



PACIFIC
ENVIRONMENTAL
GROUP, INC.

ENVIRONMENTAL
PROTECTION
95 OCT 20 AM 11:02

October 19, 1995
Project 360-014.1A

Mr. Barney Chan
Alameda County Health Care Services Agency -
Department of Environmental Health
1131 Harbor Bay Parkway
Alameda, California 94502

7138

Re: Site Assessment Work Plan
Former Dorr-Oliver Site
2901 Glascock Street
Oakland, California

Dear Mr. Chan:

Pacific Environmental Group, Inc. (PACIFIC) has prepared this work plan for investigation at the site referenced above. The primary purpose of this investigation is to complete site characterization with respect to various chemicals which may have been released to the soil and/or groundwater during previous site use, and to place the site on a path toward closure. PACIFIC has designed an investigation which is focused on: (1) delineating the extent of previously identified contaminants in the soil and groundwater, (2) identifying the presence of contaminants in known or suspected source areas, and (3) collecting data from random areas not known or suspected to be sources.

BACKGROUND

The subject site is located in an industrial area in Oakland, California. The site is almost completely occupied by a warehouse. The south edge of the warehouse is bounded by the Oakland Estuary. The north side of the warehouse is bounded by Glascock Street.

According to our conversations with Mr. Dick Croop (one of a group of owners through foreclosure who are currently managing the property) the main portion of the warehouse was built in 1923. Between 1923 and 1963, the building was primarily used as a heavy steel machine shop. After 1968, the building was primarily used to manufacture school houses and for boat storage. The building has not been used since 1992.

Hygienetics Environmental Services, Inc. prepared a Phase I report dated August 26, 1994. This report identifies a number of industrial facilities within 1 mile of the site. The facilities include a metal plating shop, a photo-chemical machine shop, a metal can manufacturing shop, a wood treating chemical company, and a number of fuel cases (including a 6,300-gallon diesel spill within 0.15 miles of the site).

Several investigations have been performed at the site by W. A. Craig, Inc. The data from these investigations are summarized in Tables 1 through 5. During these investigations 7 groundwater monitoring wells, approximately 18 soil borings and 2 test pits have been installed. In addition, underground tanks were removed at two locations within the building. The locations of the borings, monitoring wells, testpits, and former tanks are shown on Figure 1. Soils beneath the site are interlayered clays with silty and clayey sands and gravels. Groundwater occurs at depths between 12 and 15 feet and generally flows to the south towards the Oakland Estuary.

The Alameda County Health Care Services Agency (ACHCSA) and the Regional Water Quality Control Board issued a no further action letter in August 1994 for soil which was excavated from the estuary which borders the southern property boundary.

Site Assessment Summary

Previous investigations have revealed the presence of the following compounds in the soil:

- hydrocarbons (diesel fuel and gasoline compounds)
- metals; primarily lead and zinc
- Polychlorinated biphenyl's (PCB's)

Hydrocarbons in the soils and groundwater appear to be well defined. In the near surface soils (above 5 feet) hydrocarbon concentrations exceeded 1,000 parts per million (ppm) in two areas. One area was in the vicinity of Boring EB-10 where oil and grease was quantified at 11,000 ppm at 1 foot (Figure 1, Table 1). The second area was in the vicinity of Well MW-5 where diesel was quantified at 1,200 ppm at 3 feet (Table 2). In the deeper soils (between 5 and 10 feet) hydrocarbons are concentrated along the east side of the building (Figure 2). Total petroleum hydrocarbons calculated as diesel (TPH-d) was detected between 540 and 1,100 ppm. TPH calculated as gasoline (TPH-g) ranged from 52 to 1,700 ppm and motor oil ranged from 220 to 570 ppm.

The hydrocarbon plume in groundwater approximates the occurrence of hydrocarbons in soils. The plume is concentrated along the west side of the building (Figure 3). During May 1995, maximum TPH-d and TPH-g concentrations were found in Well MW-2 at 5,100 and 310 parts per billion (ppb), respectively (Table 5). Other concentrations

presented on this map were collected from open boreholes (Table 4). These borehole concentrations are useful in determining the presence or absence of hydrocarbons in the groundwater, but are less useful for comparing hydrocarbon concentrations between locations.

LUFT metals (lead, zinc, nickel, cadmium, and chromium) were analyzed from selected sample locations during previous investigations (EP-1, EP-2, EB-1, EB-6, EB-7, EB-10, and the sand blast room [Table 3]). These samples are concentrated along the western portion of the building. Elevated metal concentrations (lead and zinc) were found in shallow samples from Borings EP-2 and EB-6. Background lead concentrations appear to be in the range of 10 ppm and zinc concentrations appear to be in the range of 50 ppm. Lead concentrations at EP-2 (at the surface) were at 940 ppm and zinc was at 1,100 ppm. At location EB-6, lead was at 39 ppm and zinc was at 150 ppm, at a depth of 2 feet.

PCB's were analyzed from four locations within the building; EP-1, EP-2, EB-7, and EB-10 (Table 3). The sampling was concentrated in the southwestern portion of the building. PCB's were detected at three of these locations, including EP-2 at 48,000 ppm at the surface. This location is outside of the building, opposite a vehicle access ramp. Concentrations at this location diminished rapidly with depth, to 2 ppm at 2 feet. PCB's were detected at 0.4 ppm at location EB-7 at approximately 5 feet, and at EB-10 at 4 ppm at 4 feet. Hygienetics reported that transformers (which may have contained PCB's) were located inside the southwestern corner of the building.

SCOPE OF WORK

PACIFIC proposes a strategy which combines existing data with known previous uses of the site. While hydrocarbons appear to be pervasive across the entire site, our analysis shows that they are concentrated in certain parts of the site. Also, contaminants of concern (such as PCB's and metals) which have been identified are fairly immobile and tend to concentrate in shallow soils. We have developed a site characterization program which concentrates on shallow soils and groundwater. The scope of work for this investigation includes:

- Soil characterization by means of augering and analysis from 28 shallow soil borings.
- Groundwater characterization by means of installing two additional groundwater monitoring wells and sampling and analyzing these along with ~~four~~ existing groundwater monitoring wells. - I think there are >4 mws.

Field procedures for groundwater monitoring well installation, soil borings, monitoring well development, and sampling along with other procedures are presented as

Attachment A. The location of the proposed soil borings and monitoring wells are shown on Figure 4.

Soils Characterization

Hydrocarbons. Since adequate hydrocarbon data already exists for the site, a limited additional program is being proposed. PACIFIC is proposing to collect a total of seven soil samples for hydrocarbon analysis. Two of these samples will be collected in the vicinity of EB-10. Oil and grease concentrations of 11,000 ppm were quantified in this area. The other five samples will be collected in the 5- to 10-foot depth interval along the soils plume shown on Figure 2. Areas which previously exhibited higher concentrations will be targeted. These soil samples will be "finger-printed" using modified EPA Method 8015 to determine if the hydrocarbons present might more accurately be quantified as other heavy end type hydrocarbons such as stoddard solvent or kerosene.

Metals. Since metals were used pervasively within the warehouse, a grid sampling program is proposed to characterize the site for LUFT metals (lead, zinc, nickel, cadmium, and chromium). Sampling will be concentrated in areas where wood flooring exists, however, representative samples will be collected across the entire site. Samples will be collected at 1 and 3 feet below ground surface. The 1-foot sample will be analyzed for LUFT metals and also for pH. The 3-foot sample will also be analyzed for pH and held for possible future soils analysis, pending the results of the shallow sample. If the 1-foot sample contains elevated metals and depressed pH, the 3-foot sample will be analyzed for metals as well.

PCB's. Soil samples will be collected and analyzed for PCB's at 18 locations within the grid. Sampling locations are concentrated in the area around EP-2 since there was a noted occurrence in this area. Also, additional samples will be concentrated in the southwestern corner of the site, where transformers were reportedly present. Samples will also be collected near EB-7 and EB-10 since low concentrations of PCB's were previously found in the area. The remainder of the site will be screened by analyzing for PCB's at selected locations. Samples will be collected at the surface and 2 feet. The surface samples will be analyzed and the 2-foot samples will be held pending the results of the surface sample. The shallow samples will be analyzed within seven days so that the holding time is not exceeded for the deeper samples.

Groundwater Characterization

The purpose of the groundwater investigation is to define lateral extent of contaminants in the groundwater. PACIFIC proposes to install two additional monitoring wells at the approximate locations shown on Figure 4. These two wells, along with existing

Wells MW-1, MW-4, MW-6, and MW-7 will provide adequate groundwater screening locations to determine the extent of contamination.

One new well would be located to complete downgradient groundwater characterization for the western portion of the building. The well would be located downgradient of Borings EB-5 and EB-6. The second new well would be located to complete lateral groundwater characterization to the east of the site. Access and utility constraints in the area will determine the exact placement of the wells.

The new wells and the existing wells listed above will be sampled and analyzed for the following compounds:

- **Volatile Organic Compounds by EPA Method 8240.** These compounds are highly volatile and if they are present at the site should be found in the groundwater.
- **LUFT Metals and PCB's.** While it is unlikely that these compounds would affect groundwater quality since they are hydrophobic, they have been detected at elevated concentrations in site soils and should be eliminated as impacting groundwater.
- **Hydrocarbon Scan by Modified EPA Method 8015.** This scan will help to quantify hydrocarbons at the site, such as stoddard solvent and kerosene, that may currently be quantified as diesel.

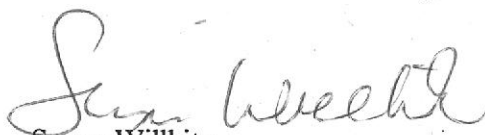
SCHEDULE

PACIFIC is prepared to start work on this project on November 6, 1995, assuming that approval is received from ACHCSA by November 3, 1995. Based on this schedule, a report on this investigation would be available by January 10, 1996. A detailed schedule is shown on Figure 5.

If you have any questions regarding the contents of this letter please call.

Sincerely,

Pacific Environmental Group, Inc.


Susan Willhite
Senior Geologist
CEG 1272



- Attachments:
- Table 1 - Soil Analytical Data, Soil Borings -
Total Petroleum Hydrocarbons
(TPH as Gasoline, TPH as Diesel, BTEX Compounds, TPH
as Diesel, and TPH as Motor Oil)
 - Table 2 - Soil Analytical Data, Monitoring Wells -
Total Petroleum Hydrocarbons
(TPH as Gasoline, BTEX Compounds, TPH as Diesel, and
TPH as Motor Oil)
 - Table 3 - Soil Analytical Data -
Metals and PCB's
 - Table 4 - Groundwater Analytical Data, Open Boreholes
Total Petroleum Hydrocarbons
(TPH as Gasoline, BTEX Compounds, and TPH as Diesel)
 - Table 5 - Groundwater Analytical Data -
Total Petroleum Hydrocarbons
(TPH as Gasoline, BTEX Compounds, and TPH as Diesel)
 - Figure 1 - Soil Concentration Map (0-5 feet)
 - Figure 2 - Soil Concentration Map (5-10 feet)
 - Figure 3 - Groundwater Concentration Map
 - Figure 4 - Proposed Soil Boring and Monitoring Well Location Map
 - Figure 5 - Schedule
 - Attachment A - Field Procedures

cc: Mr. Dennis Buran, Glascock Street Properties
Mr. Steve Morris, Regional Water Quality Control Board

Table 1 (continued)
Soil Analytical Data
Soil Borings
 Total Petroleum Hydrocarbons
 (TPH as Gasoline, TPH as Diesel, BTEX Compounds, TPH as Diesel, and TPH as Motor Oil)

Former Dorr-Oliver Site
 2901 Glascock Street
 Oakland, California

Sample Dates: March 29 through April 18, 1995

Boring Number	Sample Depth (feet)	TPH as Gasoline (ppm)	Benzene (ppm)	Toluene (ppm)	Ethyl-benzene (ppm)	Xylenes (ppm)	TPH as Diesel (ppm)	TPH as Motor Oil (ppm)
SB-1	9	100	ND	ND	ND	ND	500	230
	14	24	ND	0.006	ND	0.043	220	99
SB-2	8	130	ND	0.020	ND	0.15	980	410
	13	56	ND	0.006	ND	0.098	300	120
SB-3	7	79	ND	ND	ND	ND	540	220
	12	42	ND	0.007	ND	0.076	210	81
	15-1/2	1.6	ND	ND	ND	0.008	57	22
SB-4	8	4.1	ND	ND	ND	0.008	320	420
	13	3.7	ND	ND	ND	ND	66	83
	18	1.4	ND	ND	ND	ND	1.5	ND
SB-7	8	1,700	3.3	9.9	19	81	1,100	280
	11-1/2	170	0.42	0.78	1.7	5.9	230	54
	16-1/2	5.4	ND	0.021	0.030	0.077	21	ND
SB-8	8	ND	ND	ND	ND	ND	10	34
	13	12	ND	0.008	0.005	0.022	230	220
	17	18	0.009	0.020	0.007	0.040	270	180
SB-9	8	56	ND	ND	0.010	0.035	960	570
	12-1/2	590	ND	0.15	0.33	2.4	5,700	2,300
SB-10	16-1/2	ND	ND	ND	ND	ND	ND	ND
EB-1	5	ND	ND	ND	ND	ND	ND	NA
EB-2	4	ND	ND	ND	ND	ND	ND	NA
EB-3	3	ND	ND	ND	ND	ND	ND	NA
	4	ND	ND	ND	ND	ND	ND	NA
EB-5	4	ND	ND	ND	ND	ND	ND	NA
EP-1	1	ND	ND	ND	ND	ND	ND	NA
	4	ND	ND	ND	ND	ND	ND	NA
EP-2	Surface	51	0.14	0.18	0.49	7.2	9,600	NA
	2	ND	ND	ND	ND	ND	1.8	NA
	4	ND	ND	ND	ND	ND	ND	NA
EB-6	2	ND	ND	ND	ND	ND	7.9	NA
EB-7	5.5	ND	ND	ND	ND	ND	ND	NA
EB-8	5.5	ND	ND	ND	ND	ND	1.8	NA

Table 1 (continued)
Soil Analytical Data
Soil Borings

Total Petroleum Hydrocarbons
 (TPH as Gasoline, TPH as Diesel, BTEX Compounds, TPH as Diesel, and TPH as Motor Oil)

Former Dorr-Oliver Site
 2901 Glascock Street
 Oakland, California

Sample Dates: March 29 through April 18, 1995

Boring Number	Sample Depth (feet)	TPH as Gasoline (ppm)	Benzene (ppm)	Toluene (ppm)	Ethyl-benzene (ppm)	Xylenes (ppm)	TPH as Diesel (ppm)	TPH as Motor Oil (ppm)
EB-9	5.5	ND	ND	ND	ND	ND	ND	NA
EB-10	1	31	ND	0.15	0.21	1.6	2,500	11,000 *
Sand Blast	Floor	NA	0.029	0.017	0.030	0.014	ND	NA
ppm = Parts per million ND = Not detected NA = Not analyzed * = Quantified as oil and grease Data obtained from W.A. Craig, Inc.								

Table 2
Soil Analytical Data
Monitoring Wells
 Total Petroleum Hydrocarbons
 (TPH as Gasoline, BTEX Compounds, TPH as Diesel, and TPH as Motor Oil)

Former Dorr-Oliver Site
 2901 Glascock Street
 Oakland, California

Sample Date: September 23, 1994

Well Number	Sample Depth (feet)	TPH as Gasoline (ppm)	Benzene (ppm)	Toluene (ppm)	Ethyl-benzene (ppm)	Xylenes (ppm)	TPH as Diesel (ppm)	TPH as Motor Oil (ppm)
MW-1	5	ND	ND	ND	ND	ND	ND	NA
	10	48	ND	0.005	ND	0.086	300	NA
	15	4.3	ND	ND	ND	ND	130	46
MW-2	4.5	26	ND	ND	0.017	0.021	250	NA
	9	52	ND	0.018	ND	0.19	830	NA
	14.5	50	0.039	0.022	0.61	0.84	7,900	3,900
MW-3	5	ND	ND	ND	ND	ND	ND	NA
	9.5	110	ND	ND	ND	0.30	780	NA
	15	ND	ND	ND	ND	ND	ND	ND
MW-4	5	ND	ND	ND	ND	ND	ND	NA
	9	ND	ND	ND	ND	ND	ND	NA
	14	1.9	ND	ND	ND	ND	ND	ND
MW-5	3	NA	NA	NA	NA	NA	1,200	1,900
	8	ND	ND	ND	ND	ND	ND	ND
	12	99	ND	0.017	0.023	0.20	1,800	730
MW-6	8	8.7	ND	ND	ND	ND	620	390
	12	4.7	ND	ND	ND	0.005	46	21
MW-7	10	ND	ND	ND	ND	ND	ND	ND
ppm = Parts per million ND = Not detected NA = Not analyzed Data obtained from W.A. Craig, Inc.								

Table 3
Soil Analytical Data
(Metals and PCB's)

Former Dorr-Oliver Site
2901 Glascock Street
Oakland, California

Sample Dates: April 17 and 18, 1995

Boring Number	Sample Depth (feet)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	PCB's (mg/kg)
EB-2	Surface	NA	NA	NA	NA	NA	NA
	2	NA	NA	NA	NA	NA	NA
	4	ND	45	7.9	46	52	ND
EB-6	2	1.2	41	39	64	150	NA
EB-7	5.5	ND	41	7.3	73	37	0.4
EB-10	1	ND	40	13	60	51	4.0
EP-1	1	ND	22	8.1	39	25	ND
EP-2	Surface	4.5	82	940	80	1,100	48,000
	2	NA	NA	NA	NA	NA	2.0
Sand Blast	2	6.1	13	40	60	51	NA
mg/kg = Milligrams per kilogram NA = Not analyzed ND = Not detected Dated obtained from W.A. Craig, Inc.							

Table 4
Groundwater Analytical Data
Open Boreholes
 Total Petroleum Hydrocarbons
 (TPH as Gasoline, BTEX Compounds, and TPH as Diesel)

Former Dorr-Oliver Site
 2901 Glascock Street
 Oakland, California

Sample Dates: March 29 through April 17, 1995

Boring Number	TPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl-benzene (ppb)	Xylenes (ppb)	TPH as Diesel (ppb)
SB-1	310	ND	0.78	ND	0.91	17,000
SB-2	5,200	3.9	4.9	2.6	14	190,000
SB-3	1,000	ND	2.6	0.77	4.8	110,000
SB-4	1,100	ND	0.6	0.69	0.71	9,900
SB-7	260	13	13	10	40	130
SB-8	120	ND	ND	ND	0.89	6,200
SB-9	820	16	1.8	ND	4.4	210,000
SB-10	ND	0.65	1.2	ND	1.3	250
EB1-W	ND	ND	ND	ND	ND	ND
EB2-W	ND	ND	ND	ND	1.1	ND
EB3-W	ND	ND	ND	ND	ND	ND
EB4-W	ND	ND	ND	ND	ND	ND
ppb = Parts per billion ND = Not detected Data obtained from W.A. Craig, Inc.						

Table 5
Groundwater Analytical Data
 Total Petroleum Hydrocarbons
 (TPH as Gasoline, BTEX Compounds, and TPH as Diesel)

Former Dorr-Oliver Site
 2901 Glascock Street
 Oakland, California

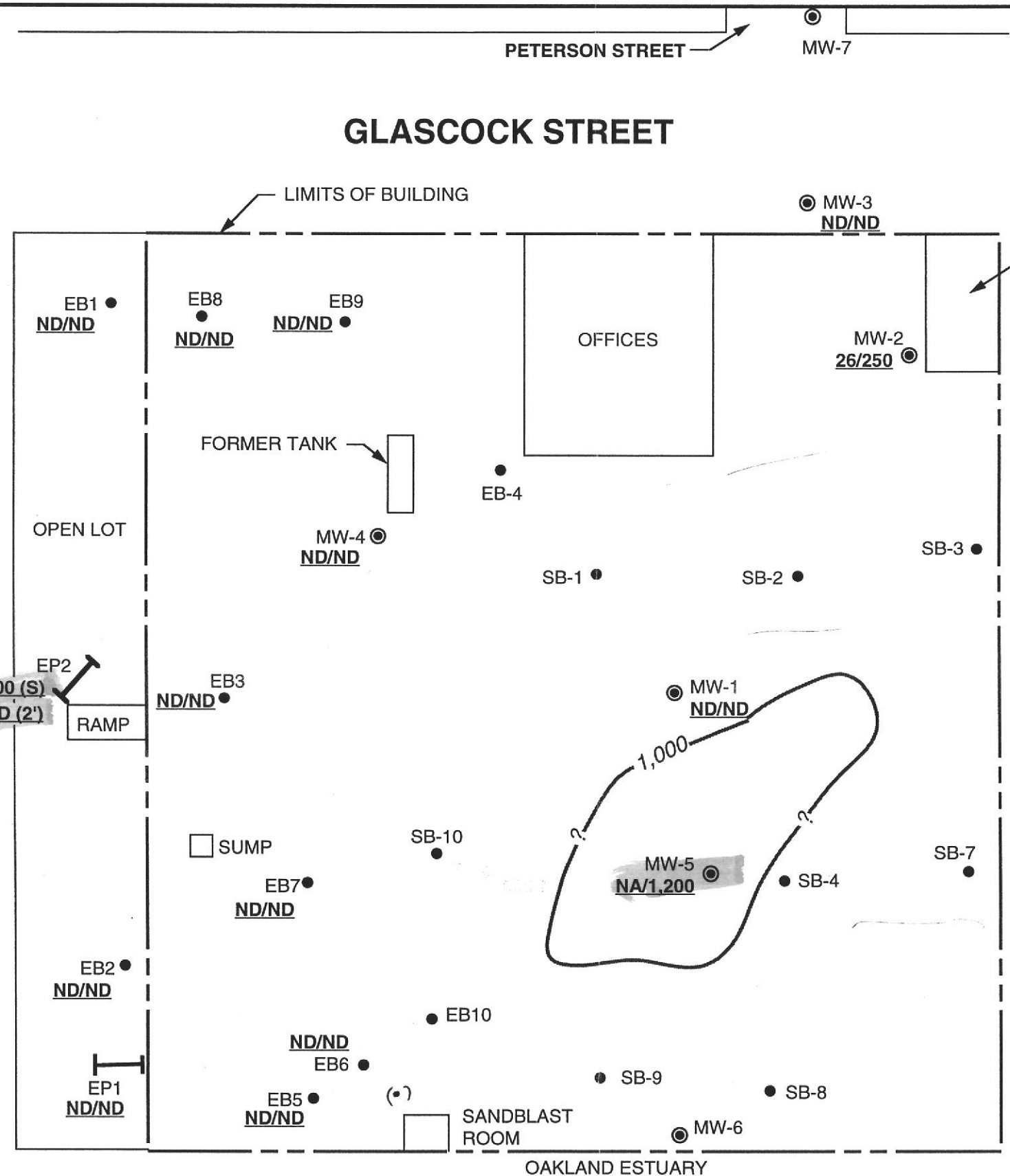
Sample Date: May 15, 1995

Well Number	TPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl-benzene (ppb)	Xylenes (ppb)	TPH as Diesel (ppb)
MW-1	290	7.9	ND	ND	1.4	3,400
MW-2	310	2.3	1.9	ND	1.4	5,100
MW-3	60	ND	ND	ND	ND	310
MW-4	ND	ND	ND	ND	ND	ND
MW-5	ND	ND	ND	ND	ND	490
MW-6	120	5.6	0.88	ND	2.1	1,100
MW-7	110	ND	ND	ND	ND	ND
ppb = Parts per billion ND = Not detected Data obtained from W.A. Craig, Inc.						



PETERSON STREET

GLASCOCK STREET



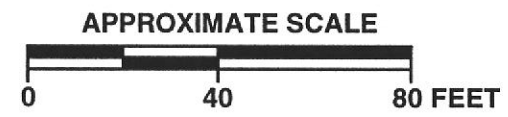
LEGEND

- MW-1 ● GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
- EB1, SB-1 ● SOIL SAMPLE LOCATION AND DESIGNATION
- EP1 ↘ TEST PIT LOCATION AND DESIGNATION
- 51/9,600 TPH-g/TPH-d CONCENTRATION IN SOIL AT 0-5 FEET, IN PARTS PER MILLION (ppm), 3-95 and 4-95 (BY W.A. CRAIG, INC.)
- 1,000 ——— TPH-d ISOCONCENTRATION CONTOUR IN SOIL, IN ppm
- ND NOT DETECTED
- NA NOT ANALYZED

SOURCE: Map from W.A. Craig dated 6-95



PACIFIC ENVIRONMENTAL GROUP, INC.



FORMER DORR-OLIVER SITE
2901 Glascock Street
Oakland, California

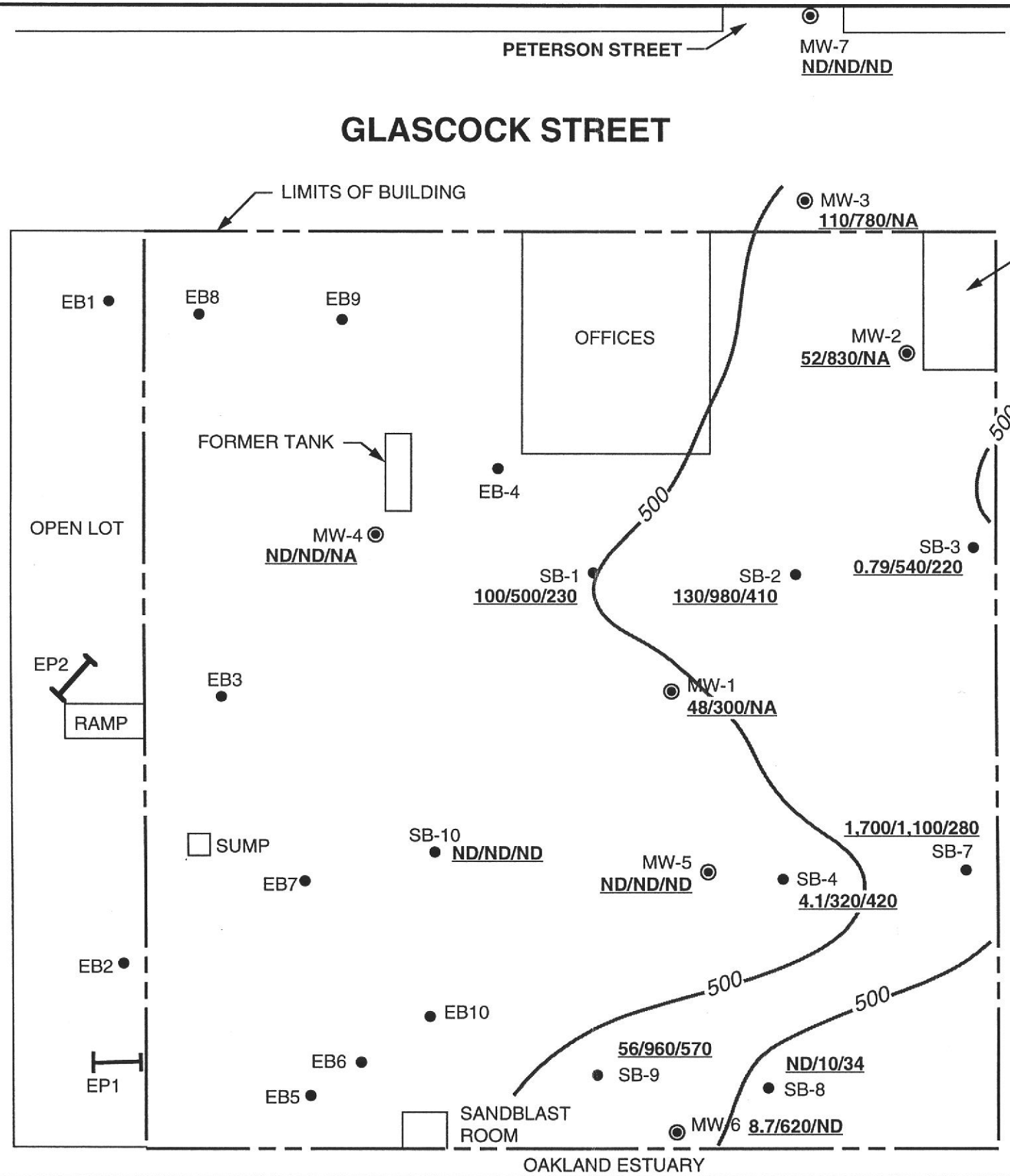
SOIL CONCENTRATION MAP (0 - 5 FEET)

FIGURE:
1
PROJECT:
360-014.1A



PETERSON STREET

GLASCOCK STREET



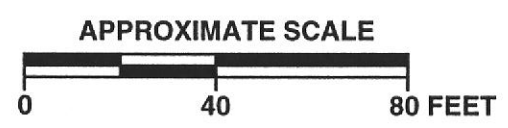
LEGEND

- MW-1 ● GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
- EB1, SB-1 ● SOIL SAMPLE LOCATION AND DESIGNATION
- EP1 ↗ TEST PIT LOCATION AND DESIGNATION
- 0.79/540/220 TPH-g/TPH-d/TPH-MOTOR OIL CONCENTRATION IN SOIL AT 5-10 FEET, IN PARTS PER MILLION (ppm), 3-95 and 4-95 (BY W.A. CRAIG, INC.)
- 500 ——— TPH-d ISOCONCENTRATION CONTOUR IN SOIL, IN ppm
- ND NOT DETECTED
- NA NOT ANALYZED

SOURCE: Map from W.A. Craig dated 6-95



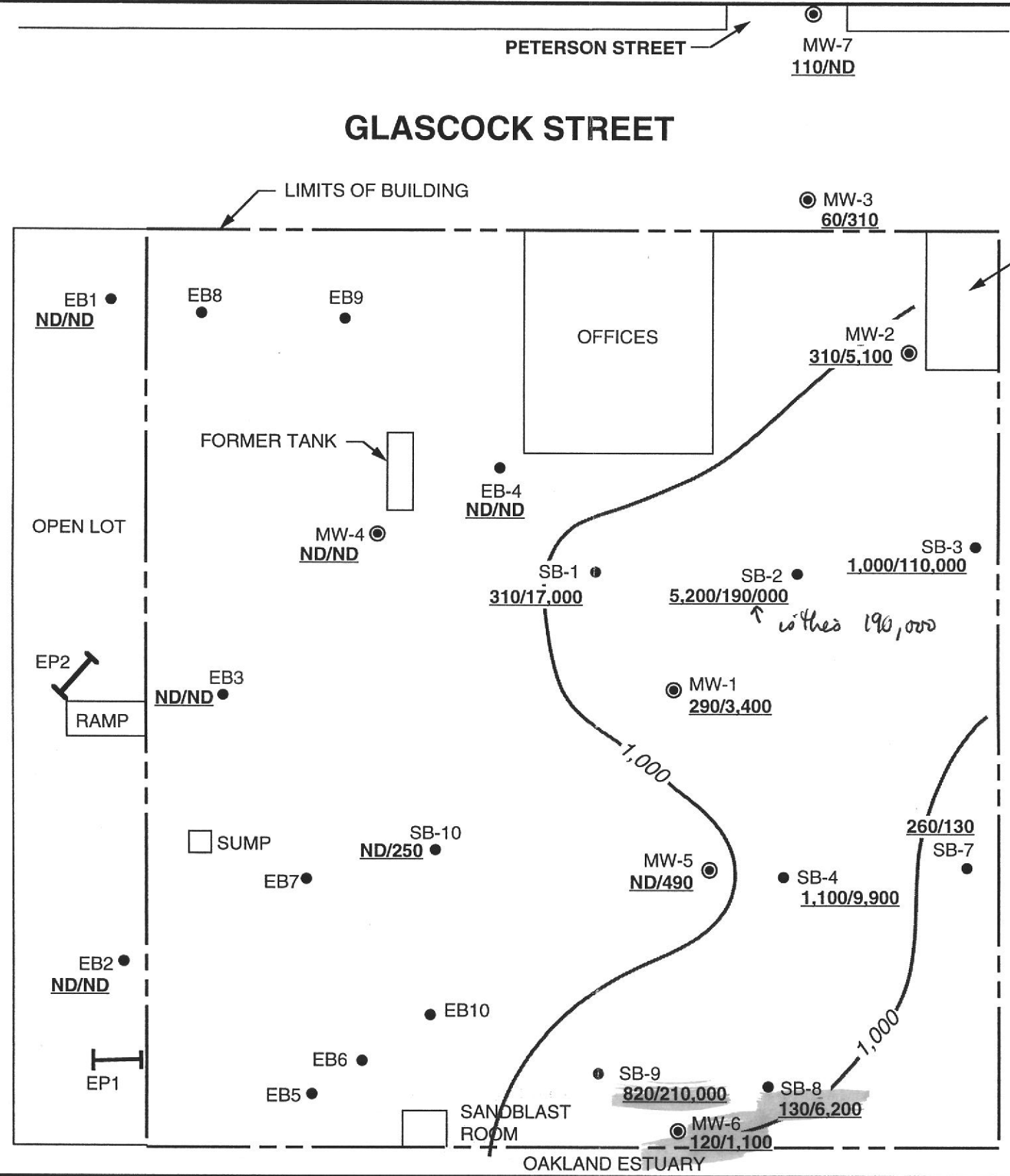
PACIFIC ENVIRONMENTAL GROUP, INC.



FORMER DORR-OLIVER SITE
 2901 Glascock Street
 Oakland, California

SOIL CONCENTRATION MAP (5 - 10 FEET)

FIGURE:
2
 PROJECT:
 360-014.1A

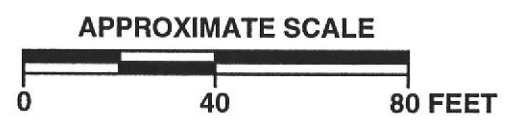


- LEGEND**
- MW-1 ● GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
 - EB1, SB-1 ● SOIL SAMPLE LOCATION AND DESIGNATION
 - EP1 ↕ TEST PIT LOCATION AND DESIGNATION
 - 260/130 TPH-g/TPH-d CONCENTRATION IN GROUNDWATER, IN PARTS PER BILLION (ppb), WELLS SAMPLED 5-95, WATER SAMPLES FROM SOIL BORINGS SAMPLED 4-95 (BY W.A. CRAIG, INC.)
 - 1,000 ——— TPH-d ISOCONCENTRATION CONTOUR IN GROUNDWATER, IN ppb
 - ND NOT DETECTED
 - NA NOT ANALYZED
- ↓
APPROXIMATE DIRECTION OF GROUNDWATER FLOW

SOURCE: Map from W.A. Craig dated 6-95



PACIFIC ENVIRONMENTAL GROUP, INC.



FORMER DORR-OLIVER SITE
2901 Glascock Street
Oakland, California

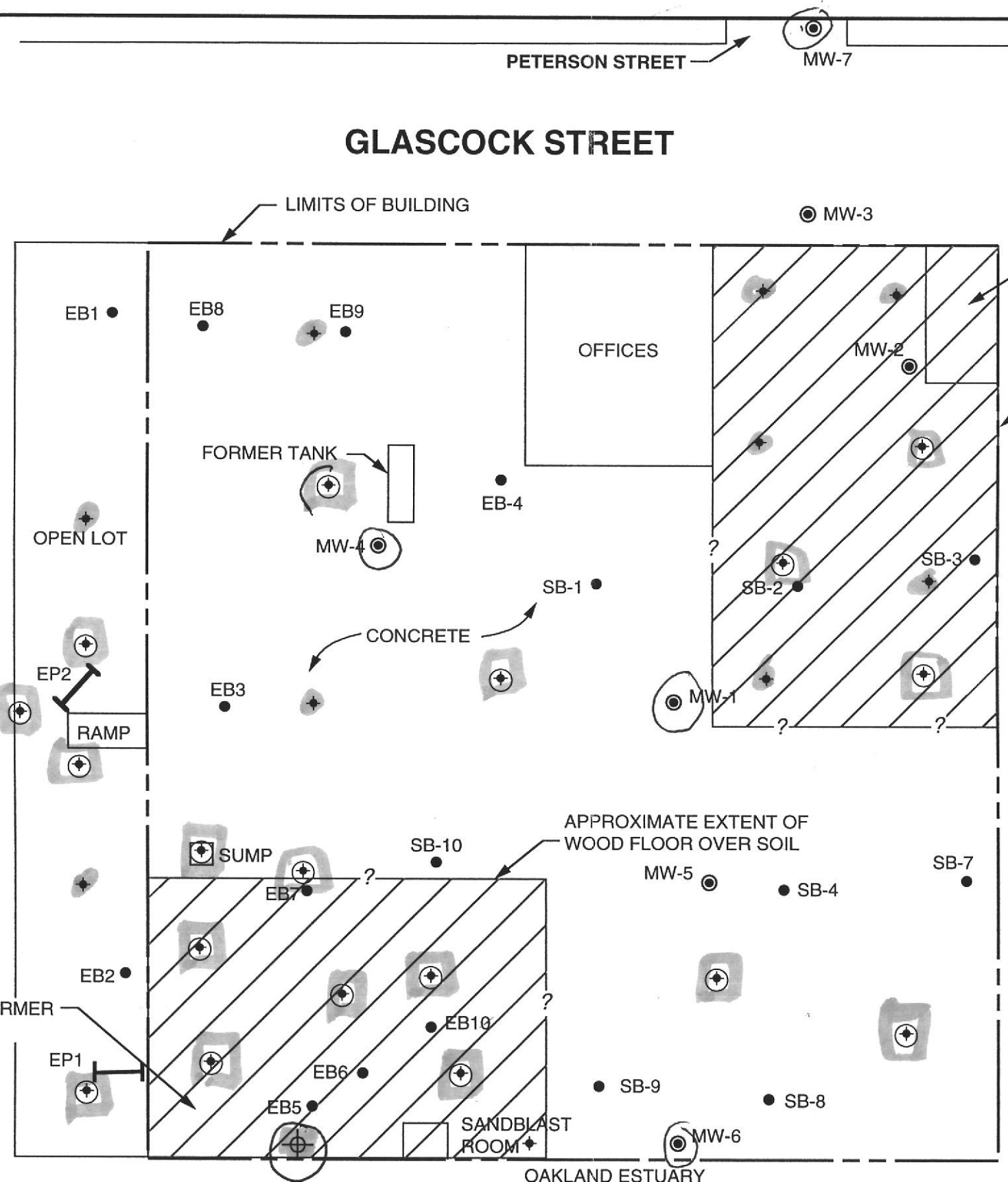
GROUNDWATER CONCENTRATION MAP

FIGURE: 3
PROJECT: 360-014.1A



PETERSON STREET

GLASCOCK STREET



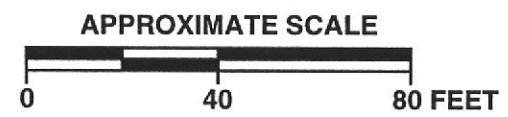
LEGEND

- MW-1 GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
- EB1, SB-1 SOIL SAMPLE LOCATION AND DESIGNATION
- EP1 TEST PIT LOCATION AND DESIGNATION
- PROPOSED GROUNDWATER SAMPLING WELL LOCATION
- PROPOSED SOIL SAMPLE LOCATION FOR METALS
- PROPOSED SOIL SAMPLE LOCATION FOR PCB'S AND METALS

SOURCE: Map from W.A. Craig dated 6-95



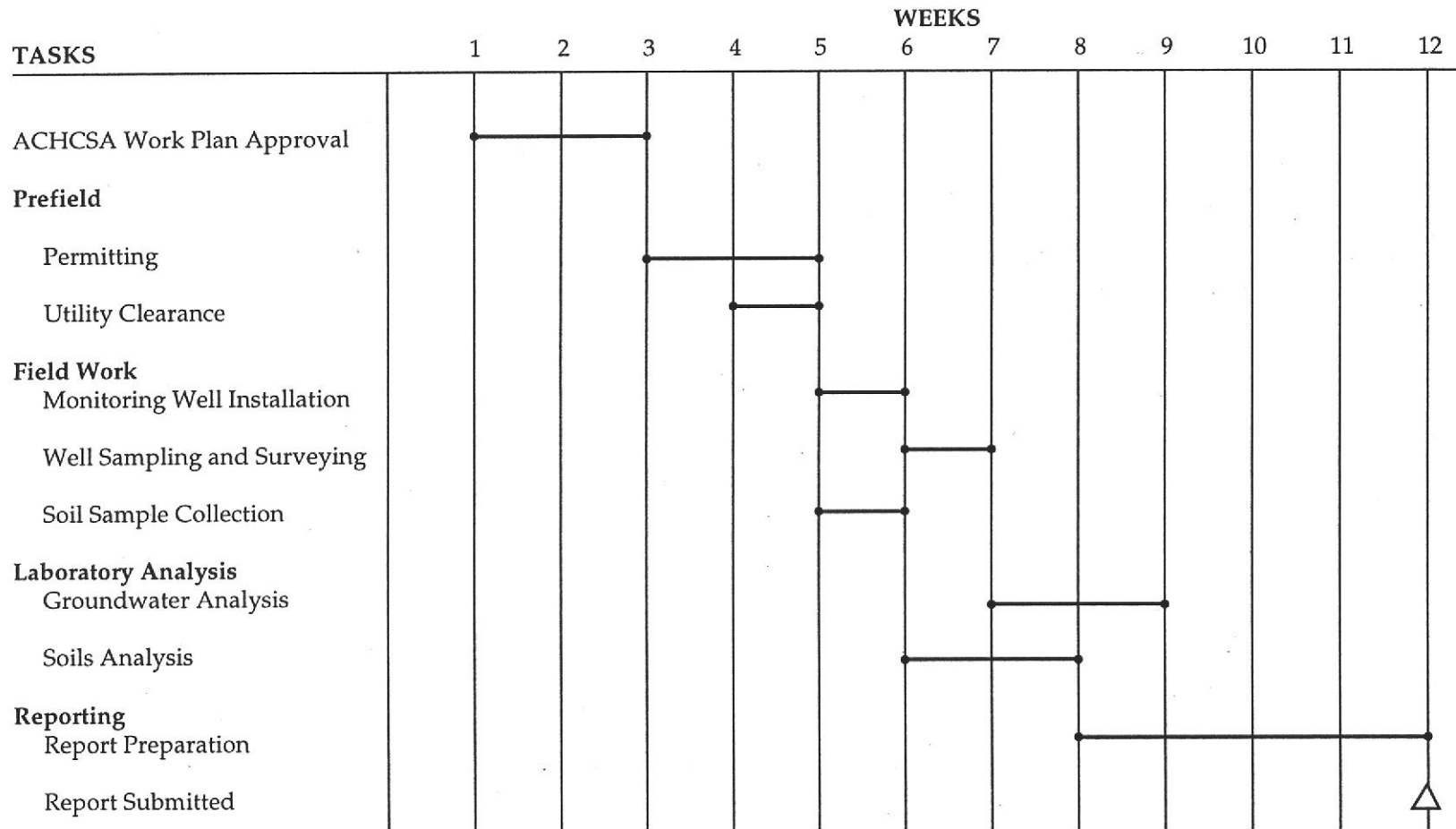
PACIFIC ENVIRONMENTAL GROUP, INC.



FORMER DORR-OLIVER SITE
2901 Glascock Street
Oakland, California

PROPOSED SOIL BORING AND MONITORING WELL LOCATION MAP

FIGURE: 4
PROJECT: 360-014.1A



PACIFIC ENVIRONMENTAL GROUP, INC.

FORMER DORR-OLIVER SITE
 2901 Glascock Street
 Oakland, California

SCHEDULE

FIGURE:
5
 PROJECT:
 360-014.1A

ATTACHMENT A
FIELD PROCEDURES

ATTACHMENT A FIELD PROCEDURES

Soil Borings and Soil Sample Preservation

Soil borings will be hand augered to depths of 3 and 5 feet. Soil samples will be collected by driving a brass liner into the soil at the appropriate depths. Each soil sample will be logged by a Pacific Environmental Group, Inc. geologist using the Unified Soil Classification System and standard geologic techniques. Soil samples for chemical analysis will be retained in brass liners, capped with Teflon® squares and plastic end caps, taped, and sealed in clean zip-lock bags. The samples will be placed on ice for transport to the laboratory accompanied by chain-of-custody documentation. All down-hole sampling equipment will be steam-cleaned following the completion of the soil boring. Down-hole sampling equipment will be washed in a tri-sodium phosphate solution between samples.

Groundwater Monitoring Well Installation

The groundwater monitoring wells will be drilled using 8-inch hollow-stem auger drilling equipment. During drilling soil samples for logging will be collected at 5-foot depth intervals using a California-modified split-spoon sampler from the hollow-stem auger drilling equipment. The split-spoon sampler will be driven a maximum of 18 inches using a 140-pound hammer with a 30-inch drop. The wells will be completed by installing 2-inch diameter, flush-threaded, Schedule 40 PVC casing with 0.020-inch factory-slotted screen. Approximately 15 to 20 feet of screen will be placed in the bottom of the boring. An RMC 2 x 12 sand pack will be placed in the annular space across the entire screened interval, and will extend approximately 3 feet above the top of the screen for the well. A bentonite and Portland cement seal will extend from the sand pack to the ground surface.

Following well completion, the vault box elevation and the elevation of the top of the PVC well casing of the monitoring wells will be surveyed to the nearest 0.01 foot, relative to mean sea level, by a licensed surveyor. The boring logs will show well construction details and the well head elevations.

Organic Vapor Procedures

Soil samples collected will be analyzed in the field for ionizable organic compounds using the HNU Model PI-101 (or equivalent) photo-ionization detector (PID) with a 10.2 eV lamp. The test procedure will involve measuring approximately 30 grams from an undisturbed soil sample, placing this subsample in a clean glass jar, and sealing the jar with aluminum foil secured under a ring-type threaded lid. The jar will be warmed for approximately 20 minutes (in the sun), the foil pierced, and the head-space within the jar tested for total organic vapor, measured in parts per million as benzene (ppm; volume/volume). The instrument will be calibrated prior to drilling using a 100-ppm isobutylene standard (in air) and a sensitivity factor of 55 which relates the photo-ionization potential of benzene to that of isobutylene at 100 ppm. The results of the field testing will be noted on the boring logs. PID readings are useful for indicating relative levels of contamination, but cannot be used to evaluate hydrocarbon levels with the confidence of laboratory analyses.

Well Development and Groundwater Sampling

The groundwater monitoring wells will be developed and sampled a minimum of 24 hours after completion of the wells. Well development procedure will include swabbing and bailing and/or pumping. Water will be removed from the well until relatively turbid free water is produced, or until a minimum of ten casing volumes have been removed. The groundwater sampling procedure will consist of first measuring the water level in the well, and checking it for the presence of separate-phase hydrocarbons (SPH) using an MMC oil-water interface probe. If no SPH are present, the well will then be purged of a minimum of five casing volumes of water. During purging, temperature, pH, and electrical conductivity will be monitored until stable to document that a representative sample is collected. After the water level recovers, a sample will be collected from each well using a Teflon bailer and placed into appropriate EPA-approved containers. The samples will be labeled, logged onto a chain-of-custody document, and transported on ice to the laboratory.

Rinsate, Purge, and Development Waters, and Soil Cuttings Storage and Disposal

Waters produced during field activities will be transported via a purge trailer and disposed of at a state-certified treatment and disposal facility. When necessary, waters will temporarily be stored on site in DOT-approved 55-gallon drums pending transport and disposal.

Soil cuttings generated during drilling will be placed on visqueen and covered with plastic. Samples of the cuttings will be collected and sent to a state-certified laboratory for analysis. Pending analytical results, the soil cuttings will be hauled by a state-certified waste hauler to a state-certified treatment and disposal facility.