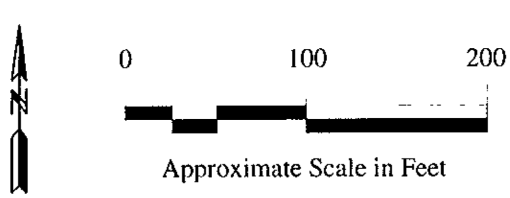

Basemap: Aerial photograph, flown 24 August 1998, photograph number ALA-AV-6100-11-38, original scale 1:12,000. Pacific Aerial Surveys, Oakland CA

Figure 2

Vicinity Map

2440 East Eleventh Street
Oakland CA

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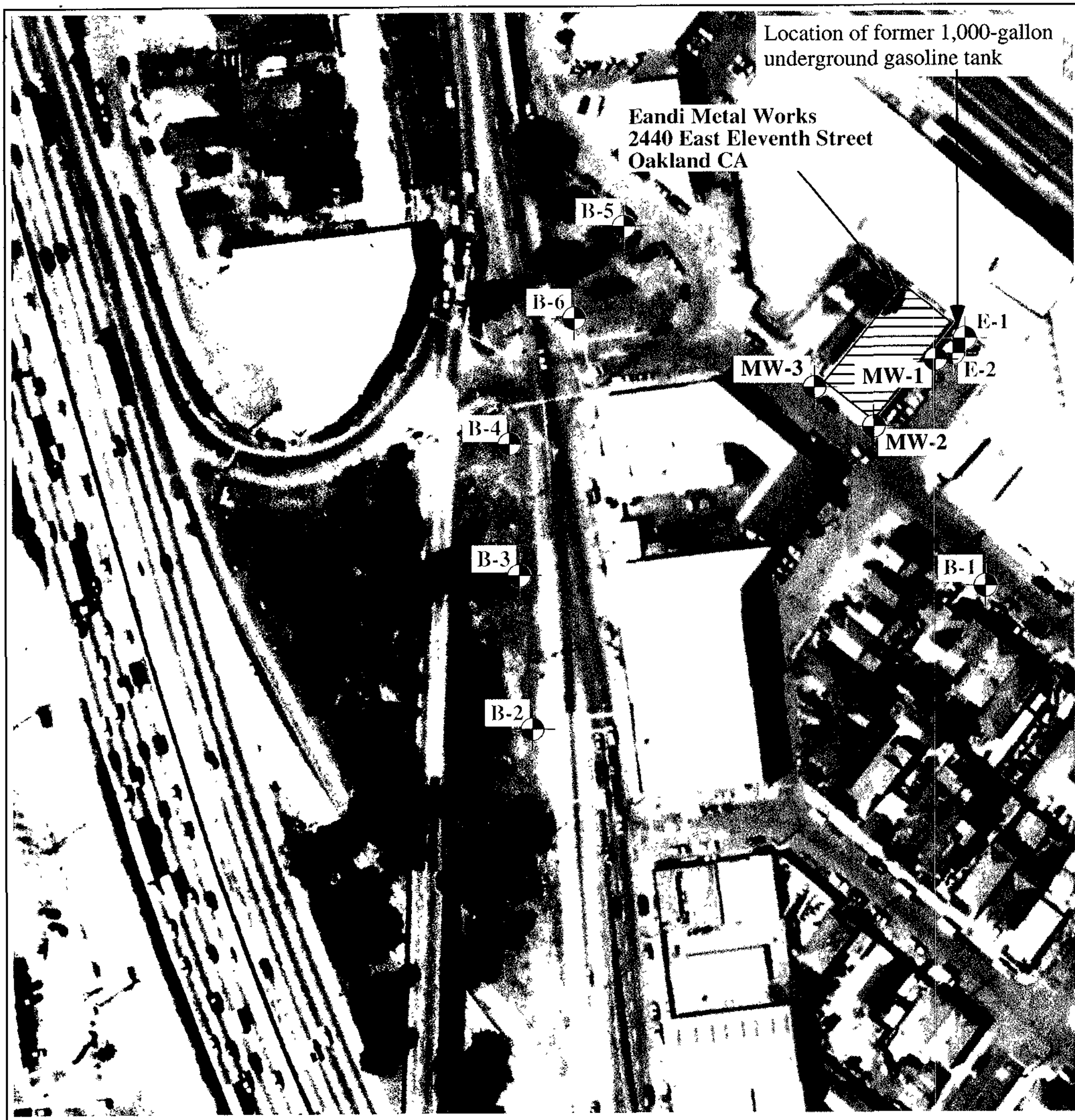

Legend

Existing monitoring well

Previous hollow stem auger boring

Proposed direct-push boring

N

0 100 200

Approximate Scale in Feet

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

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ATTACHMENT 1

Standard Operating Procedures

STANDARD OPERATING PROCEDURE (SOP) 4A
WELL PURGING AND SAMPLING

1.0 INTRODUCTION AND SUMMARY

This SOP describes procedures to purge and sample wells that have been properly installed and developed. Typically, this SOP will be used for sampling monitoring wells with 2- or 4-inch diameter casing. The sampling described herein is appropriate for a variety of groundwater analyses, including: total and dissolved metals, volatile and semi-volatile organic compounds, and general minerals. For newly installed and developed well, the purging and sampling described in this SOP is typically performed at least 7 days after well development to allow ambient groundwater conditions to re-establish in the vicinity of the well.

The procedures described in this SOP should be modified for domestic wells or wells with dedicated sampling equipment. The procedures should also be modified if product is observed in the well.

Typical well sampling and purging activities include decontaminating the purging and sampling equipment, purging the stagnant water from the well casing and filter pack by pumping or bailing, measuring field parameters and evacuated volume of groundwater during purging, terminating the purging process when field parameters stabilize, collecting groundwater samples by pumping or bailing, and labeling and preserving the collected samples.

2.0 EQUIPMENT AND MATERIALS

- Buckets and bristle brushes for decontamination
- Low residue, organic free soap such as Liquinox or Alconox
- If sampling is to be performed for metals, dilute (10%) reagent-grade nitric acid (for decontamination)
- Tap water (for decontamination)
- Distilled water (for decontamination and quality control blank samples)
- Cooler with ice (do not use blue ice or dry ice)
- Ziplock bags of size to accommodate sample containers
- Steel, 55-gallon, open-top drums, DOT 17H
- 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.
- Laboratory-cleaned containers of proper type and size for the analytical parameters (refer to Table 1)
- Reagent-grade chemicals for sample preservation, as required for the analytical parameters (refer to Table 1)
- If dissolved metals analyses are required, 45-micron cellulose acetate filters and filtering device. Alternate filter type and size (cellulose nitrate, Teflon, or glass-fiber pre-filters) may be required as specified in the Quality Assurance Project Plan or Sampling Plan. The make, type, and size of filter, including disposable filters, should be documented.

- Glass beaker, ±250 milliliter for measurement of field parameters. A similar flow-through cell may also be used.
- Water level meter
- pH, temperature, and specific conductivity instruments, including pH and specific conductivity standards approximating or spanning the natural groundwater parameters. As specified in the Quality Assurance Project Plan or Sampling Plan, oxidation-reduction potential (ORP) or dissolved oxygen meters may also be required.
- Purging equipment consisting of one of the following:

  Bailer: Steel, PVC, Teflon, or stainless steel. Dedicated or new bailer rope.

  Bladder Pump: Plastic or Teflon bladder. 4-inch or 6-inch diameter by ±4-foot long decontamination chambers.

  Submersible Electric Pump: Normally used where relatively large quantities of purge water are expected from wells with quick recharge. Pump should have flow control valve and foot valve. 6-inch diameter by ±4-foot long decontamination chambers.

  Surface Centrifugal Pump: Limited to water lift of approximately 20 feet. Dedicated or new flexible plastic suction hose. Foot valve. Flow control valve.
- Sampling device consisting of one of the following:

  Bailer: Teflon or stainless steel. Dedicated or new bailer rope. If samples are collected for volatile organic compound analysis, bailer should also be fitted with bottom-emptying device.

  Bladder Pump: Teflon bladder. Dedicated or new Teflon or Tygon tubing for sample discharge line. 4-inch or 6-inch diameter by ±4-foot long decontamination chambers.

As specified in the Site Safety Plan, additional safety and personnel decontamination equipment and materials may be needed.

3.0 TYPICAL PROCEDURES

The following procedures are intended to cover the majority of purging and sampling conditions. However, normal field practice requires re-evaluation of these procedures and implementation of alternate procedures upon encountering unusual or unexpected conditions. Deviations from the following procedures may be expected and should be documented.

1. Remove top cap and perform field organic vapor monitoring of well casing
2. Measure static water level and total depth and compare to historic measurements. Remeasure if discrepancies are noted with historic data. Document observations of product, if appropriate. Calculate volume of standing water in casing.
3. Decontaminate purging and sampling equipment (see section DECONTAMINATION in this SOP)
4. Begin purging and if possible, adjust purge rate to expose as little of the screened interval as possible (subject to reasonable time constraints). Record the following observations at the beginning of purge, periodically during purge, and during sampling:

- Purge volume and time
- pH, temperature, and specific conductivity
- Turbidity (clarity and color)
- Approximate drawdown and well yield during purge
- Whether well was purged dry
- Other observations (such as presence of product) as appropriate

5. Terminate purging when one of the following conditions is observed:

   Quick Recharge Wells: Well shows stabilized field parameters and at least 3 casing volumes of standing water have been removed - ready for sampling. If field parameters have not stabilized after removal of 5 casing volumes of standing water, terminate purging anyway. Wells should be allowed to recover to at least 1/2 the original standing water depth prior to sampling.

   Slow Recharge Wells: Wells that are initially purged dry, and do not recover to 1/2 the original standing water depth within 4 hours, should be purged dry again and then sampled when sufficient recovery has occurred to submerge the sampling bailer or pump. Generally, 3 feet of recovery may be considered sufficient recovery for normal bailer or pump submergence.

6. If recharge has submerged the entire screened interval, sample from mid-depth of screened interval. Otherwise, sample from mid-depth of water column at time of sampling.
7. If dissolved metals analyses are to be performed, filter sample. Also if dissolved metals analyses are to be performed and the sample is moderately turbid or very turbid, collect companion filtered and unfiltered samples.
8. For parameters other than dissolved metals, do not filter sample. Fill sample containers directly and preserve according to the requirements of Table 1. Containers should generally filled to capacity. 40 milliliter glass vials should be filled from the bottom using a sample discharge tube (bottom-emptying device for bailer or discharge tube of bladder pump). 40 milliliter vials should not have headspace.
9. Label sample containers, place in ziplock bag, and place on ice in cooler.
10. Log samples onto chain-of-custody form and maintain sample custody until shipped to laboratory.
11. Containerize purge water, excess sample, and decontamination wastewater in steel drum(s). Label drum(s) with hazardous waste label, contents, and well number from which waste originated.

4.0 QUALITY ASSURANCE AND QUALITY CONTROL

Quality control samples should consist of the following:

- Duplicate samples at a frequency of 1 per 10 natural samples
- Cross-contamination blank (also known as a sampler rinsate blank) at a frequency of 1 per 10 natural samples. Cross-contamination blanks are prepared by passing deionized water over and through decontaminated sampling equipment (including sample filter if used).

- If analyses require collection of samples in 40 milliliter vials, travel blanks should also be included at a frequency of 1 per day of sampling.
- Optional quality control samples include standard reference materials and natural matrix spikes.

Meters for measurement of field parameters should be calibrated at least once per day. Calibration standards should generally approximate or span natural groundwater characteristics. Recalibration may be appropriate if unusual measurements are noticed. Calibration activities should be documented on the instrument calibration log.

5.0 DOCUMENTATION

The following information should be collected prior to sampling and taken into the field for reference:

- Well completion schematic
- Summary of historic water level, total depth, and field parameter measurements

Observations, measurements, and other documentation of the purging and sampling effort should be recorded on the following:

- Daily Report
- Field Notebook
- Instrument Calibration Log
- Well Purge and Sample Log
- Chain-of-Custody

Documentation should include any deviations from this SOP, as well as documentation of the containerization and disposition/disposal of investigation-derived waste.

6.0 DECONTAMINATION

Prior to entering the site, purging and sampling equipment should be decontaminated by steam cleaning, pressure washing, or equivalent.

Prior to sampling each well, down-well equipment and equipment that will contact the sample (except sample containers) should be decontaminated according to the following procedure:

- Steam clean or pressure wash (optional unless oily contamination covers equipment)
- Wash with soap
- Rinse with tap water
- Double rinse with distilled water

If metals are included in the analytical parameters, the decontamination procedures should include:

- Steam clean or pressure wash (optional unless oily contamination covers equipment)
- Wash with soap

- Rinse with tap water
- Rinse with dilute nitric acid (skip for pumps containing metal parts)
- Rinse with tap water
- Double rinse with distilled water

Suction or discharge hoses from purge pumps need external decontamination only. Purge or sampling pumps should be decontaminated by filling the decontamination chamber with the aforementioned solutions and pumping the solutions from the chamber to the waste drum.

Prior to leaving the site, purging and sampling equipment should be steam cleaned, pressure washed, or equivalent.

7.0 INVESTIGATION-DERIVED WASTE

Purge water, excess sample, and decontamination wastewater should be containerized in steel drums. Drums should be labeled with hazardous waste labels, including: Generator's name and accumulation date. Wastes from different wells may be combined, but wastes that are anticipated to contain chemical should not be mixed with waste that are not thought to be contaminated.

8.0 SAFETY

Primary chemical hazards during well purging and sampling are associated with dermal exposure. Acids used for decontamination and sample preservation may also present chemical hazards. Primary protection against dermal exposure includes splash protection and gloves. Special chemical hazards may be associated with the presence of product, if discovered during sampling. Water quality samples are not generally considered representative in the presence of product. Accordingly, it may be appropriate to abandon sampling efforts if product is discovered.

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

9.0 REFERENCES

Aller, L., T.W. Bennett, G. Hackett, R.J. Petty, J.H. Lehr, H. Sedoris, and D.M. Nielsen, 1989. Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells. National Water Well Association, Dublin, OH. 1989.

U.S. Environmental Protection Agency, 1989a. A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001, OSWER Directive 9355.0-14. USEPA, Office of Emergency and Remedial Response, Washington, DC. December 1989.

U.S. Environmental Protection Agency, 1989b. USEPA Method Study #39, Method 504, 1,2-Dibromoethane (EDB) and 1,2-Dibromo-3-Chloropropane (DBCP) in Water, Pb 89-119 580/AS. National Technical Information Service, Springfield VA. 1989.

Table 1

Sampling and Preservation for Groundwater Samples

Parameter	Analytical Method	Container	Preservation	Maximum Holding Time
Purgeable Halocarbons by GC	EPA 8010	Three 40-ml glass vials	HCl to pH<2, cool to 4 degrees Celsius	14 days after collection
Purgeable Aromatics by GC	EPA 8020	Three 40-ml glass vials	HCl to pH<2, cool to 4 degrees Celsius	14 days after collection
Organochlorine Pesticides and PCB's	EPA 8080	Two 1-liter amber glass	Cool to 4 degrees Celsius	Extract 7 days after collection Analyze 40 days after extraction
Organophosphorus Pesticides	EPA 8140	Two 1-liter amber glass	Cool to 4 degrees Celsius	Extract 7 days after collection Analyze 40 days after extraction
Chlorinated Herbicides (Phenoxy Herbicides)	EPA 8150	Two 1-liter amber glass	Cool to 4 degrees Celsius	Extract 7 days after collection Analyze 40 days after extraction
Volatile Organic Compounds by GC/MS	EPA 8240 or 8260	Three 40-ml glass vials	HCl to pH<2, Cool to 4 degrees Celsius	14 days after collection
Fuel Oxygenates (MTBE, TAME, ETBE, DIPE)	EPA SW846 8260 Modified	Three 40-ml glass vials	Cool to 4 degrees Celsius	14 days after collection
Semi-Volatile Organic Compounds by GC/MS (Base/Neutral/Acid Extractable Organics)	EPA 8270	Two 1-liter amber glass	Cool to 4 degrees Celsius	Extract 7 days after collection Analyze 40 days after extraction
Dibromoethane (EDB) and 1,2-Dibromo-3-Chloropropane (DBCP)	EPA 504	Two 1-liter amber glass	Cool to 4 degrees Celsius	Extract 7 days after collection Analyze 40 days after extraction
Total Petroleum Hydrocarbons Gasoline/BTEX	Extract by EPA 5030, analyze by EPA 8015	Three 40-ml glass vials	HCl to pH<2, cool to 4 degrees Celsius	Extract 7 days after collection Analyze 7 days after extraction
Total Petroleum Hydrocarbons Diesel, Kerosene, or Motor Oil	Extract by EPA 3510, analyze by EPA 8015	One 1-liter amber glass	HCl to pH<2, cool to 4 degrees Celsius	Extract 7 days after collection Analyze 7 days after extraction
Oil & Grease	SM 503	One 1-liter glass with aluminum foil-lined cap	H_2SO_4 to pH<2, cool to 4 degrees Celsius	28 days after collection
Total Metals	EPA 7000 Series	One 1/2 liter poly	HNO3 to pH<2, cool to 4 degrees Celsius	6 months after collection (28 days for mercury)
Dissolved Metals	EPA 7000 Series	One 1/2 liter poly	HNO3 to pH<2, cool to 4 degrees Celsius	6 months after collection (28 days for mercury)
General Minerals	Various	Two 1-liter poly	Cool to 4 degrees Celsius	7 days after collection

STANDARD OPERATING PROCEDURE (SOP) 29
SOIL SAMPLING USING DIRECT-PUSH TECHNIQUES

1.0 INTRODUCTION AND SUMMARY

This SOP describes methods for collecting soil samples in conjunction with field investigations using "Direct-Push" (DP) techniques. DP techniques, such as Enviro-Core®, Geoprobe®, and cone penetrometer testing (CPT), utilize small-diameter probes which are pushed, driven, or vibrated into the ground to the desired sampling depth. As the DP probes are being advanced, soil samples may be collected using stainless steel liners or clear plastic tubes. Soil samples may be collected continuously or at designated intervals. The soil sampling techniques described in this SOP are generally suitable for chemical characterization and physical classification tests. However, because of the narrow diameter of the DP probe, the resulting soil samples should generally be considered "disturbed" with respect to physical structure and may not be suitable for measuring sensitive physical parameters, such as strength and compressibility.

The DP techniques described in this SOP generally produce a borehole with: (1) a diameter of approximately 1.5- to 2.5-inches corresponding to the outside diameter of the DP probe, and (2) limited capability for cross-contamination between subsurface strata as the DP probe passes from contaminated strata to uncontaminated underlying strata. However, should conditions require strict measures to help prevent cross-contamination or maintain the integrity of an aquitard, consideration should be given to augmenting the procedures of this SOP, for example, by using pre-drilled and grouted isolation casing.

The procedures for soil sampling using DP techniques generally consist of initial decontamination, advancement of the DP probe, recovering the core sampler, logging and packaging of the soil samples, decontamination of the core sampler (for chemical characterization samples), and continued sampling until the total depth of the borehole is reached. Withdrawal of the DP probe upon reaching the total depth requires completion of the borehole by grouting.

2.0 EQUIPMENT AND MATERIALS

- Equipment to make a borehole and/or push the DP probe to the desired depth. Methods include DP rig or CPT rig.
- Core sampler. The sampler type, material of construction, outside diameter, and length should be noted. Sampler lengths are typically 3- to 5-feet.
- Liners may or may not be required depending on the type of DP technique. The liner type, material of construction, outside diameter, and length should be noted.
- Plastic end caps of appropriate diameter for liner type.
- Teflon sheets, approximate 6-mil thickness, precut to a diameter or width of the liner diameter plus approximately 1 inch.
- 1/2-pint widemouth glass jars, laboratory cleaned.
- Kimwipes, certified clean silica sand, or deionized water (for blank sample preparation).

- Duct tape.
- Sample labels, boring log forms, chain-of-custody forms, hazardous waste labels, and daily report forms.
- Ziploc plastic bags of size to accommodate sample.
- Stainless steel spatula and knife.
- Cooler with ice (do not use blue 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 noted.
- Equipment and materials necessary to decontaminate the DP equipment and groundwater sampling tool. Equipment may include, buckets, bristle brushes, and low-residue organic-free soap (such as Alconox or Liquinox)
- Equipment to capture decontamination wastewater such as 55-gallon, steel drums.
- Distilled water.

As specified in the Site Safety Plan, additional safety and personnel decontamination equipment and materials may be needed.

3.0 TYPICAL PROCEDURES

The following typical procedures are intended to cover the majority of soil sampling conditions using DP techniques. However, normal field practice requires re-evaluation of these procedures and implementation of alternate procedures upon encountering unusual or unexpected subsurface conditions. Deviations from the following procedures may be expected and should be noted.

1. Decontaminate the downhole equipment (push rods, DP probe tips, and core sampler).
2. Investigate the location of the proposed boreholes for buried utilities and obstructions. At least 72 hours before drilling, contact known or suspected utility services individually or collectively through services such as "Underground Service Alert". As appropriate, retain private buried utility location services or geophysical investigation services to search for buried utilities and obstructions. Also, as appropriate, pothole suspect utility locations prior to drilling or relocate boreholes. During initial advancement of each borehole, use post-hole diggers to break the ground surface and cautiously explore the first 1- to 2-feet for buried utilities. Continue boring with DP probe and exercise caution by having the operator pay particular attention to the "feel" of the probe. The suspected presence of an obstruction, buried pipeline or cable, utility trench backfill, or similar may be cause for suspension of drilling, subject to further investigation.
3. Advance the DP probe to the desired sampling depth. Samples should be taken at intervals of 5-feet or less in homogeneous strata and at detectable changes of strata. For continuous sampling, the core sampler will be advanced 3- to 5-feet depending on the DP technique. Note depth interval, subsurface conditions, and operator's comments on the boring log.

4. Retrieve the core sampler. Remove the liner from the core sampler for purposes of chemical characterization and/or physical parameter testing. Observe soil at each end of liner(s) for purposes of completing sample description. Place Teflon sheet at each end of liner, cover with plastic caps, and tape plastic caps with duct tape (do not use electrical tape) to further minimize potential loss of moisture or volatile compounds. Label liner(s) and place in ziploc bag on ice inside cooler. Enter samples on chain-of-custody form.
5. If headspace screening to be performed, place subsample of soil in a ziploc plastic bag. After allowing the soil in the bag to equilibrate for 5 minutes, screen for organic vapors with the field organic vapor monitor by inserting the probe into the bag. Record depth interval, observed sample reading, and ambient (background) reading on the boring log.
6. Visually classify soil sample in approximate accordance with ASTM D 2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Descriptions should include moisture content, color, textural information, group symbol, group name, and odor. Optional descriptions, especially if classification is performed with protective gloves, include particle angularity and shape, clast composition, plasticity, dilatancy, dry strength, toughness, and reaction with HCl. Add notes pertaining to geologic structure of sample, as appropriate. Record depth interval, visual classification, and other notes to the boring log.
7. Repeat steps 3 through 6 until total depth of borehole is reached.
8. Complete the boring by backfilling with grout. Unless otherwise delineated in the Workplan, Quality Assurance Project Plan, or Sampling Plan, grout may consist of:
   - neat cement grout, using 1 sack (94 pounds dry weight) of Type I/II Portland cement to 5 gallons of water, or
   - cement-bentonite grout using the same basic formula but substituting approximately 5% powdered bentonite for part of the cement.

   Local requirements may require inspection of grout seal placement by the regulating authority.
9. Decontaminate the downhole equipment between boreholes. Decontaminate all equipment prior to leaving the site.
10. Containerize decontamination wastewater in steel drums. Affix labels to the drums identifying date, description of contents, generator name, and generator address.

4.0 QUALITY ASSURANCE AND QUALITY CONTROL

Optional quality control samples may be collected, including: field blanks to check for field-induced cross-contamination, travel/trip blanks to check for non-field induced cross-contamination, and replicates.

The comparability of the field visual classification may be checked by conducting laboratory classification tests.

5.0 DOCUMENTATION

Observations, measurements, and other documentation of soil sampling should be recorded on the following:

- Field Notebook or Drilling Log
- Chain-of-Custody

Documentation should include any deviations from this SOP, as well as documentation of the containerization and disposition of investigation-derived waste.

6.0 DECONTAMINATION

Prior to entering the site, the DP rig and appurtenant items (push rod, probe tips, sampling tools, etc.) should be decontaminated by steam cleaning or pressure washing. Between each borehole, appurtenant items that contacted downhole soil/water should be decontaminated by steam cleaning or pressure washing. Prior to leaving the site, the DP rig and appurtenant items should be decontaminated by steam cleaning and pressure washing. Decontamination water should be captured and containerized.

Prior to each sample, the core sampler and other equipment or materials that may directly contact the sample should be decontaminated. Decontamination for these items should consist of a soap wash (Alconox, Liquinox, or other organic free - low residue soap), followed by a tap water rinse, followed by a distilled water rinse. Wastewater from the soap wash should be captured and containerized. Wastewater from the tap water and distilled water rinses may be discharged to the ground surface or a sanitary sewer.

7.0 INVESTIGATION-DERIVED WASTE

Wastes resulting from the activities of this SOP may include excess soil sample, decontamination wastewater, and miscellaneous waste (paper, plastic, gloves, jars, aluminum foil, site safety disposable, etc.) Unless otherwise prohibited by the Site Safety Plan, miscellaneous waste should be disposed of as municipal waste.

Excess soil sample should be placed in individual steel drums or 5-gallon plastic buckets with waste labels affixed. Decontamination wastewater for each borehole should be placed in individual steel drums with waste labels affixed. Wastewaters from multiple boreholes may be combined.

8.0 SAFETY

Normal and special safety precautions are described in the Site Safety plan. Physical hazards typically prevail because the DP rig contains exposed hydraulic equipment and because push rods consist of heavy material with sharp edges.

Chemical hazards are typically discovered upon raising the push rods and exposing the sampling tool. Opportune monitoring for volatile chemicals may be conducted at these times. Splash protection and direct contact protection are also essential measures to minimize the potential for chemical exposure.

9.0 REFERENCES

American Society for Testing and Materials, 1989. 1989 Annual Book of ASTM Standards, Section 4 - Construction, Volume 4.08 - Soil and Rock, Building Stones; Geotextiles. ASTM, Philadelphia, PA. 1989.

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STANDARD OPERATING PROCEDURE (SOP) 33
GRAB GROUNDWATER SAMPLING IN A BOREHOLE WITH TEMPORARY CASING

1.0 INTRODUCTION AND SUMMARY

This SOP describes methods for collecting grab groundwater samples using a bailer in an borehole, with temporary casing, with and without purging. Boreholes are typically created using hand-auger equipment, hollow-stem auger equipment, or direct push techniques.

The procedures for grab groundwater sampling generally consist of initial decontamination of sampling equipment, purging if desired, insertion of a teflon bailer to the desired depth within the temporary casing, capturing the sample, raising the bailer, and decanting the groundwater sample into appropriate containers.

2.0 EQUIPMENT AND MATERIALS

- Water level meter.
- Tap water, buckets, bristle brushes, low-residue organic-free soap (such as Alconox or Liquinox) for decontamination of sampling equipment. Containers to store decontamination wastewater.
- Distilled water (for decontamination and when necessary, quality control blank samples).
- Laboratory-cleaned containers of proper type and size for the analytical parameters (refer to Table 1).
- Reagent-grade chemicals for sample preservation, as required for the analytical parameters (refer to Table 1).
- If field filtration will be performed for dissolved metals analyses, 45-micron cellulose acetate filters and filtering device. Alternate filter type and size (cellulose nitrate, Teflon, or glass-fiber pre-filters) may be required. The make, type, and size of filter, including disposable filters, should be documented.
- Sample labels and chain-of-custody forms.
- Ziploc plastic bags of size to accommodate sample containers.
- Cooler with ice (do not use blue ice or dry ice).
- Field organic vapor monitor (for volatile organic compounds) The make, model, and calibration information of the field organic vapor monitor (including compound and concentration of calibration gas) should be noted.
- If water quality parameters are to be measured, use glass beaker, ±250 milliliter for measurement of field parameters. A similar flow-through cell may also be used.
- If water quality parameters are to be measured, use pH, temperature, and specific conductivity instruments, including pH and specific conductivity standards approximating or spanning the natural groundwater parameters. Oxidation-reduction potential (ORP) or dissolved oxygen meters may also be required.

- SCH 40 PVC casing. Casing should be of a diameter and length suitable for placement and removal from the borehole and include a slotted section to allow groundwater to collect within the casing.
- Teflon sampling bailer. Dedicated or new bailer rope. If samples are collected for volatile organic compound analysis, bailer should also be fitted with bottom-emptying device.

As specified in the Site Safety Plan, additional decontamination equipment and materials may be needed.

3.0 TYPICAL PROCEDURES

The following typical procedures are intended to cover the majority of sampling conditions wherein a borehole is made using hand-auger equipment, hollow-stem augers, or direct push equipment. Deviations from the following procedures may be expected and should be noted.

1. Decontaminate temporary casing and sampling equipment (see DECONTAMINATION section in this SOP).
2. Lower the temporary casing into the borehole.
3. Measure depth to water (from ground surface) within the temporary casing. Wait a suitable period (such as 10 minutes) and re-measure the depth to water. If suitable agreement is obtained, continue with the next step. Otherwise, wait and re-measure until suitable agreement is obtained.
4. If purging is desired, evacuate the groundwater within the temporary casing using a bailer, purge pump, peristaltic pump, or other suitable device. As desired, measure field parameters at the beginning of purge and temporarily thereafter. Note if the temporary casing is dewatered during purging. For boreholes that recharge in a timely manner, terminate purging after (1) at least 3 standing water borehole volumes have been evacuated and field parameters have stabilized, or (2) after 10 standing water borehole volumes have been evacuated. For boreholes that are dewatered during purging, terminate purging and allow the borehole to recharge.
5. Lower Teflon bailer into the temporary casing and collect sample. Sample from mid-depth of water column.
6. Fill sample containers and add preservative according to the requirements of Table 1. Containers should generally be filled to capacity. 40 milliliter glass vials should be filled from the bottom using a bottom-emptying device for the bailer. 40 milliliter vials should not have headspace.
7. If field filtration will be performed for dissolved metals analyses, filter sample. If the sample is moderately turbid or very turbid, collect companion filtered and unfiltered samples. When performed, it is important to field-filter samples before adding preservative.
8. Label sample containers, place in ziplock bag, and place on ice in cooler.
9. Log samples onto chain-of-custody form and maintain sample custody until shipped to laboratory.

10. Remove the temporary casing from the borehole.
11. Containerize decontamination wastewaters in buckets or drums for eventual discharge to the sanitary sewer. Affix labels to the containers identifying date, description of contents, generator name, and generator address.

4.0 QUALITY ASSURANCE AND QUALITY CONTROL

Depending on the level of data validation required on a given project, quality control sampling may consist of none, one, or any combination of the following samples, to be collected at a pre-established frequency (i.e., one quality control sample for every 10 natural samples):

- Duplicate samples.
- Cross-contamination blank - prepared by collecting a sample of deionized water which has been passed over and through decontaminated sampling equipment.
- Travel blanks - typically if analyses require collection of samples in 40 milliliter vials (typical frequency of 1 per day of sampling).
- Other quality control samples include standard reference materials and natural matrix spikes.

If used, meters for measurement of field parameters should be calibrated at least once per day. Calibration standards should generally approximate or span natural groundwater characteristics. Recalibration may be appropriate if unusual measurements are noticed. Calibration activities should be documented on the instrument calibration log.

5.0 DOCUMENTATION

Observations, measurements, and other documentation of grab groundwater sampling should be recorded on the following:

- Field Notebook
- Chain-of-Custody

Documentation should include any deviations from this SOP, as well as documentation of the containerization and disposition of investigation-derived waste.

6.0 DECONTAMINATION

Prior to collecting each sample, the temporary casing, bailer and other equipment or materials that may contact the sample should be decontaminated. Decontamination for these items should consist of a soap wash (Alconox, Liquinox, or other organic free - low residue soap), followed by a tap water rinse, followed by a distilled water rinse. Wastewater from the soap wash should be captured and containerized. Wastewater from the tap water and distilled water rinses may be discharged to the ground surface or a sanitary sewer.

Prior to sampling each borehole, fresh decontamination solutions should be prepared.

7.0 INVESTIGATION-DERIVED WASTE

Wastes resulting from the activities of this SOP may include decontamination wastewater and miscellaneous waste (paper, plastic, gloves, jars, etc.). Unless otherwise prohibited by the Site Safety Plan, miscellaneous waste should be disposed of as municipal waste.

Decontamination wastewater for each borehole should be placed in buckets or steel drums with waste labels affixed, for eventual discharge to the sanitary sewer or, if necessary, alternate means of disposal.

8.0 SAFETY

Primary chemical hazards during grab groundwater sampling are associated with dermal exposure. Acids used for decontamination and sample preservation may also present chemical hazards. Primary protection against dermal exposure includes splash protection and gloves. Special chemical hazards may be associated with the presence of product, if discovered during sampling. Water quality samples are not generally considered representative in the presence of product. Accordingly, it may be appropriate to abandon sampling efforts if product is discovered.

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

9.0 REFERENCES

Aller, L., T.W. Bennett, G. Hackett, R.J. Petty, J.H. Lehr, H. Sedoris, and D.M. Nielsen, 1989. Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells. National Water Well Association, Dublin, OH. 1989.

U.S. Environmental Protection Agency, 1989a. A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001, OSWER Directive 9355.0-14. USEPA, Office of Emergency and Remedial Response, Washington, DC. December 1989.

Table 1

Sampling and Preservation for Groundwater Samples

Parameter	Analytical Method	Container	Preservation	Maximum Holding Time
Purgeable Halocarbons by GC	EPA 8010	Three 40-ml glass vials	HCl to pH<2, cool to 4 degrees Celsius	14 days after collection
Purgeable Aromatics by GC	EPA 8020	Three 40-ml glass vials	HCl to pH<2, cool to 4 degrees Celsius	14 days after collection
Organochlorine Pesticides and PCB's	EPA 8080	Two 1-liter amber glass	Cool to 4 degrees Celsius	Extract 7 days after collection Analyze 40 days after extraction
Organophosphorus Pesticides	EPA 8140	Two 1-liter amber glass	Cool to 4 degrees Celsius	Extract 7 days after collection Analyze 40 days after extraction
Chlorinated Herbicides (Phenoxy Herbicides)	EPA 8150	Two 1-liter amber glass	Cool to 4 degrees Celsius	Extract 7 days after collection Analyze 40 days after extraction
Volatile Organic Compounds by GC/MS	EPA 8240 or 8260	Three 40-ml glass vials	Cool to 4 degrees Celsius	14 days after collection
Fuel Oxygenates (MTBE, TAME, ETBE, DIPE)	EPA SW846 8260 Modified	Three 40-ml glass vials	Cool to 4 degrees Celsius	14 days after collection
Semi-Volatile Organic Compounds by GC/MS (Base/Neutral/Acid Extractable Organics)	EPA 8270	Two 1-liter amber glass	Cool to 4 degrees Celsius	Extract 7 days after collection Analyze 40 days after extraction
Dibromoethane (EDB) and 1,2-Dibromo-3-Chloropropane (DBCP)	EPA 504	Two 1-liter amber glass	Cool to 4 degrees Celsius	Extract 7 days after collection Analyze 40 days after extraction
Total Petroleum Hydrocarbons Gasoline/BTEX	Extract by EPA 5030, analyze by EPA 8015	Three 40-ml glass vials	HCl to pH<2, cool to 4 degrees Celsius	Extract 7 days after collection Analyze 7 days after extraction
Total Petroleum Hydrocarbons Diesel, Kerosene, or Motor Oil	Extract by EPA 3510, analyze by EPA 8015	One 1-liter amber glass	HCl to pH<2, cool to 4 degrees Celsius	Extract 7 days after collection Analyze 7 days after extraction
Oil & Grease	SM 503	One 1-liter glass with aluminum foil-lined cap	H_2SO_4 to pH<2, cool to 4 degrees Celsius	28 days after collection
Total Metals	EPA 7000 Series	One 1/2 liter poly	HNO3 to pH<2, cool to 4 degrees Celsius	6 months after collection (28 days for mercury)
Dissolved Metals	EPA 7000 Series	One 1/2 liter poly	HNO3 to pH<2, cool to 4 degrees Celsius	6 months after collection (28 days for mercury)
General Minerals	Various	Two 1-liter poly	Cool to 4 degrees Celsius	7 days after collection

ATTACHMENT 2

Site Safety Plan

Site Safety Plan

Soil and Groundwater Investigation
2440 East Eleventh Street
Oakland CA

Anticipated Field Work The anticipated field work includes drilling of soil borings and soil and groundwater sampling.

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 which 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 Field work 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 field work, 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 (Matthew B. Hall)	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	510/784-4251	• Fruitvale Healthcare Center 3020 East Fifteenth Street Oakland CA • From the facility, turn right (north) onto Twenty-Third Avenue. • Bear right (northeast) and stay on Twenty-Third Avenue. • Turn right (southeast) onto East Fourteenth Street/International Boulevard. • Turn left onto Derby Avenue. Proceed on Derby Avenue to East Fifteenth Street. • Fruitvale Healthcare Center is located in a cul-de-sac on East Fifteenth Street. • See hospital location map.
Ambulance	911	
Fire Department	911	
Police Department	911	
Onsite Telephone	To be determined	
Site Safety Officer	Matthew B. Hall 510/528-4234 (work) 415/250-4158 (mobile) 415/441-9277 (home)	
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	