



PORT OF OAKLAND

November 14, 1997

HAND-DELIVERED

Barney Chan
Alameda County Health Care
Services Agency
1131 Harbor Bay Parkway, #1130
Alameda, CA 94502-6577

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1420

**Re: Environmental Contamination at Pacific Dry Dock Yards I and II,
Respectively 1441 and 321 Embarcadero, Oakland**

Dear Mr. Chan:

Your letter of August 27, 1997 to Mr. Stephen Wilson of Crowley Maritime Corporation ("Crowley") directed that a further workplan be submitted by September 29, 1997, for additional investigation at Pacific Dry Dock Yards I and II, respectively 1441 and 321 Embarcadero, Oakland. Thereafter, Crowley requested that Alameda County grant an extension of the deadline to submit the subject workplan. In your subsequent September 29, 1997, letter to Mr. Wilson, you indicated that "we will grant the extension requested, [to] November 15, 1997, on the condition that if the mutual work plan [agreed to by the Port and Crowley] is not submitted by this date, we will request that the Port send their consultant's work plan for review" (emphasis added). As discussed below, the Port and Crowley could not agree on a mutually agreeable work plan to the County.

Since your August letter, the Port attempted to work with Crowley and its environmental personnel and consultants to discuss and come to some understandings regarding the nature, scope and details of additional investigations which the Port believes are required. The Port's consultant, Geomatrix Consultants, Inc., developed a specific scope of work for a one-phase investigation to fill the data gaps and complete characterization of the two sites. This work plan was sent to Crowley; Crowley commented upon the work plan; and lengthy discussions were undertaken between Port and Crowley environmental personnel and consultants to resolve those comments. It has just recently appeared, however, that Crowley and the Port will not be able to resolve their differences regarding the workplan. Consequently, the Port is presenting its proposed work plan and requesting that the County adopt and require Crowley to undertake the investigations and analyses described in that workplan.

The scope of work for additional investigations at Pacific Dry Dock Yards I and II contemplates a one-phase investigation. This investigation is intended to fill the data gaps, complete characterization of the site and allow estimation of concentrations of chemicals in the soils and groundwater. These significant data gaps preclude an adequate characterization of both sites for purposes of an adequate human health and ecological risk assessment. The Port believes that such gaps must be filled and the sites fully and completely characterized before supportable risk assessments can be undertaken and concluded. This is especially necessary considering the intended future uses of both yards.

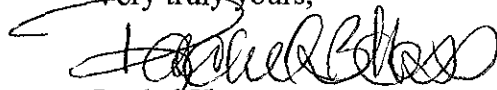
As the Port indicated in its April 10, 1997, letter to you and John Wolfenden of the RWQCB, the City of Oakland and Port are currently engaged in a joint planning process for the Oakland Waterfront. The Port and City have retained a planning consultant, ROMA Design Group ("ROMA"), to undertake this effort. In addition, numerous citizen groups have strongly voiced their desires of wanting more open space and public access along the Oakland Waterfront.

While the planning process is still underway, a draft Estuary Plan has been prepared which proposes the redevelopment of Yard II into open space, with human contact activities. Enclosed is the most recent "revised concept" drawing dated September 4, 1997, which shows a proposed 11 acre meadow and wetlands at Yard II.

The Port is concerned with the future use of the property not only as an owner, but also as a public entity concerned with human health and the environment. Because of such concerns, the Port believes that the workplan it has prepared will provide results that will be more truly representative of site conditions than relying solely on the results of previous investigations and will finally provide a sound basis for assessment of risks posed by each of the sites.

We would be pleased to discuss the draft work plan with you at your convenience. We have also provided a copy of this letter and the attached work plan to Crowley.

Very truly yours,



Rachel Hess
Associate Port Environmental Scientist

Enclosures:

- (1) Draft Workplan for Additional Environmental Investigation, Pacific Dry Dock Yards I and II, 1441 and 321 Embarcadero, Oakland dated September 1997
- (2) Estuary Plan for Oak St. to 9th Ave revised concept September 4, 1997

cc w/encl. (2): Charles Nalen, Crowley
Stephen Wilson, Crowley
Steven Moore, RWQCB

cc w/encl. (1): Steven Moore, RWQCB
Charles Nalen, Crowley

cc w/o encl.: Joyce Washington
Mark O'Brien
Sally Goodin, Geomatrix

1510)



**DRAFT WORK PLAN FOR ADDITIONAL
ENVIRONMENTAL INVESTIGATION**

**Pacific Dry Dock Yards I and II
1441 and 321 Embarcadero
Oakland, California**

Prepared for

**Port of Oakland
530 Water Street
Oakland, California**

**September 1997
Project 3999**

Geomatrix Consultants

**DRAFT WORK PLAN FOR ADDITIONAL
ENVIRONMENTAL INVESTIGATION**
Pacific Dry Dock Yards I and II
1441 and 321 Embarcadero
Oakland, California

This draft work plan outlines the basis for and the scope of the environmental investigation that needs to be undertaken above the high-tide line at Pacific Dry Dock Yards I and II in order to adequately understand site conditions for the evaluation of environmental risks posed by the sites, if any. Pacific Dry Dock Yard I is located at 1441 Embarcadero, and Pacific Dry Dock Yard II is located at 321 Embarcadero in Oakland, California, as shown on Figure 1.

We understand that the Port of Oakland (Port) owns these properties and that Pacific Dry Dock and Repair Company, which merged with Crowley Marine Services, Inc. (Crowley), formerly operated these sites to repair and refurbish boats. We understand that Crowley used products containing regulated materials and generated various regulated and nonregulated wastes as part of repairing and refurbishing seagoing vessels. These products and waste materials included sandblasting materials, oil-based paints, solvents, acids, bases, oils, and motor fuels.

The scope of work outlined in this draft work plan was developed to be a one-phase investigation which could be reasonably expected to fill all the data gaps and complete characterization of the sites. These additional chemical investigations are necessary because the data on shallow soil and downgradient groundwater currently available are too limited to reliably estimate representative chemical concentrations for use in the risk assessments for both sites. A phased approach to the investigation, including phasing of some analyses and/or compositing of samples for some analyses in initial phases, could be undertaken to potentially limit the additional investigative costs.

PREVIOUS INVESTIGATIONS AND OVERVIEW OF DATA GAPS

Crowley has undertaken several investigations at both Yards I and II. These investigations have indicated the presence of elevated levels of metals and petroleum hydrocarbons in soil and groundwater at both the sites. In order to assess the potential risks posed by the sites, the distribution of chemicals at each site must be understood, and the data on chemical concentrations must be sufficient to establish the representative concentrations of each chemical of potential concern. Based on our review of the available data, there are data gaps that must be filled before an evaluation of potential risks, if any, posed by each site can be reliably undertaken. An overview of the data gaps is presented below. Yard-specific data gaps are summarized in the following sections.

The primary data gaps relate to the insufficiency of chemical data for shallow soil at both sites and inadequate evaluation of chemicals in groundwater that is discharging from both sites. The reasons that chemical data are critical for shallow soil are:

1. The primary source of chemicals reaching soil and groundwater at both sites is surface discharges (except in the vicinity of underground storage tanks). Because the discharges occurred at the surface, it is likely that concentrations of chemicals (particularly less mobile chemicals such as metals, heavier petroleum hydrocarbons, and semivolatile organic compounds) will be highest in the shallow soil.
2. Exposure of humans to soil at the sites will most likely be to shallow soil. In fact, the exposure scenario postulated by Crowley in its risk assessment for the Yard II site assumed that humans would only be exposed to the shallow soil at the site.

Because chemical concentrations are expected to be highest in shallow soil and because this is the soil to which people will most likely be exposed, it is critical for the risk assessment to have enough data on the shallow soil to estimate representative chemical concentrations.

The other major potential environmental issues associated with the sites are potential ecological impacts to San Francisco Bay (the Bay) due to surface water and groundwater discharge. The

primary potential ecological impact from the sites is groundwater discharge to the Oakland Inner Harbor (except for chemically affected sediments in the intertidal and subtidal areas, which are not included in this data evaluation). The groundwater that is discharging from the sites needs to be analyzed for all the chemicals of potential concern.

YARD I

DATA GAPS

The available chemical analytical data for upland soil within the upper 5 feet at the Yard I site are summarized on Figures 2 through 5; the metals data are summarized for the west and east portions of the yards, respectively, on Figures 2 and 3, and the organic data are summarized on Figures 4 and 5.

As indicated on Figure 2, only one soil sample from approximately 4 feet below ground surface (bgs) has been analyzed for five metals in the western portion of the site. These data are clearly inadequate to assess or characterize metals concentrations in shallow soil under this portion of the site. As indicated on Figure 3, there are more metals data on shallow soil under the eastern portion of the site. The data for the eastern portion include: 14 samples from the upper 5 feet bgs analyzed only for lead; 5 samples analyzed for copper, lead, and mercury; and 2 samples analyzed for CAM metals. These data may be adequate with respect to lead. However, there are only two samples from between 4 and 5 feet bgs that have been analyzed for the full suite of metals that may be elevated at the site; one of the two samples is clearly impacted by metals (copper, lead, and zinc) associated with site usage. These data are not sufficient to estimate representative metals concentrations in the shallow soil to which future site users may be exposed.

The organic data indicate that elevated levels of petroleum hydrocarbons were observed in soil at the site. Total recoverable petroleum hydrocarbon (TRPH) has been reported in shallow soil at the site up to 4600 milligrams per kilogram (mg/kg); total oil and grease (TOG) to 7800 mg/kg, total petroleum hydrocarbon as diesel (TPHd) to 3000 mg/kg, and total petroleum hydrocarbon

as gasoline (TPHg) to 970 mg/kg. As illustrated on Figures 4 and 5, there are numerous benzene, toluene, ethylbenzene, and xylenes (BTEX) analyses associated with the total hydrocarbon analyses; these data indicate that BTEX are generally not elevated in the petroleum hydrocarbons analyzed at the site. However, the data for semivolatile organic compounds (SVOCs), in particular polynuclear aromatics (PNAs) which are typically associated with petroleum hydrocarbons, are very limited; only one sample in shallow soil was tested under the western portion and four samples under the eastern portion.

There are 6 monitoring wells at the site. In addition, grab groundwater samples have been collected at 17 locations. The groundwater analytical results are summarized on Figures 6 and 7. As indicated, the majority of the analyses on groundwater have been for TPH, BTEX, and lead. There are very few analyses for VOCs (2), SVOCs (5), and metals other than lead (3). Chemical data on groundwater are needed for two purposes: 1) to screen the site for the possible presence of significant areas impacted by site chemicals and 2) to evaluate potential impacts associated with discharge to the Bay. To accomplish these goals, groundwater data must be collected along the downgradient perimeter of the site and analyzed for all the chemicals known to have been used at the site. The currently available groundwater data are inadequate. In particular, the data are inadequate due to the paucity of analyses for metals other than lead, VOCs other than BTEX, and SVOCs, especially along the downgradient perimeter.

PROPOSED WORK SCOPE

The proposed scope of work to fill the data gaps in the soil and groundwater data are presented on Figures 8 and 9. For soil, as indicated on Figure 8, we identified a grid sampling program on approximately 100 foot centers. At the grid sampling locations, soil would be collected and analyzed for metals and SVOCs because current testing for these constituents is inadequate. In the western portion of the site, samples would be collected in the shallow soil (upper foot) and at the water table (expected to be about 4 feet bgs) because testing for these constituents is extremely limited in this area. Grid samples in the eastern portion of the site will be collected only in the shallow soil at locations where adequate deeper data are available. At some grid sample locations, we have included analyses for TPH and PNAs instead of SVOCs; these are

grid locations that are very close to locations where elevated TPH in some form has been reported but the data on possible PNA constituents are inadequate. We have also included PCB and organotin analyses on shallow grid samples based on their known use in marine paints and occurrence in offshore sediments.

In addition to the grid samples, we have identified target sample points where specific data are needed. These include: full-scan analyses adjacent to the paint storage shed and TPH, PNA, and PCB analyses at locations where elevated TPH has previously been reported.

The proposed groundwater sampling program is identified on Figure 9. The program includes the installation of temporary sampling points at approximately 100-foot spacings along the downgradient perimeter of the site. Groundwater samples would be analyzed for TPHg, TPHd, TPHmo, VOCs, SVOCs, organotins, and metals.

YARD II

DATA GAPS

The available chemical analytical data for upland soil less than 5 feet at the Yard II site are summarized on Figures 10 and 11. Figure 10 summarizes the metals data for upland soil; Figure 11 summarizes the organic data.

There are no metals data for shallow soil (above 2.5 feet bgs). The available data for the interval 2.5 to less than 5 feet bgs are summarized on Figure 10. There are four analyses for lead only; two analyses for CAM metals; one analysis for copper and lead; one analysis for copper, lead, and mercury; and one analysis for copper, lead, mercury, and zinc. These data are too sparse to assess site conditions and too limited to estimate representative metals concentrations for the site.

The organic data for shallow soils (less than 5 feet bgs) are very limited at the Yard II site except in Areas 5 and 6, as illustrated on Figure 11. The available data indicate elevated TRPH at several locations where no other organic data are available. In addition, tetrachloroethene (PCE) was reported in the one shallow soil sample from Area 2 (the sample was located adjacent to the

degreaser area); no other data on VOCs are available for shallow soil in this area. In addition to the PCE in shallow soil, 1,1,1-trichloroethane (TCA) was reported in 19 of the 25 deeper soil samples tested in Areas 1 and 2. Trichloroethene (TCE), 1,1,2-TCA, 1,1-dichloroethene (DCE), and 1,1-dichloroethane (DCA) have also been reported in one deeper soil sample each in Area 1. These data indicate potential impacts from VOCs but are inadequate to identify or estimate representative concentrations of chemicals of potential concern.

As indicated on Figure 11, extensive testing for TPH and VOCs has been performed in Area 5. The data indicate areas with elevated TPH; however, there has been no testing for PNAs. In addition, we understand that bilge water, which could include PCB-containing oils, may have been discharged in this area. In Area 6, the data indicate there are some areas with elevated TRPH; subsequent testing did not evaluate these soils. In addition, there are no SVOC/PNA data for shallow soils in this area.

The available groundwater data for the site are summarized on Figure 12. As indicated on Figure 12, very limited chemical analyses are available for groundwater under the southwestern portion of the site, which represents the downgradient perimeter of the property. For instance in Area 1, the chemicals of potential concern based on the soil data include arsenic, copper, lead, mercury, zinc, and TRPH; however, the two water samples collected in this area were tested for TPH, BTEX, and mercury. In Area 2, the chemicals of potential concern based on the soil data include TPH and TPH constituents; however, the one groundwater sample collected in this area was analyzed only for lead. There has been no other testing along the southwestern perimeter. Elsewhere at the site, there has been no testing for metals other than copper, lead, mercury, and zinc or at locations other than the monitoring wells. There has been no testing for SVOCs on any site groundwater. The data are not adequate to evaluate potential impacts, if any, of discharge to the Bay.

PROPOSED WORK SCOPE

The necessary investigations to fill the gaps in the metals and organic data for the shallow soil data are presented on Figures 13 and 14, respectively. Figure 15 presents the proposed combined scope of work for the soil investigation, which has been adapted from Figures 13 and 14 to minimize the number of borings while still addressing the data gaps. The proposed groundwater sampling program is presented on Figure 16.

The approach to developing the soil sampling program was to identify a grid sampling program on approximately 120-foot centers. Grid samples would be collected in the upper foot of soil and at the water table (expected to be about 4 feet bgs). The soil samples would be analyzed for metals, TPH, VOCs, and SVOCs. In addition, the shallow soil samples would be tested for PCBs and organotins which are known to have been used in marine paints. In addition, we added targeted samples for metals testing (shown on Figure 13) in areas which could have elevated metals based on past site use (chemical, material, and/or sand blast grit storage areas, the plate shop, and the cooling tower). We also added targeted sample locations for organic testing (shown on Figure 14) based on past site use (under the degreaser area and the power house) and where the available data indicate the presence of hydrocarbons in soil but the constituent-specific analytical data are inadequate to assess risk (at previous boring locations PDDII-3, 5, and 8, where TRPH were elevated but no other analyses are available and at CH-1, CH-1C, CH-3D, and MW-4 in Area 5, where PNA data are not available). The combined program is presented on Figure 15. In general, grid samples were either moved slightly to cover target samples or eliminated if targeted sampling was considered adequate.

The proposed groundwater sampling program is identified on Figure 16. The program includes the installation of temporary sampling points at approximately 100-foot spacings along the downgradient perimeter of the site. Groundwater samples would be analyzed for TPHg, TPHd, TPHmo, VOCs, SVOCs, organotins, and metals.

*Too
Frequent*

We believe that this scope of work should be adequate to address the data gaps and to evaluate risks posed by the Yard I and II sites, if any. If you have any questions or need additional information, please call me or Greg Brorby. We appreciate the opportunity to work with you.

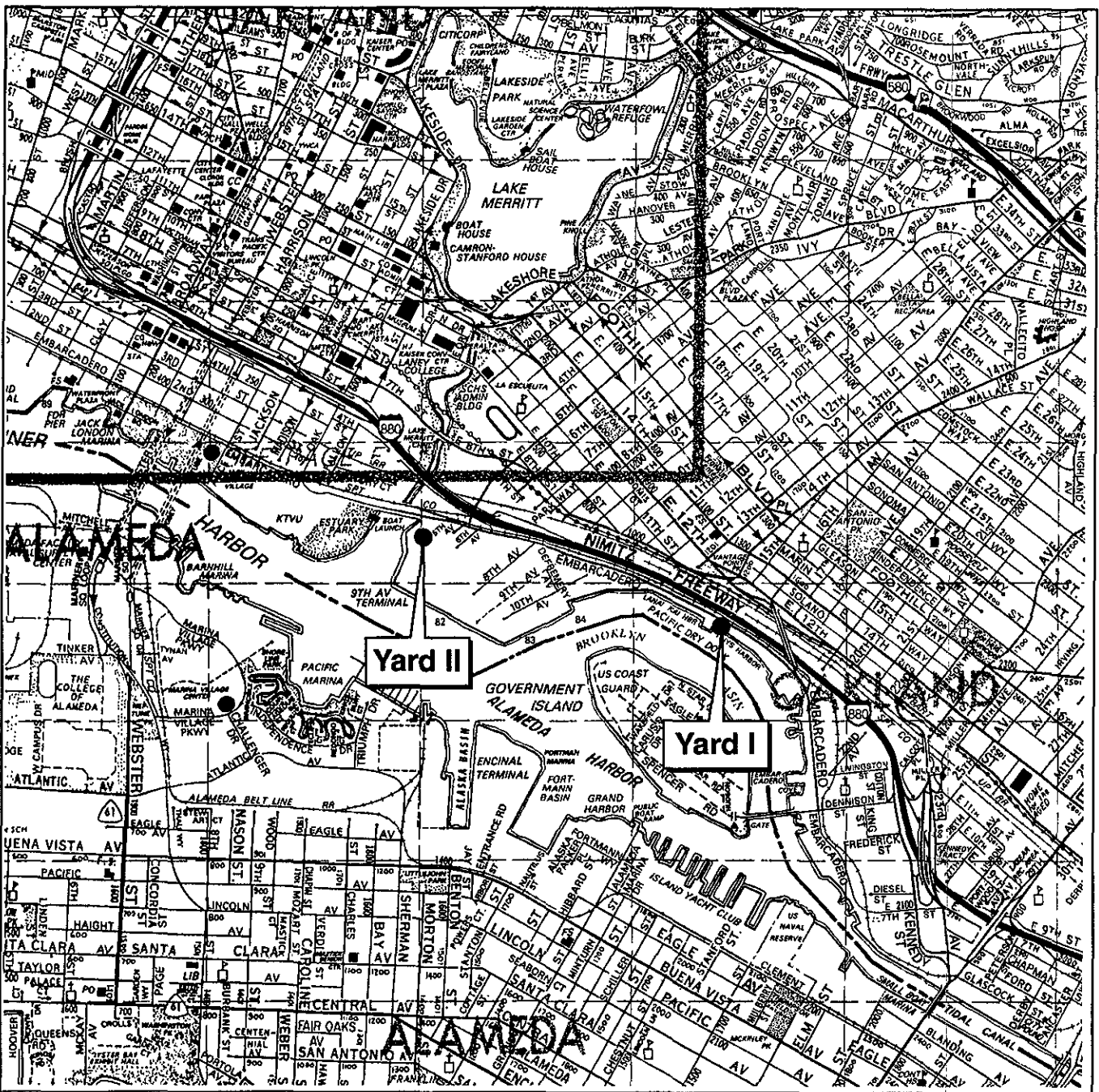
Respectfully submitted,

GEOMATRIX CONSULTANTS, INC.

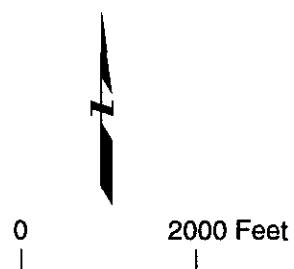
Sally E. Goodin, R.G.
Vice President and Principal Geologist

Attachments:

- Figure 1 Site Location Map
- Figure 2 Soil Analytical Results, Metals, 0 to 5 Feet Bgs, Western Portion
- Figure 3 Soil Analytical Results, Metals, 0 to 5 Feet Bgs, Eastern Portion
- Figure 4 Soil Analytical Results, Petroleum Hydrocarbons, 0 to 5 Feet Bgs, Western Portion
- Figure 5 Soil Analytical Results, Petroleum Hydrocarbons, 0 to 5 Feet Bgs, Eastern Portion
- Figure 6 Summary of Groundwater Analytical Results, Western Portion
- Figure 7 Summary of Groundwater Analytical Results, Eastern Portion
- Figure 8 Proposed Soil Sampling Program
- Figure 9 Proposed Groundwater Sampling Program
- Figure 10 Metals Results for Soil, 2.4 to 4.9 Feet Bgs
- Figure 11 Organic Results for Soil, Less Than 5 Feet Bgs
- Figure 12 Summary of Groundwater Sampling Analytical Results
- Figure 13 Necessary Metals Sampling - Soil
- Figure 14 Necessary Organic Sampling - Soil
- Figure 15 Proposed Combined Soil Sampling Program
- Figure 16 Proposed Groundwater Sampling Program



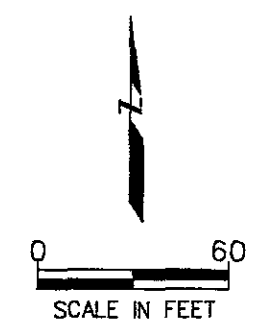
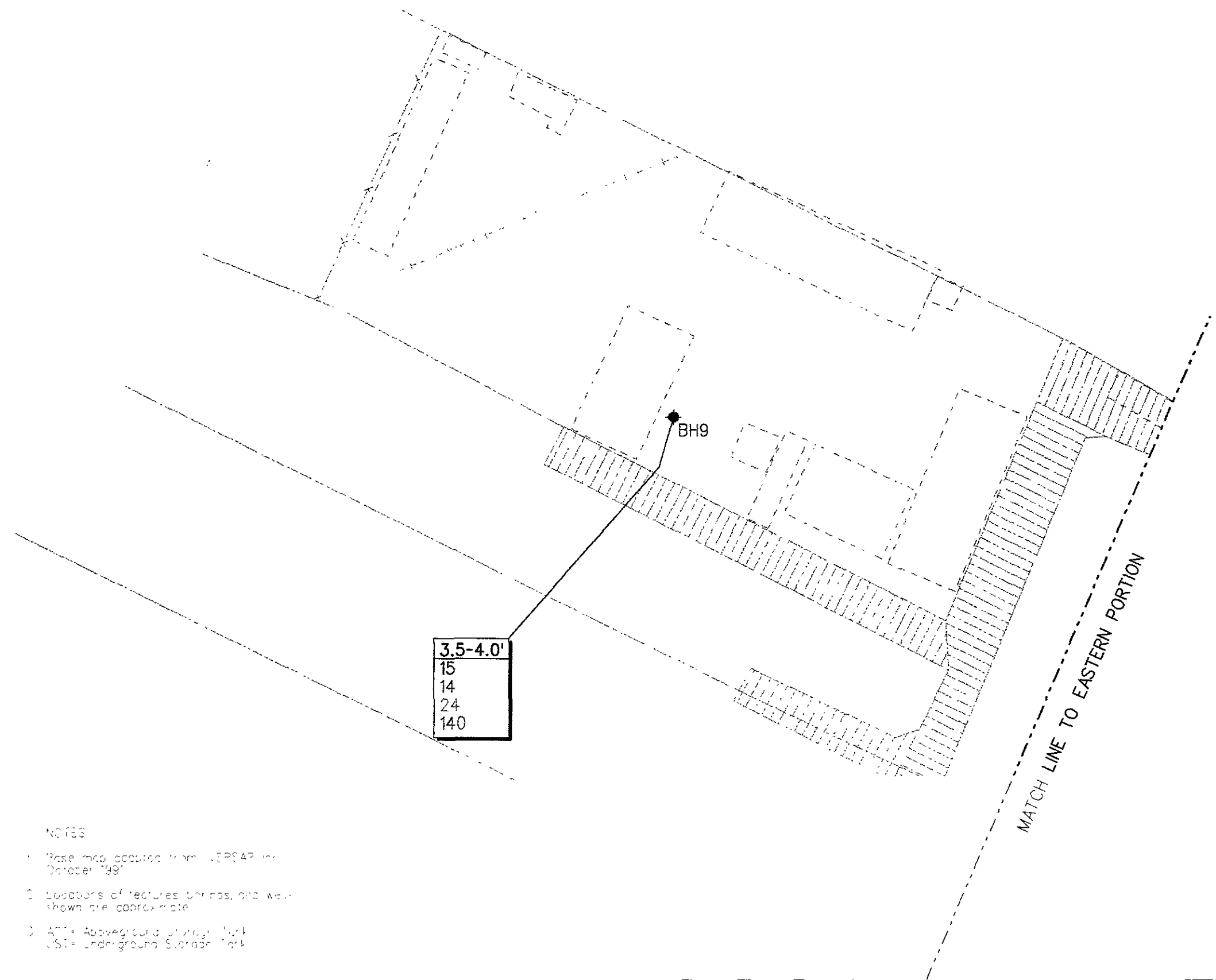
Base map from *The Thomas Guide, 1995 Alameda/Contra Costa Counties Street Guide and Directory*.
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SITE LOCATION MAP
 Pacific Dry Dock and Repair
 Yard I and Yard II
 1441 Embarcadero and 321 Embarcadero
 Oakland, California

Figure
 1
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EXPLANATION

BH9 ● SOIL BORING LOCATION, OCTOBER 1991 AND JANUARY 1992

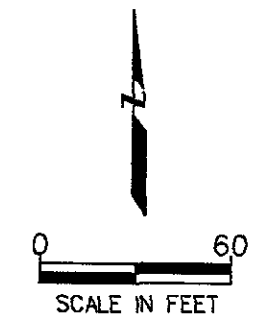
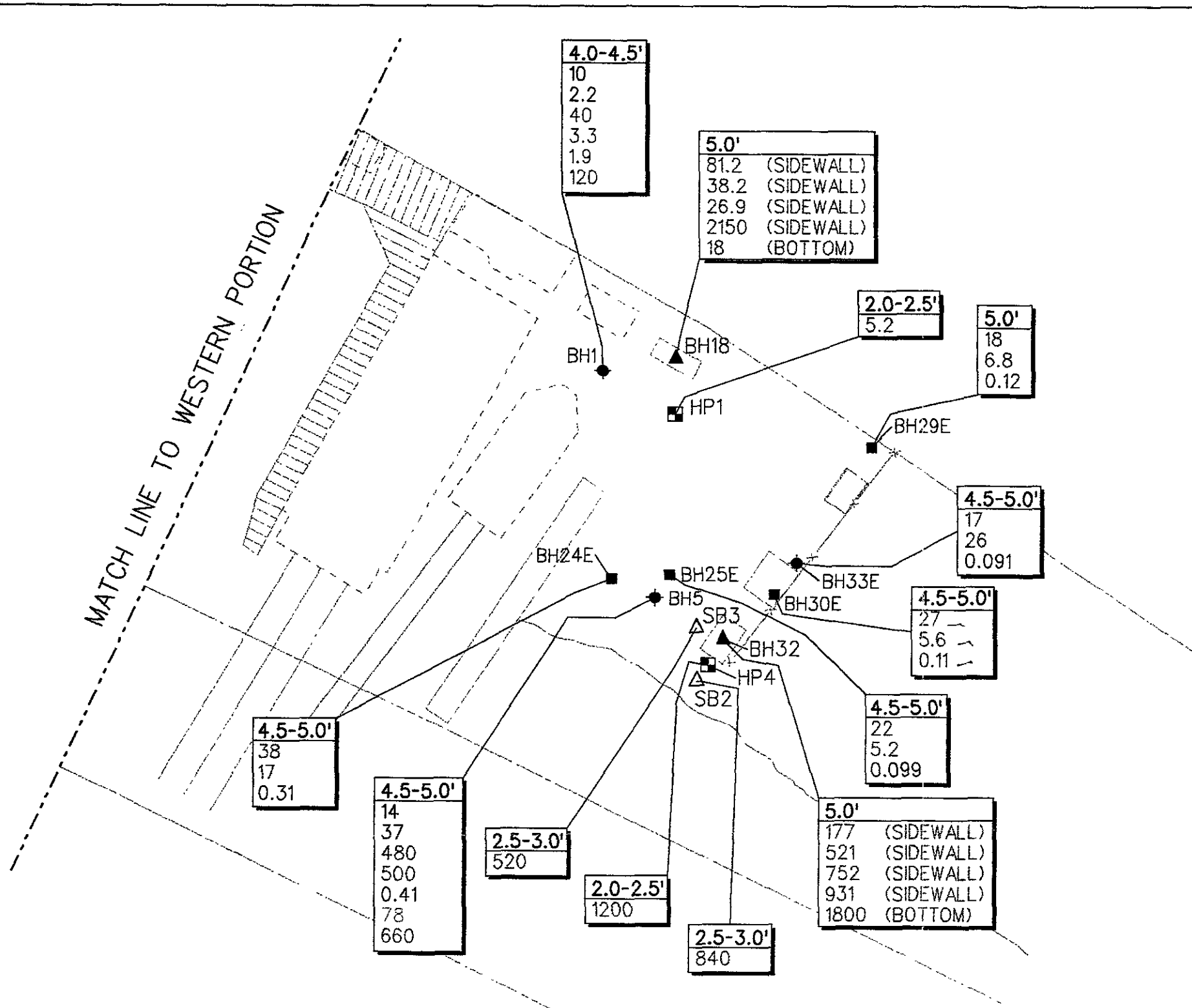
DEPTH	←	DEPTH OF SAMPLE IN FEET BELOW GROUND SURFACE (bgs)
CHROMIUM	}	CONCENTRATION OF CONSTITUENT IN MILLIGRAMS PER KILOGRAM (mg/kg)
LEAD		
NICKEL		
ZINC		

- NOTES
1. Base map adapted from NERPA report, October 1991.
 2. Locations of features, buildings, and walls shown are approximate.
 3. AOT = Aboveground Storage Tank
 UST = Underground Storage Tank

SOIL ANALYTICAL RESULTS
 METALS, 0 TO 5 FEET BGS
 WESTERN PORTION
 Pacific Dry Dock and Repair, Yard 1
 1441 Embarcadero
 Oakland, California

GEOMATRIX	Project No. 3999	Figure 2
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- EXPLANATION
- HP1 ■ HYDROPUNCH SAMPLE LOCATION, FEBRUARY 1996
 - SB2 △ SOIL BORING LOCATION, FEBRUARY 1996
 - BH18 ▲ SOIL EXCAVATION SAMPLE LOCATION, JUNE AND JULY 1995
 - BH29E ■ SOIL BORING LOCATION, AUGUST 1992
 - BH1 ◆ SOIL BORING LOCATION, MARCH 1992

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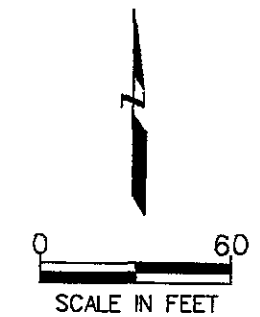
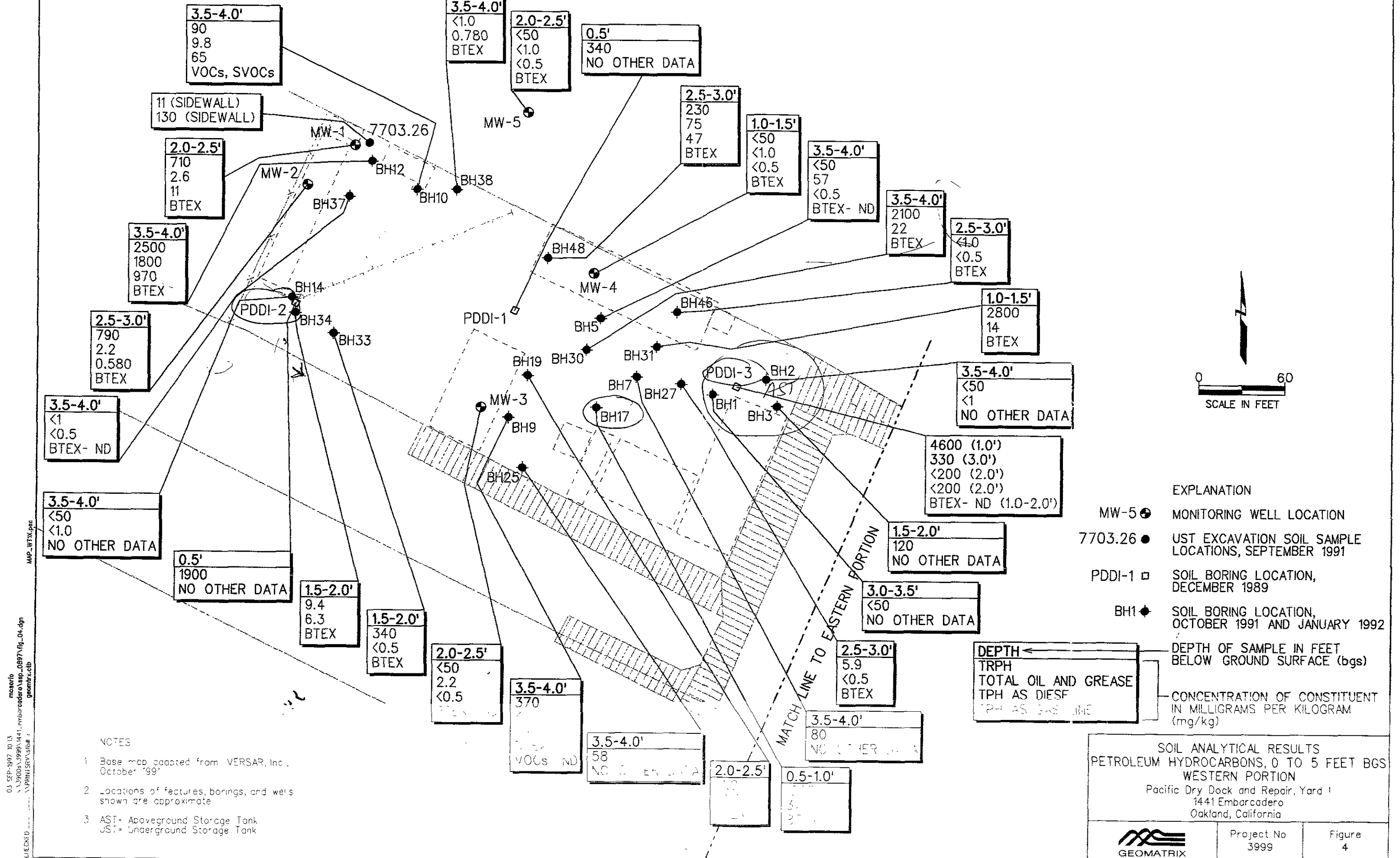
DEPTH	CONCENTRATION OF CONSTITUENT IN MILLIGRAMS PER KILOGRAM (mg/kg)
ARSENIC	
CHROMIUM	
COPPER	
LEAD	
MERCURY	
NICKEL	
ZINC	

NOTES

1. Base map data from V:\ASAC\... October 1997
2. Locations of features, borings, and wells shown are approximate
3. AST = Aboveground Storage Tank
 UST = Underground Storage Tank

SOIL ANALYTICAL RESULTS
 METALS, 0 TO 5 FEET BGS
 EASTERN PORTION
 Pacific Dry Dock and Repair, Yard 1
 1441 Embarcadero
 Oakland, California

 GEOMATRIX	Project No 3999	Figure 3
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- EXPLANATION**
- MW-5 ● MONITORING WELL LOCATION
 - 7703.26 ● UST EXCAVATION SOIL SAMPLE LOCATIONS, SEPTEMBER 1991
 - PDDI-1 □ SOIL BORING LOCATION, DECEMBER 1989
 - BH1 ● SOIL BORING LOCATION, OCTOBER 1991 AND JANUARY 1992

DEPTH ←
 TRPH
 TOTAL OIL AND GREASE
 TPH AS DIESEL
 TPH AS GASOLINE

←
 DEPTH OF SAMPLE IN FEET
 BELOW GROUND SURFACE (bgs)

←
 CONCENTRATION OF CONSTITUENT
 IN MILLIGRAMS PER KILOGRAM
 (mg/kg)

SOIL ANALYTICAL RESULTS
 PETROLEUM HYDROCARBONS, 0 TO 5 FEET BGS
 WESTERN PORTION
 Pacific Dry Dock and Repair, Yard 1
 1441 Embarcadero
 Oakland, California

- NOTES**
1. Base map adapted from VERSAR, Inc., October '99
 2. Locations of features, borings, and wells shown are approximate
 3. AST = Aboveground Storage Tank
 UST = Underground Storage Tank

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820 (0.5')
740 (3.0')
VOCs, SVOCs- ND (0.5')

0.5'
53,000
VOCs, SVOCs- ND

4.5-5.0'
120
8.4
<0.5
BTEX- ND
SVOCs

4.0-4.5'
310
1.6
2.4
BTEX

4.5-5.0'
<50
11.0
4.3
BTEX

2.0-2.5'
120
530
<0.5
BTEX- ND

4.0-4.5'
<50
<1.0
<0.5
BTEX- ND

<50 (2.5' and 5.0')
<1.0 (2.5' and 5.0')
<0.5 (2.5' and 5.0')
BTEX

4.0-4.5'
98
2.5
2.4
BTEX- ND

4.0-4.5'
<50
<1.0
<0.5
BTEX- ND

4.5-5.0'
<50
<1.0
<0.5
BTEX- ND

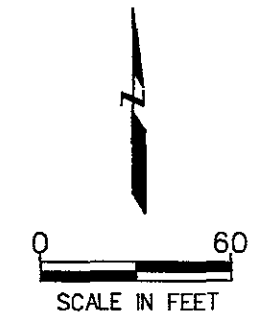
4.5-5.0'
<50
<1.0
<0.5
BTEX

4.5-5.0'
550
160
0.88
BTEX- ND
SVOCs

4.5-5.0'
<50
9.2
<0.5
BTEX

4.5-5.0'
270
43
13
BTEX

MATCH LINE TO WESTERN PORTION



- EXPLANATION
- BH18 ▲ SOIL EXCAVATION SAMPLE LOCATION, JUNE AND JULY 1995
 - PDDI-8 □ SOIL BORING LOCATION, DECEMBER 1989
 - BH27E ■ SOIL BORING LOCATION, AUGUST 1992
 - BH1 ◆ SOIL BORING LOCATION, MARCH 1992

DEPTH ←	DEPTH OF SAMPLE IN FEET BELOW GROUND SURFACE (bgs)
TRPH	TOTAL OIL AND GREASE
TPH AS DIESEL	CONCENTRATION OF CONSTITUENT IN MILLIGRAMS PER KILOGRAM (mg/kg)
TPH AS GASOLINE	

SOIL ANALYTICAL RESULTS
PETROLEUM HYDROCARBONS, 0 TO 5 FEET BGS
EASTERN PORTION
Pacific Dry Dock and Repair, Yard 1
1441 Embarcadero
Oakland, California

- NOTES
1. Base map adapted from NERSAP, Inc. October 1991
 2. Locations of features, borings, and wells shown are approximate
 3. Samples from borings B-0 and B-11 were also analyzed for petroleum hydrocarbons. The locations of these borings are not shown
 4. AST = Aboveground Storage Tank
UST = Underground Storage Tank

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*Sum
Gross
material
the
need to sample
for VOCs*

Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TPHd	17	8	53-830
TPHg	17	0	-
B	16	3	1.6-7.5
T	17	5	0.58-2.2
E	17	2	0.56-1.4
X	17	2	1.5-1.9
Lead	2	0	-

Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TOG	1	1	11,000
TPHd	0	-	-
TPHg	1	1	34,000,000
B	1	0	<9400
T	1	1	170,000
E	1	1	480,000
X	1	1	1,900,000
Cadmium	1	0	-
Chromium	1	0	-
Lead	1	1	130
Nickel	1	0	-
Zinc	1	1	280

Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TPHd	6	1	98
TPHg	6	0	-
B	6	0	-
T	6	1	0.87
E	6	0	-
X	5	0	-
Lead	1	0	-

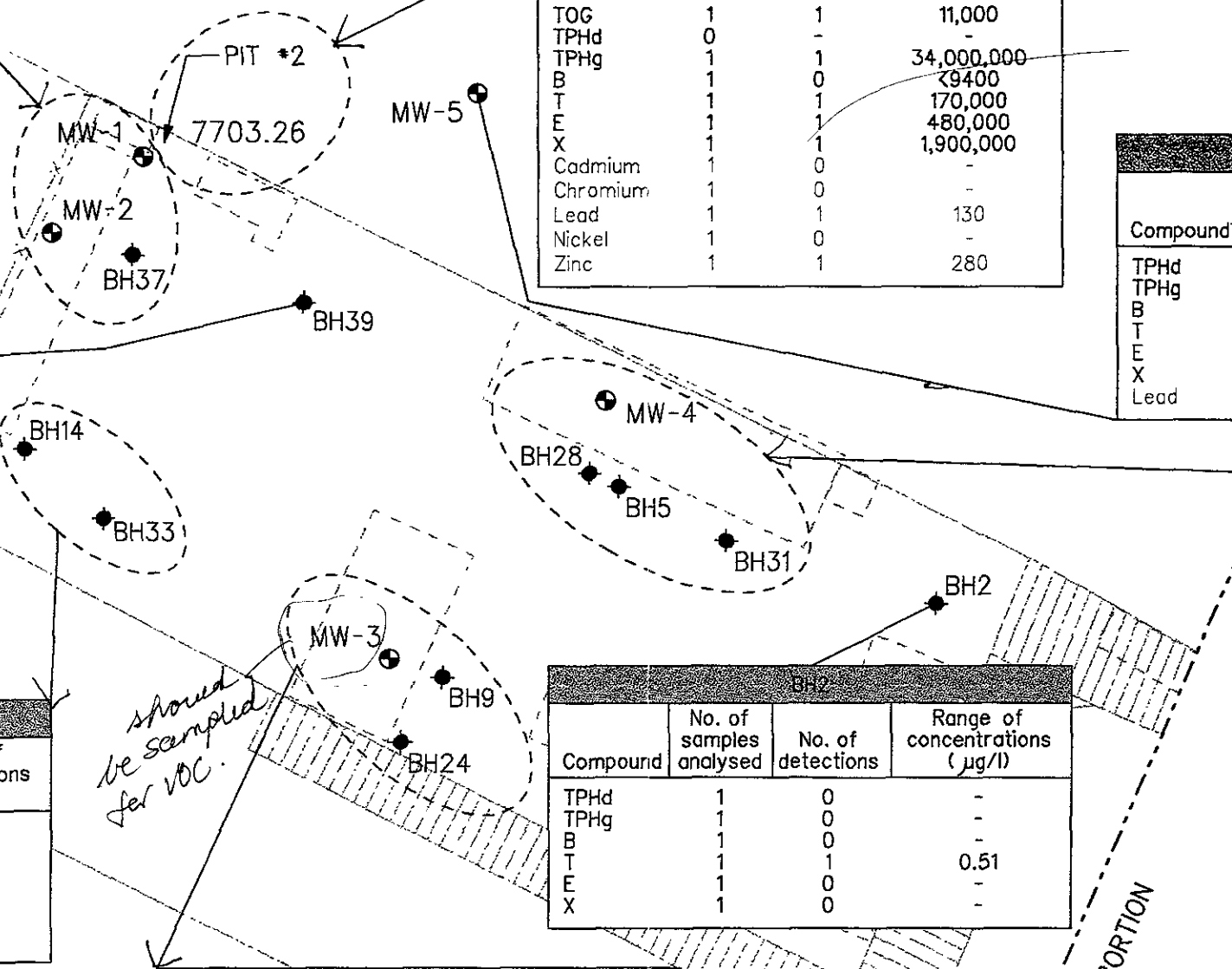
Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TPHd	1	0	-
TPHg	1	0	-
B	1	1	1.4
T	1	1	4.1
E	1	0	-
X	1	0	-

Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TOG	1	1	18,000
TPHd	8	1	450
TPHg	9	2	57-250
B	9	2	0.6-7
T	9	3	0.77-21
E	9	2	0.74-1.4
X	9	3	1.5-11
Cadmium	1	0	-
Chromium	1	1	560
Lead	2	1	1100
Nickel	1	1	1200
Zinc	1	1	2800

Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TPHd	2	1	260
TPHg	2	0	-
B	2	0	-
T	2	0	-
E	2	0	-
X	2	0	-

Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TPHd	1	0	-
TPHg	1	0	-
B	1	0	-
T	1	1	0.51
E	1	0	-
X	1	0	-

Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TPHd	12	2	64-840
TPHg	12	1	100
B	12	1	38
T	12	3	0.55-0.90
E	12	0	-
X	12	0	-



should be sampled for VOC

ABBREVIATIONS:

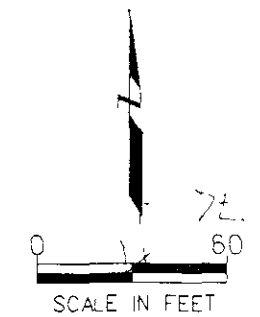
- TOG - Total oil and grease
- TPHd - Total petroleum hydrocarbons as diesel
- TPHg - Total petroleum hydrocarbons as gasoline
- BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
- MTBE - Methyl tert butyl ether

NOTES

1. Base map adapted from USAR Inc. October 1991
2. Locations of features shown on figure are approximate
3. Groundwater analytical data have been grouped for presentation purposes only. Monitoring well data for multiple sampling events is included
4. Only those compounds analyzed for are shown
5. Sample JST-E collected from tank contents and data are not shown on this figure

- EXPLANATION**
- MW-5 ● MONITORING WELL LOCATION
 - 7703.26 ● UST EXCAVATION SOIL SAMPLE AND GRAB GROUNDWATER LOCATIONS, SEPTEMBER 1991
 - BH2 ● SOIL BORING AND GRAB GROUNDWATER SAMPLE LOCATION, OCTOBER 1991 AND JANUARY 1992

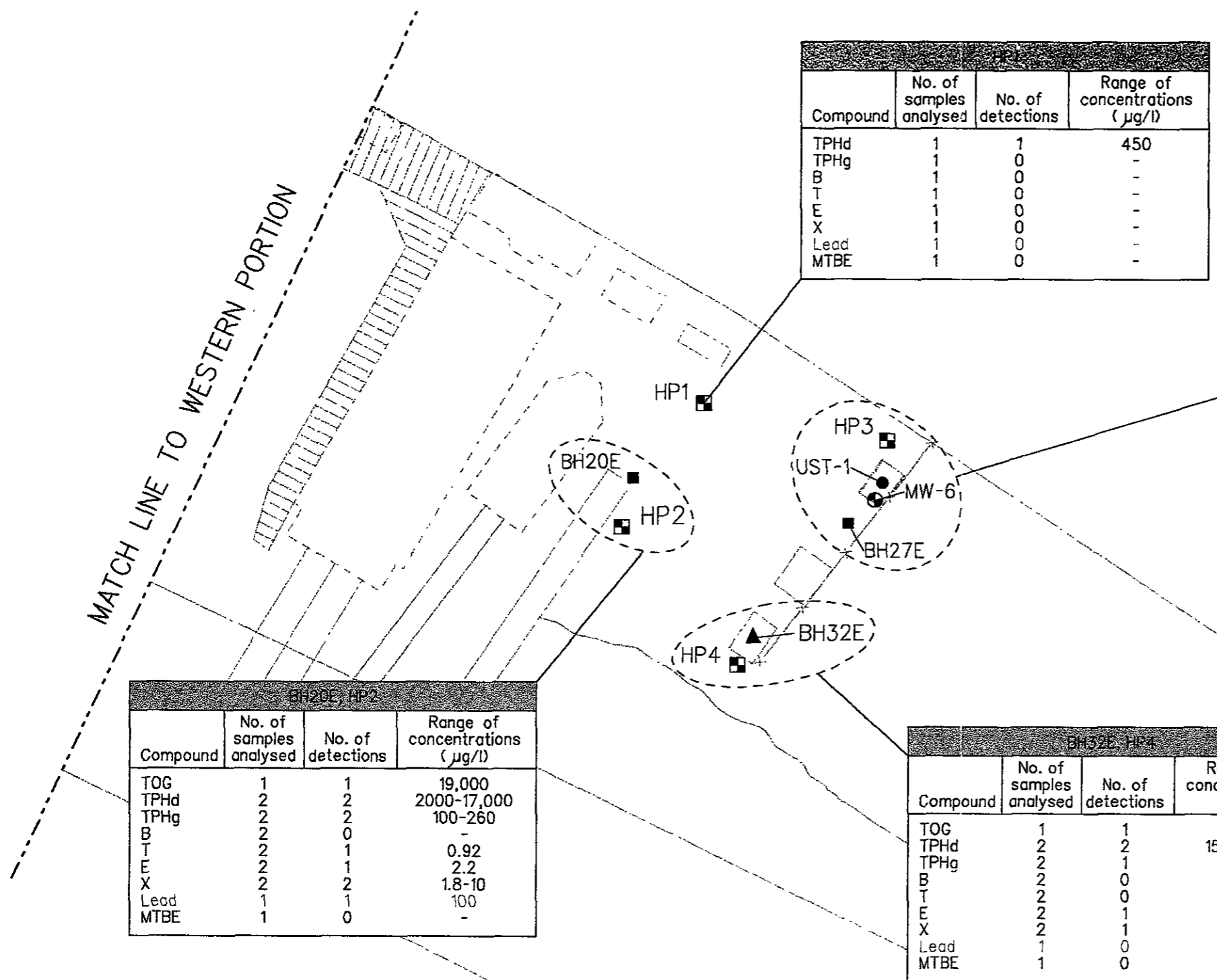
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS, WESTERN PORTION
Pacific Dry Dock and Repair, Yard 1
1441 Embarcadero
Oakland, California



	Project No. 3999	Figure 6
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Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TPHd	1	1	450
TPHg	1	0	-
B	1	0	-
T	1	0	-
E	1	0	-
X	1	0	-
Lead	1	0	-
MTBE	1	0	-

Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TOG	2	1	5500
TPHd	4	3	77-16,000
TPHg	4	2	320-380
B	4	1	28
T	4	1	120
E	4	1	11
X	4	1	35
Lead	2	0	-
MTBE	1	0	-

Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TOG	1	1	19,000
TPHd	2	2	2000-17,000
TPHg	2	2	100-260
B	2	0	-
T	2	1	0.92
E	2	1	2.2
X	2	2	1.8-10
Lead	1	1	100
MTBE	1	0	-

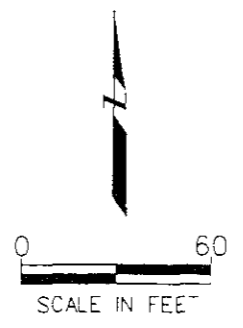
Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TOG	1	1	12,000
TPHd	2	2	150-2700
TPHg	2	1	70
B	2	0	-
T	2	0	-
E	2	1	1.1
X	2	1	2.0
Lead	1	0	-
MTBE	1	0	-

- EXPLANATION**
- MW-6 ● MONITORING WELL LOCATION
 - HP1 ■ HYDROPUNCH SAMPLE LOCATION, FEBRUARY 1996
 - BH32E ▲ SOIL EXCAVATION AND GRAB GROUNDWATER SAMPLE LOCATIONS, JUNE AND JULY 1995
 - BH27E ■ SOIL BORING AND GRAB GROUNDWATER SAMPLING LOCATIONS, AUGUST 1992
 - UST-1 ● EXCAVATION GRAB GROUNDWATER SAMPLE LOCATION, FEBRUARY 1994

ABBREVIATIONS:

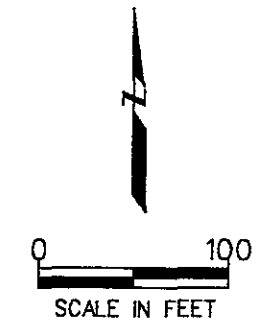
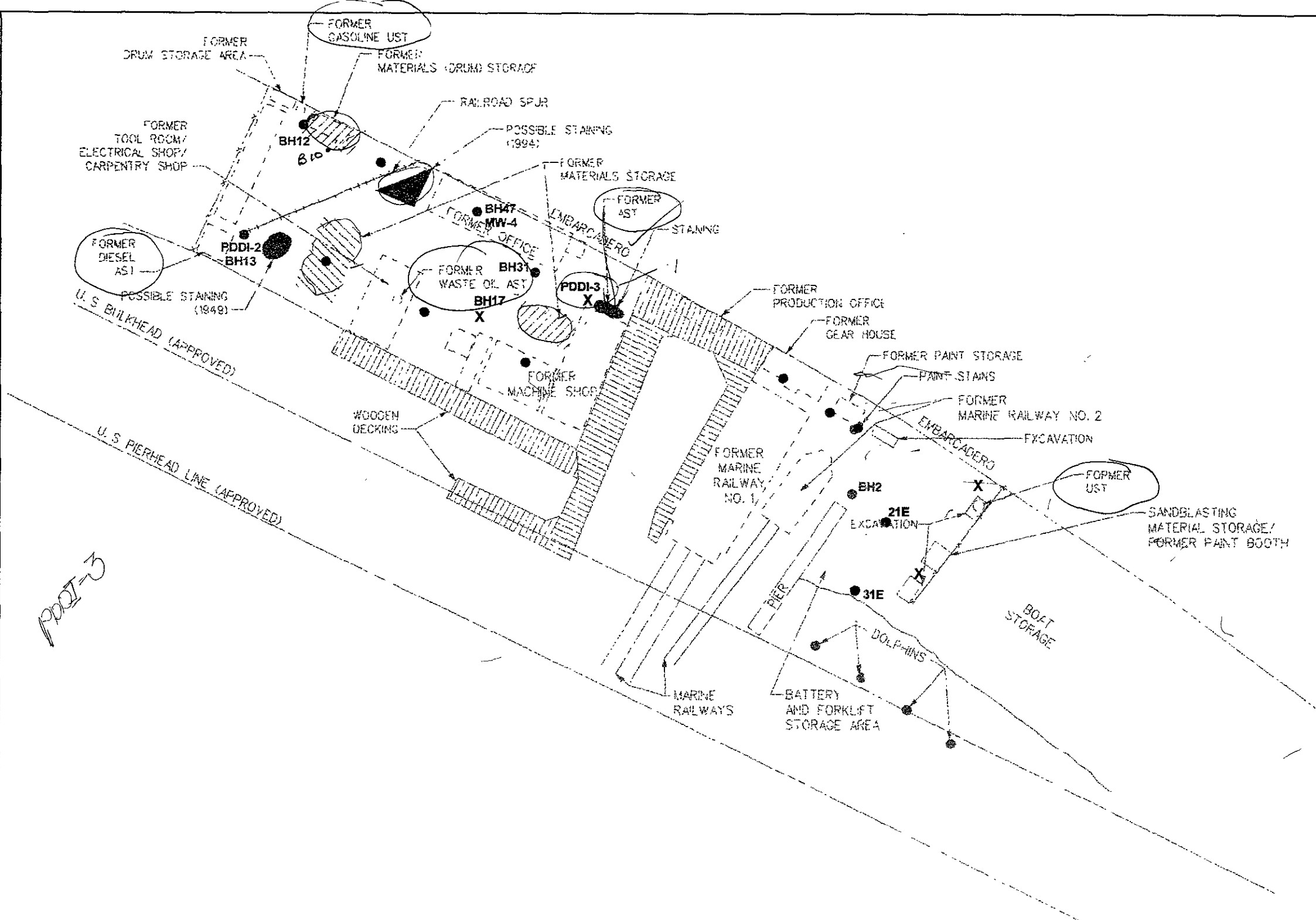
- TOG - Total oil and grease
- TPHd - Total petroleum hydrocarbons as diesel
- TPHg - Total petroleum hydrocarbons as gasoline
- BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
- MTBE - Methyl tert butyl ether

- NOTES**
1. Base map adopted from VERPAR, Inc. October 1997
 2. Locations of features shown on map are approximate
 3. Groundwater analytical data have been grouped by area for presentation purpose only



SUMMARY OF GROUNDWATER ANALYTICAL RESULTS, EASTERN PORTION
 Pacific Dry Dock and Repair, Yard 1
 1441 Embarcadero
 Oakland, California

	Project No. 3999	Figure 7
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EXPLANATION

(1994) DATE OF AERIAL PHOTOGRAPH REVIEWED

GRID SAMPLES

- X SHALLOW SOIL (UPPER FOOT); METALS, SVOCs, ORGANOTINS, AND PCBs
- SHALLOW SOIL AND AT WATER TABLE; METALS, AND SVOCs. IN ADDITION, PCBs AND ORGANOTINS ON SHALLOW SOIL.
- SHALLOW SOIL AND AT WATER TABLE; METALS, TPH, PNAs AND PCBs

TARGET SAMPLES *(authoritative)*

- X SHALLOW SOIL; TPH, PNAs AND PCBs
- SHALLOW SOIL AND AT WATER TABLE; TPH, AND PNAs. IN ADDITION, PCBs ON SHALLOW SOIL
- SHALLOW SOIL AND AT WATER TABLE; METALS, VOCs, SVOCs, ORGANOTINS AND PCBs

NOTES

1. Base map adapted from REF 1A - October 1991
2. Locations of features shown are approximate
3. AST - Aboveground Storage Tank
UST - Underground Storage Tank

PROPOSED SOIL SAMPLING PROGRAM

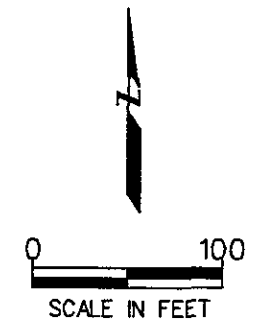
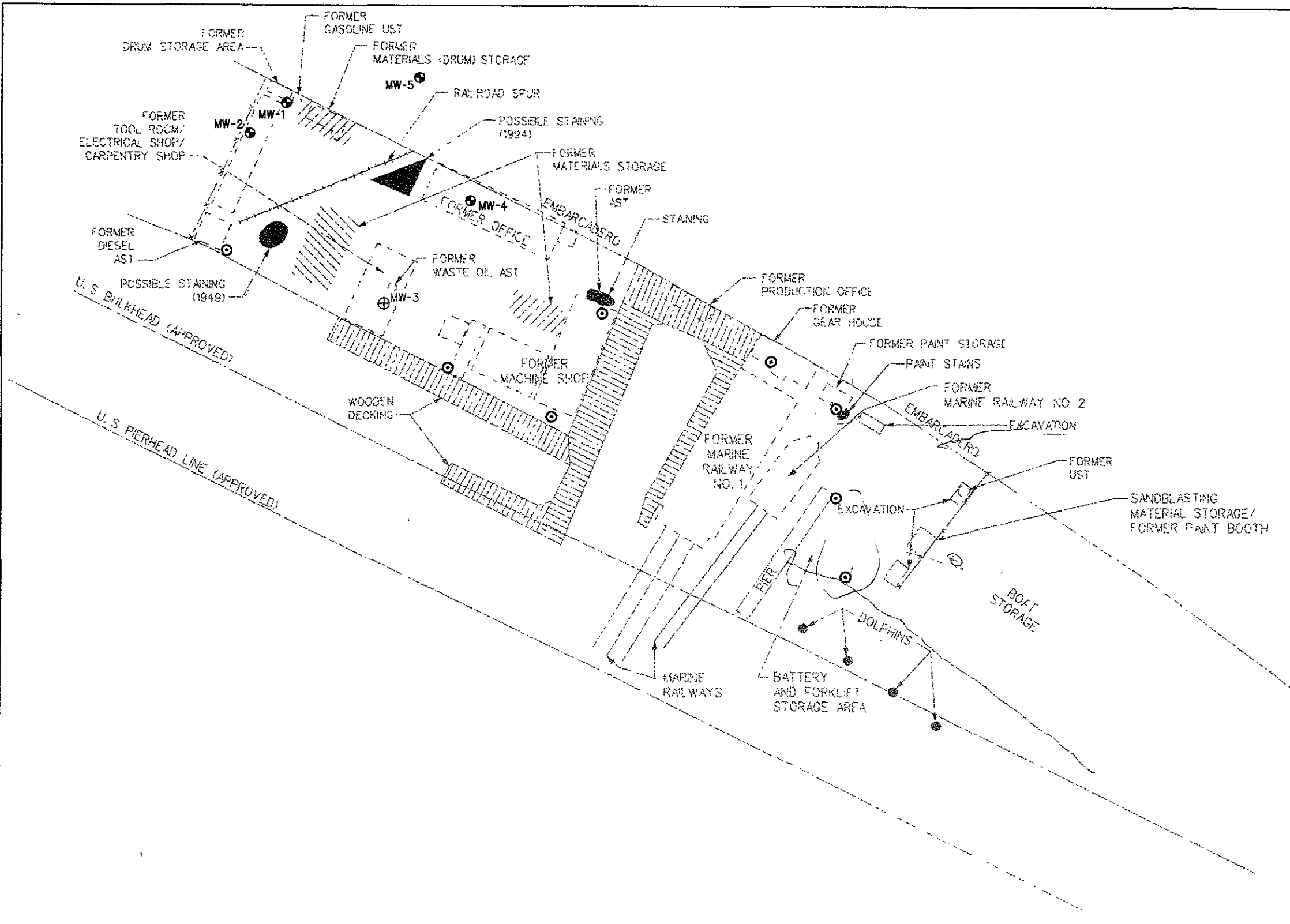
Pacific Dry Dock and Repair, Yard 1
1441 Embarcadero
Oakland, California



Project No
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Figure
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- EXPLANATION**
- (1994) DATE OF AERIAL PHOTOGRAPH REVIEWED
 - EXISTING MONITORING WELL
 - ⊙ PROPOSED TEMPORARY GROUNDWATER SAMPLING POINT; METALS, TPH, VOCs, SVOCs AND ORGANOTINS
 - ⊕ EXISTING MONITORING WELL TO BE SAMPLED

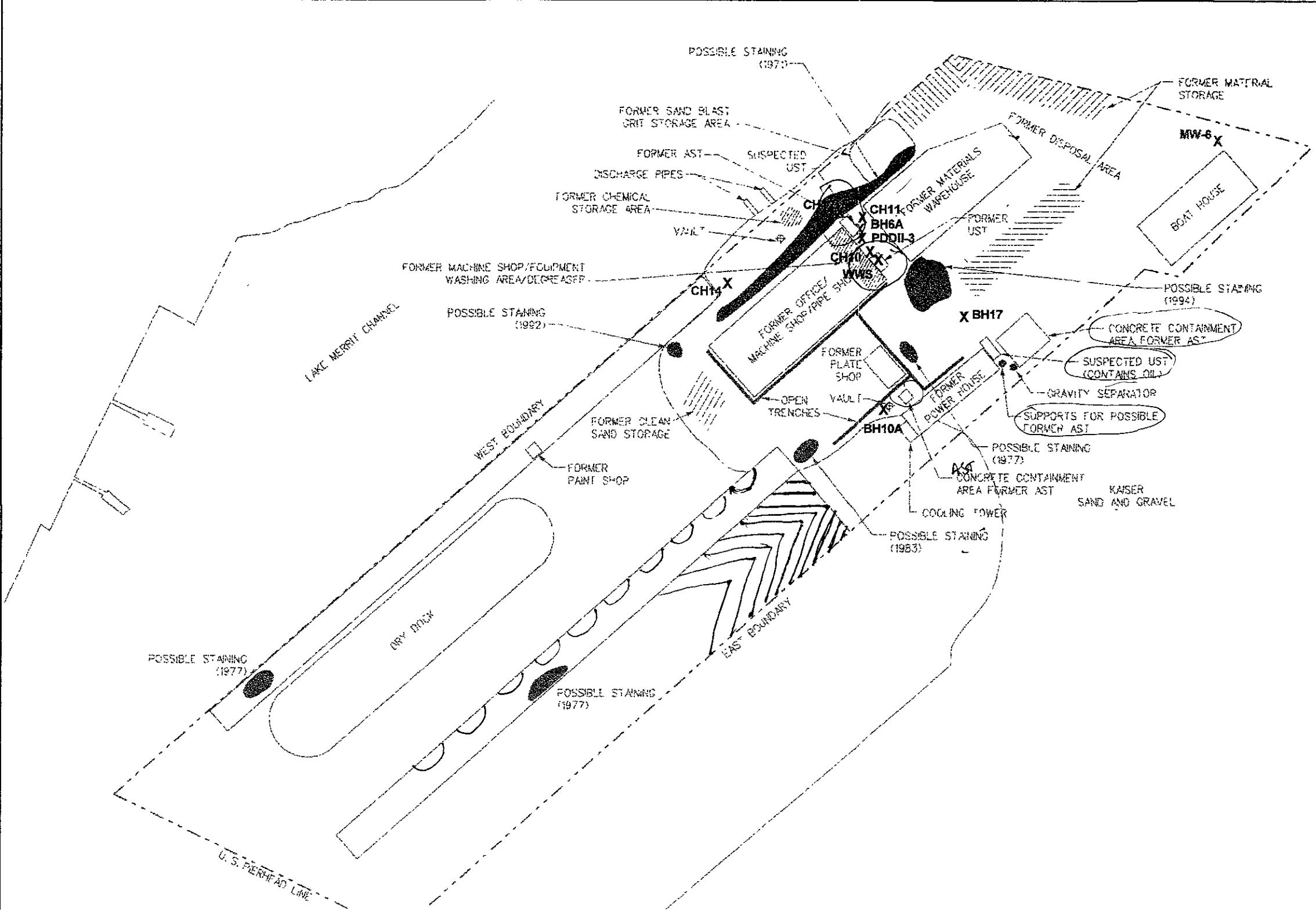
PROPOSED GROUNDWATER SAMPLING PROGRAM
 Pacific Dry Dock and Repair, Yard I
 1441 Embarcadero
 Oakland, California

 GEOMATRIX	Project No 3999	Figure 9
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NOTES

1. Base map adapted from VRSAR by J. J. Cooper, 1997
2. Locations of features shown are approximate
3. AST - Aboveground Storage Tank
 UST - Underground Storage Tank

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- EXPLANATION**
- ⊗ UNDERGROUND VAULT
 - OPEN TRENCHES
 - - - SITE BOUNDARY
 - (1994) DATE OF AERIAL PHOTOGRAPH REVIEWED
 - X LEAD ONLY
 - X COPPER AND LEAD
 - X COPPER, LEAD AND MERCURY
 - X COPPER, LEAD, MERCURY AND ZINC
 - X CAM METALS

<p>METALS RESULTS FOR SOIL 2.4 TO 4.9 FEET BGS Pacific Dry Dock and Repair, Yard II 321 Embarcadero Oakland, California</p>		
 GEOMATRIX	Project No. 3999	Figure 10

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Depth (BGS)	Compound	Range of concentrations (mg/kg)
0.5'	TRPH	109,000
0.5'	BTEX	ND
3.0'	TRPH	22,000
3.0'	PCE	0.21

Depth (BGS)	Compound	Range of concentrations (mg/kg)
3.0'	TPHg	ND
3.0'	BTEX	ND

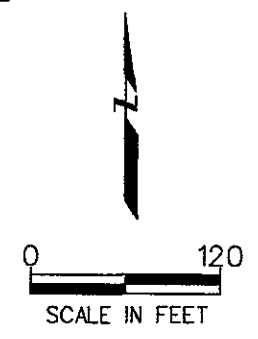
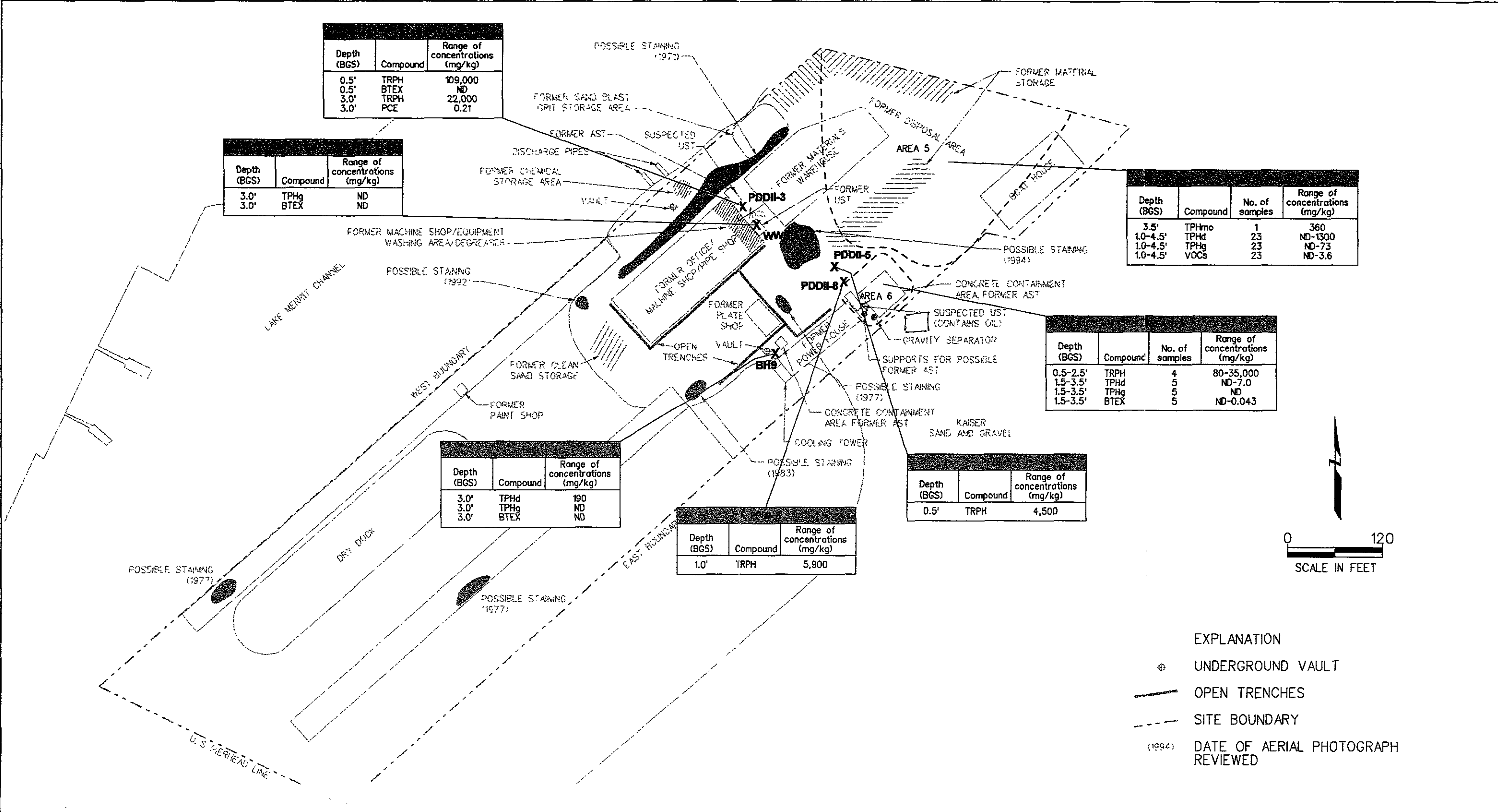
Depth (BGS)	Compound	No. of samples	Range of concentrations (mg/kg)
3.5'	TPHmo	1	360
1.0-4.5'	TPHd	23	ND-1300
1.0-4.5'	TPHg	23	ND-73
1.0-4.5'	VOCs	23	ND-3.6

Depth (BGS)	Compound	No. of samples	Range of concentrations (mg/kg)
0.5-2.5'	TRPH	4	80-35,000
1.5-3.5'	TPHd	5	ND-7.0
1.5-3.5'	TPHg	5	ND
1.5-3.5'	BTEX	5	ND-0.043

Depth (BGS)	Compound	Range of concentrations (mg/kg)
0.5'	TRPH	4,500

Depth (BGS)	Compound	Range of concentrations (mg/kg)
3.0'	TPHd	190
3.0'	TPHg	ND
3.0'	BTEX	ND

Depth (BGS)	Compound	Range of concentrations (mg/kg)
1.0'	TRPH	5,900



EXPLANATION

- ⊕ UNDERGROUND VAULT
- OPEN TRENCHES
- - - SITE BOUNDARY
- (1994) DATE OF AERIAL PHOTOGRAPH REVIEWED

**ORGANIC RESULTS FOR SOIL
LESS THAN 5 FEET BGS**

Pacific Dry Dock and Repair, Yard 3
321 Embarcadero
Oakland, California

	Project No. 3999	Figure 11
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Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TOG	0	-	-
TPHd	1	1	73
TPHg	1	0	-
B	1	0	-
T	1	0	-
E	1	0	-
X	1	0	-
MTBE	0	-	-
VOCs	1	0	-
Copper	0	-	-
Lead	0	-	-
Mercury	0	-	-
Zinc	0	-	-

Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TOG	0	-	-
TPHd	0	-	-
TPHg	0	-	-
B	0	-	-
T	0	-	-
E	0	-	-
X	0	-	-
MTBE	0	-	-
VOCs	0	-	-
Copper	0	-	-
Lead	0	-	-
Mercury	0	-	-
Zinc	0	-	-

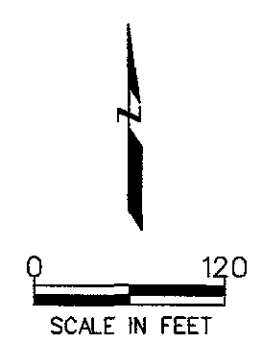
Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TOG	0	-	-
TPHd	2	1	71
TPHg	2	0	-
B	2	0	-
T	2	0	-
E	2	0	-
X	2	0	-
MTBE	0	-	-
VOCs	0	-	-
Copper	0	-	-
Lead	0	-	-
Mercury	2	0	-
Zinc	0	-	-

Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TOG	0	-	-
TPHd	1	1	260
TPHg	1	0	-
B	1	0	-
T	1	0	-
E	1	0	-
X	1	0	-
MTBE	0	-	-
VOCs	0	-	-
Copper	0	-	-
Lead	0	-	-
Mercury	0	-	-
Zinc	0	-	-

Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TOG	1	0	-
TPHd	4	1	140
TPHg	4	0	-
B	4	0	-
T	4	0	-
E	4	0	-
X	4	0	-
MTBE	2	0	-
VOCs	4	1	Chlorobenzene 0.51
Copper	2	1	100
Lead	2	0	-
Mercury	2	0	-
Zinc	2	2	30-60

Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TOG	1	0	-
TPHd	4	2	160-220
TPHg	4	1	55
B	4	1	3.6
T	4	0	-
E	4	2	1.0-1.4
X	4	1	5.3
MTBE	2	0	-
VOCs	4	3	Chlorobenzene 1.5-9.1 Chloroform 0.73
Copper	2	1	50
Lead	2	1	110
Mercury	2	1	0.28
Zinc	2	2	24-56

Compound	No. of samples analysed	No. of detections	Range of concentrations (µg/l)
TOG	5	3	7300-9500
TPHd	17	14	130-3300
TPHg	18	13	300-2600
B	18	12	2.1-77
T	18	5	0.74-5.5
E	18	8	0.77-14
X	18	5	3.6-850
MTBE	10	0	-
VOCs	18	10	Chlorobenzene 35-2200 cis/trans-1,2-DCE 1.6 1,4-DCB 8.1-13
Copper	10	7	20-100
Lead	10	2	210-310
Mercury	10	5	0.53-11
Zinc	10	10	38-440



- EXPLANATION**
- MONITORING WELL LOCATION
 - GRAB GROUNDWATER SAMPLE LOCATION
 - UNDERGROUND VAULT
 - - - OPEN TRENCHES

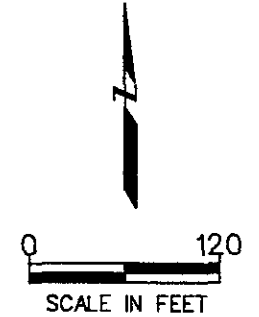
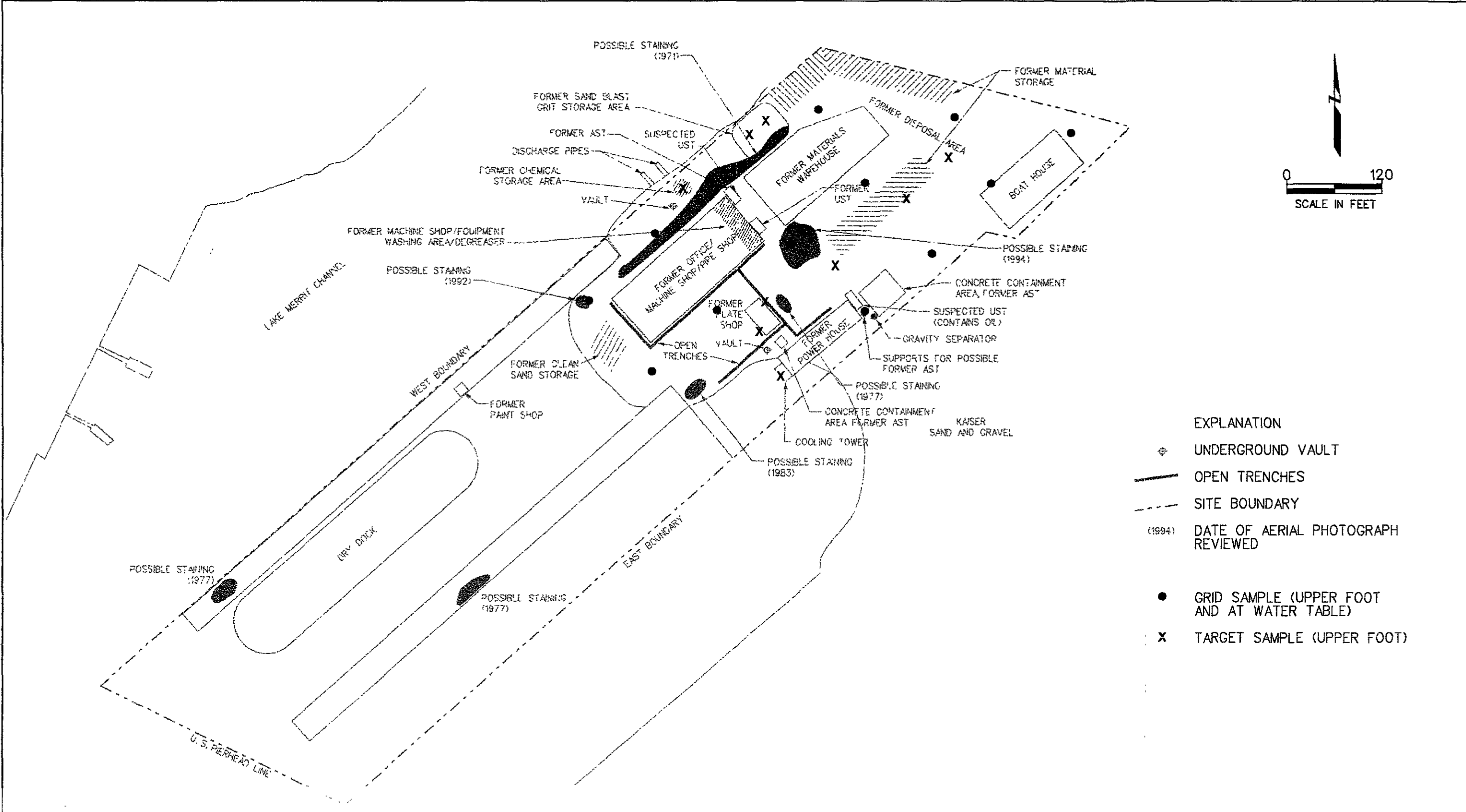
- ABBREVIATIONS:**
- TOG - Total oil and grease
 - TPHd - Total petroleum hydrocarbons as diesel
 - TPHg - Total petroleum hydrocarbons as gasoline
 - BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
 - MTBE - Methyl tert butyl ether
 - VOCs - Volatile organic compounds
 - DCB - Dichlorobenzene
 - DCE - Dichloroethene

- NOTES**
- 1 Base map obtained from VERSAR, Inc., October 1997
 - 2 Locations of features shown are approximate
 - 3 Solid and grab groundwater sampling locations within Areas 1 to 6 are shown on figures included in Appendix A

SUMMARY OF GROUNDWATER SAMPLING ANALYTICAL RESULTS
 Pacific Dry Dock and Repair, Yard II
 321 Embarcadero
 Oakland, California


	Project No. 3999	Figure 12
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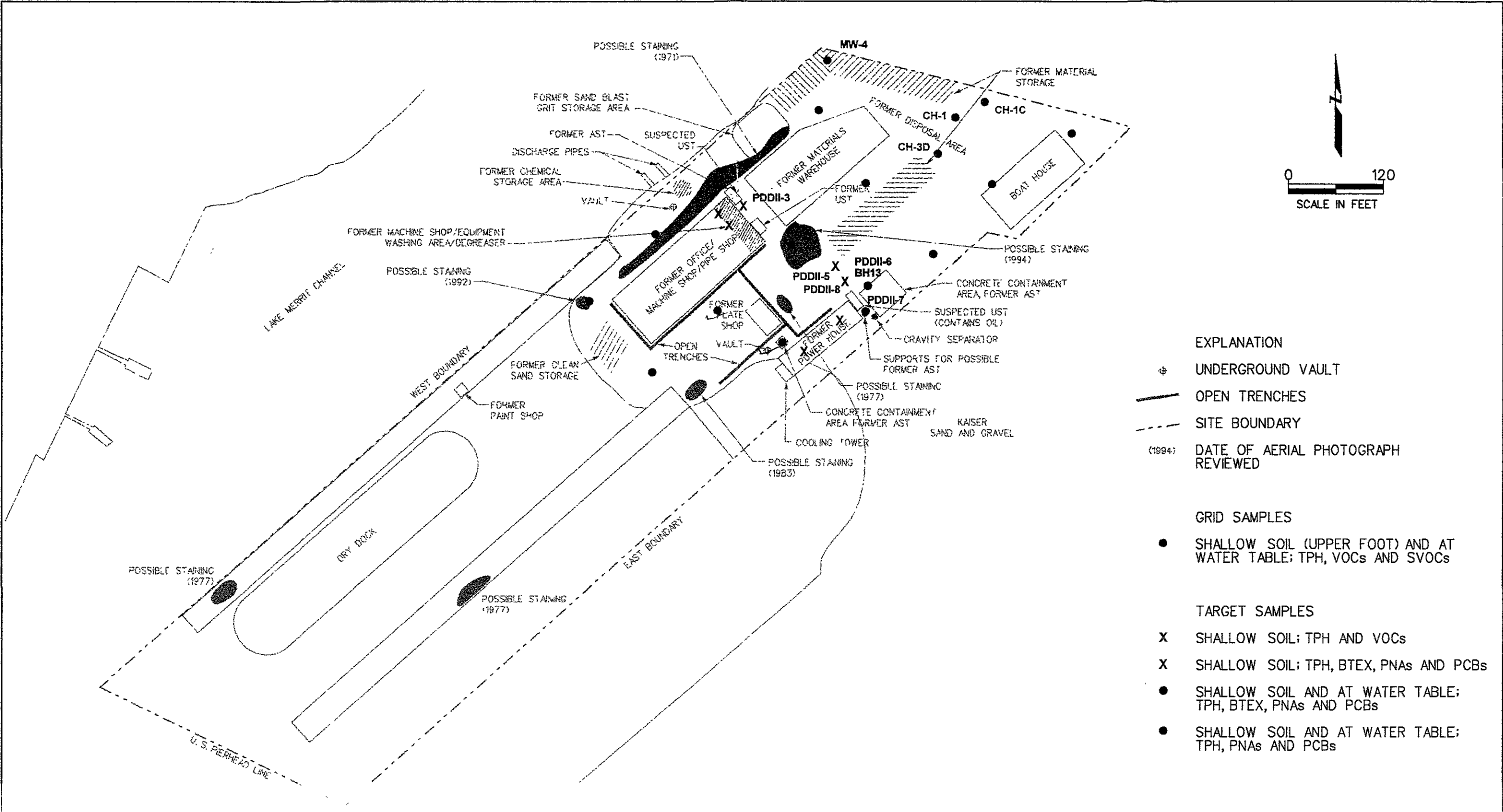


- EXPLANATION**
- ⊕ UNDERGROUND VAULT
 - OPEN TRENCHES
 - - - SITE BOUNDARY
 - (1994) DATE OF AERIAL PHOTOGRAPH REVIEWED
 - GRID SAMPLE (UPPER FOOT AND AT WATER TABLE)
 - ✕ TARGET SAMPLE (UPPER FOOT)

- NOTES**
1. Base map derived from VERSAR, Inc. October 1991.
 2. Locations of tent residues shown are approximate.
 3. A-1 Knowledge and Storage Tank is an Underground Storage Tank.

NECESSARY METALS SAMPLING - SOIL Pacific Dry Dock and Repair, Yard II 321 Embarcadero Oakland, California		
 GEOMATRIX	Project No. 3999	Figure 13

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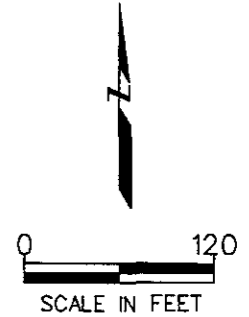
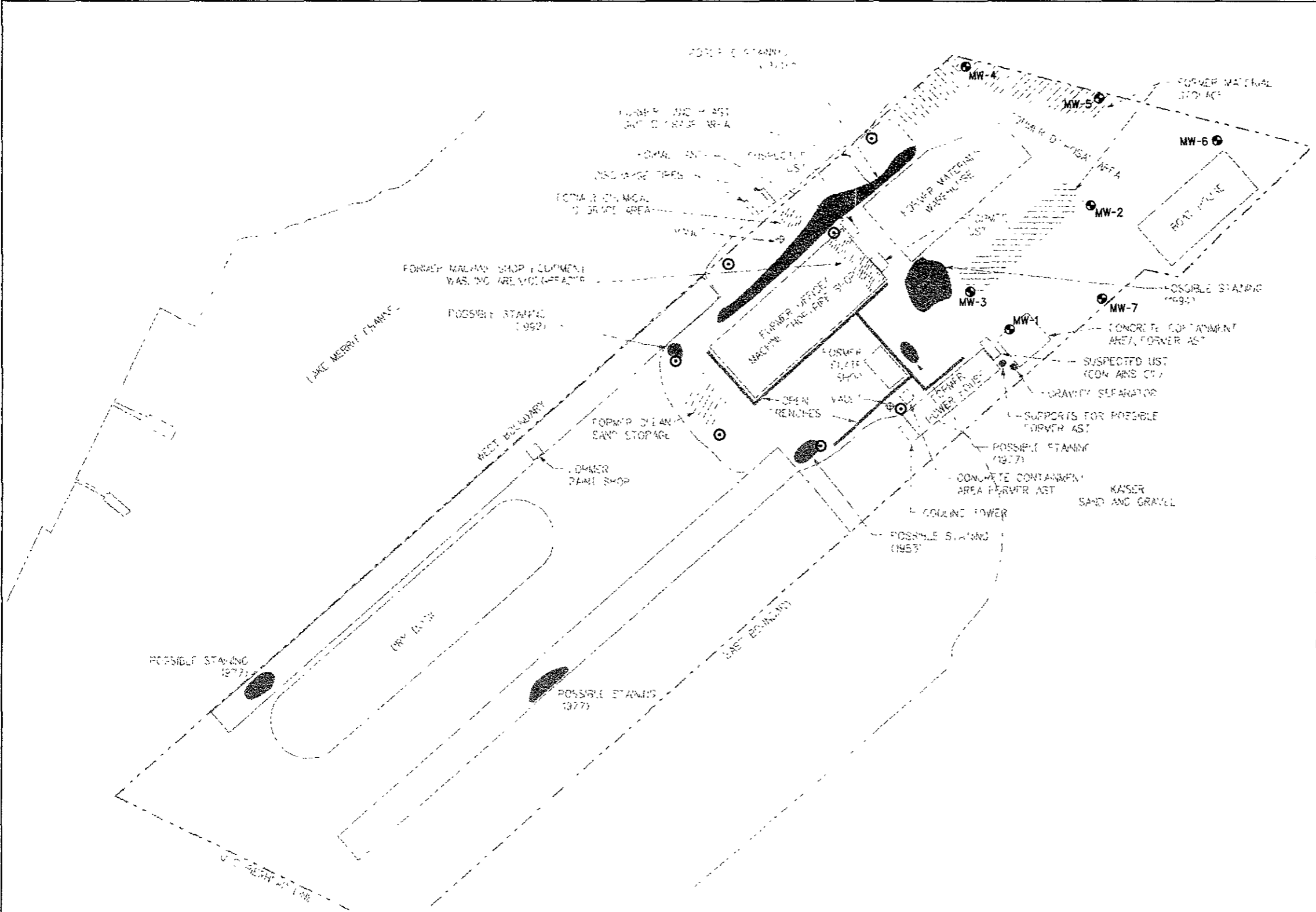
- EXPLANATION**
- ⊕ UNDERGROUND VAULT
 - OPEN TRENCHES
 - - - SITE BOUNDARY
 - (1994) DATE OF AERIAL PHOTOGRAPH REVIEWED
- GRID SAMPLES**
- SHALLOW SOIL (UPPER FOOT) AND AT WATER TABLE; TPH, VOCs AND SVOCs
- TARGET SAMPLES**
- X SHALLOW SOIL; TPH AND VOCs
 - X SHALLOW SOIL; TPH, BTEX, PNAS AND PCBs
 - SHALLOW SOIL AND AT WATER TABLE; TPH, BTEX, PNAS AND PCBs
 - SHALLOW SOIL AND AT WATER TABLE; TPH, PNAS AND PCBs

NO. 22
 Base map adapted from VERSAR, Inc., October 1991
 Location of features shown are approximate
 A = Above Ground Storage Tank
 UST = Underground Storage Tank

NECESSARY ORGANIC SAMPLING - SOIL
 Pacific Dry Dock and Repair, Yard II
 321 Embarcadero
 Oakland, California


	Project No 3999	Figure 14
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- EXPLANATION**
- UNDERGROUND VAULT
 - OPEN TRENCHES
 - SITE BOUNDARY
 - DATE OF AERIAL PHOTOGRAPH REVIEWED
 - EXISTING WELL
 - PROPOSED TEMPORARY GROUNDWATER SAMPLING POINT; METALS, TPH, VOCs AND SVOCs

PROPOSED GROUNDWATER SAMPLING PROGRAM
 Pacific Dry Dock and Repair, Yard 1
 321 Embarcadero
 Oakland, California

 GEOMATRIX	Project No 3999	Figure 16
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