USPCI
A Subsidiary of Union Pacific Corporation

THIRD QUARTER 1994 MONITORING REPORT

UNION PACIFIC RAILROAD

UNION PACIFIC RAILROAD YARD
OAKLAND, CALIFORNIA

USPCI PROJECT NO. 96199

PREPARED FOR:

UNION PACIFIC RAILROAD
ENVIRONMENTAL MANAGEMENT
1416 DODGE STREET, ROOM 930
OMAHA, NEBRASKA 68179

Prepared by:

USPCI Consulting Services
5665 Flatiron Parkway
Boulder, Colorado 80301

October 28, 1994

USPCI
A Subsidiary of
Union Pacific Corporation
Consulting Services

October 28, 1994

Mr. Harry Patterson
Union Pacific Railroad
1416 Dodge Street, Room 930
Omaha, Nebraska 68179

RE: **"Third Quarter 1994 Monitoring Report"**, Oakland Fueling Area in the Oakland TOFC Railyard, Oakland, California, USPCI Project No. 96199

Dear Mr. Patterson:

Enclosed is the final copy of the **"Third Quarter 1994 Monitoring Report"**, dated October 28, 1994 for the Union Pacific Railroad Fueling Area at the trailer-on-flat-car (TOFC) loading facility at 1717 Middle Harbor Road in Oakland, California.

Based on the information obtained during the most recent monitoring event, the following key conclusions and recommendations are included in the report:

- Although the remediation system appears to demonstrate an effectiveness, capture zone analysis techniques demonstrate the need for additional data to fully establish the effectiveness of the remediation system.

- Obtaining additional data, such as performing a graphical trend analysis and monitoring carefully placed piezometers, could confirm the effectiveness of the existing remediation system.

5665 Flatiron Parkway
Boulder Colorado 80301
303/938-5500
Fax 303.938-5520

24125 Aldine Westfield
Spring, Texas 77373
713/350-7240
Fax 713 350-7246

If you have any questions, please call me at (303) 938-5539.

Sincerely,

Denton Mauldin
Engineer III

cc: Mary Mast, USPCI
Jennifer Eberle, ACDEH
John Amdur, Port of Oakland
Philip Herden, APL
Ken Fossey, USPCI (cover letter)

Enclosure

DM/tjh

THIRD QUARTER 1994 MONITORING REPORT
UNION PACIFIC RAILROAD
UNION PACIFIC RAILROAD YARD
OAKLAND, CALIFORNIA
USPCI Project No. 96199

Prepared for:
Union Pacific Railroad
Environmental Management - Room 930
1416 Dodge Street
Omaha, Nebraska 68179

for submittal to:
Ms. Jennifer Eberle
Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, California 94621

Prepared by:
USPCI Consulting Services
5665 Flatiron Parkway
Boulder, Colorado 80301

October 28, 1994

TABLE OF CONTENTS

List of Figures

List of Tables

1. INTRODUCTION

This report was prepared by USPCI in accordance with the Alameda County Department of Environmental Health letter dated September 21, 1994, which requested the following information:

- Potentiometric and capture zone maps,
- Fluid level monitoring information from the monitoring and recovery wells,
- Pumping rates of the recovery system,
- Isoconcentration maps, and
- Groundwater modeling results.

The purpose of this report is to provide quarterly monitoring results from groundwater monitoring wells pertaining to the hydrocarbon recovery system located at the fueling area of the Union Pacific Railroad (UPRR) Oakland Trailer on Flat Car (TOFC) railyard at 1717 Middle Harbor Road in Oakland, California. Background information about the site was presented in the report, "Hydrocarbon Investigation and Remedial Design", dated June 10, 1991. The results of the hydrocarbon investigation and a conceptual design of the hydrocarbon recovery and treatment system were also presented in the June 10, 1991, report. The system design was outlined in the, "Preliminary Design Report", dated September 5, 1991. As-built information for the groundwater recovery and treatment system has been presented in the, "Hydrocarbon Recovery System, As-Built Construction Report", dated July 20, 1992. Process changes in the hydrocarbon recovery and treatment system were presented in a letter from UPRR dated March 22, 1993, which represented the permit renewal. Analytical results discussed in this report were included in the "Quarterly Monitoring Report, Hydrocarbon Recovery System, Second Quarter, 1994", dated July 14, 1994.

2. MONITORING WELL GAUGING

Third quarterly well gauging was performed on the ten monitoring wells at the TOFC railyard on July 29 and September 26, 1994. A site map including monitoring well locations is illustrated by Figure 1. Recent and historical fluid levels are presented in Table 1.

Potentiometric maps for the July and September gauging events (Figures 2 and 3) demonstrate consistent southeastern site-wide groundwater gradients with groundwater depressions in the areas of the recovery wells. The third quarter potentiometric surface maps were compared to a April 1991 potentiometric surface map, (Figure 4) which illustrates groundwater conditions at the site prior to start-up of the three wells. Comparison of the three figures illustrates a decrease in the fluid levels since April 1991. Wells in the northern area of the site have demonstrated decreases of as much as two feet in groundwater elevations during the three year period. Monitoring well OMW-6 has demonstrated slightly increased groundwater elevations during the three year period. Results of the comparison also indicate an effect on the potentiometric surface in the northern area of the site as a result of fluid removal.

Pumping rates for the three well recovery system have continued to average between two and three gallons per minute. Pumping rates have remained relatively constant since system start-up in May 1992. System performance records are included in the semi-annual reports during the second and fourth quarters of each year submitted to the East Bay Municipal Utility District.

Results of the July 29 and September 26, 1994 well gauging events indicated the presence of light non-aqueous phase liquids (LNAPLs) in monitoring wells OMW-4, OMW-7, and OMW-9. The presence of LNAPLS in the three monitoring wells is consistent with previous gauging events. Figures 5 and 6 illustrate the LNAPL thicknesses as measured in monitoring wells during June 1992 and September 1994. A comparison of the two figures suggests that the migration of the LNAPL plume has been minimal during the two year period. The reduction in the LNAPL thickness is likely a result of the operation of the remediation system, however LNAPLs from monitoring wells OMW-4, OMW-7, and OMW-9 have been bailed intermittently during the remediation and the bailing may also have an influence on the variations reflected in apparent product thicknesses measured during July 29 and September 26, 1994 (Table 1).

A review of the historical data demonstrates periodic variations in the fluid levels demonstrated by monitoring well OMW-6 which can be correlated to tidal fluctuations. The remaining nine monitoring wells have demonstrated fluctuations which may have been in response to tidal fluctuations but are of a minimal amount which do not adversely impact the site remediation.

3. GROUNDWATER SAMPLING

Groundwater samples were collected during the second quarterly sampling event on May 2, 1994. Groundwater samples were analyzed for Total Petroleum Hydrocarbons (TPH) by Method 8015 Modified and for benzene, toluene, ethylbenzene, and xylenes (BTEX) by Method 8020. Monitoring wells OMW-3 and OMW-10 indicated dissolved concentrations of BTEX and TPH. Analytical results are presented in Table 2. A dissolved hydrocarbon concentration map (Figure 7) was constructed to illustrate the distribution of the dissolved hydrocarbon compounds in groundwater at the site. As demonstrated by Figure 7, monitoring wells OMW-3 and OMW-10 are located on opposing ends of the recovery system and appear to be outside of the range of influence by the recovery system. The recent analytical results are consistent with those TPH and BTEX values obtained from previous sampling events included in Table 2.

4. CAPTURE ZONE MODELING

To determine if the remediation system provided capture of the LNAPL plume, two analytical techniques were used. Potentiometric maps based on observed water level data were prepared and analyzed to see if the extent of the capture zone included the LNAPL and dissolved plumes. A computer pathline model was used to predict the theoretical capture zone of the recovery wells based on the hydrogeologic data from the site.

4.1 POTENTIOMETRIC SURFACE ANALYSIS

Review of the potentiometric surface maps (Figures 2 and 3) suggests a radius of influence in the area of the recovery wells, extending down-gradient beyond OMW-9. Figures 2 and 3 also demonstrate a laterally extensive area of influence extending beyond the recovery wells to the east and west. The capture zone implied by the potentiometric surface maps does not appear to extend to OMW-10 or to OMW-8, located on opposite ends of the recovery system. Monitoring well OMW-3 does appear to be within the radius of influence suggested by the potentiometric surface maps. Based upon the potentiometric surface analyses, the LNAPL plume as measured in monitoring wells OMW-4, OMW-7, and OMW-9 appears to be captured by the current recovery system. The dissolved hydrocarbon constituents in monitoring well OMW-3 also appear to be within the capture zone of the three-well recovery system, although the dissolved constituents identified in monitoring well OMW-10 appear to be just beyond the capture zone.

I question whether you can correlate pot. surface w/ capture zone

4.2 PATHLINE COMPUTER MODEL SIMULATION

As an additional means of analysis, a screening level capture zone model was used to identify those areas where the current recovery system potentially was not capturing or controlling the LNAPL or dissolved plumes. A PATHLINE model (Leppert, 1990) was developed to estimate capture zones produced by the existing remediation system installed in the northern area of the site. PATHLINE is a semi-analytical capture zone simulator which uses the image well theory to estimate the effect(s) of prescribed stresses on a given groundwater flow system. PATHLINE tracks the movement of fluid particles within a flow regime having uniform ambient flow and uniform aquifer characteristics. Based on the assumptions that were made to perform this modeling effort, the PATHLINE model is to be considered a screening tool only.

The estimated ambient groundwater flow direction was to the southeast with a gradient of 0.007 ft/ft. A porosity of 0.3 ft^3/ft^3 was assumed and the effective saturated thickness was estimated to be 20 feet. An extraction rate of two gallons per minute was distributed equally amongst the extraction wells. The data used for the simulation was taken from July 7, 1992 measurements as these data appeared to show the least variations between fluid level fluctuations in monitoring wells. A hydraulic conductivity was estimated using a calibration technique. A homogeneous hydraulic conductivity was estimated by adjusting the input hydraulic conductivity until the predicted drawdown in monitoring wells matched the observed drawdown. The resulting calibrated hydraulic conductivity was $5.0x10^{-3}$ cm/sec.

The results of the PATHLINE model are illustrated in Figure 8. The results of the model suggest that the current remediation system is probably not creating enough of an influence to completely capture and control the LNAPL plume and the associated dissolved hydrocarbon constituents.

4.3 COMPARISON OF ANALYTICAL TECHNIQUES

The results of the two analytical methods demonstrate a need for further investigation at the site. The capture zone analysis through review of the potentiometric surface appears to indicate that the capture zone will extend far enough to include the LNAPL plume and most of the dissolved plume. In contrast, the PATHLINE model presents a conservative approach which suggests that gaps exist in the capture zones for the current system for both the LNAPL and dissolved plumes. The PATHLINE model does not reflect the influences of hydrologic and geologic heterogeneities which may contribute to a more effective system as shown by the potentiometric surface maps. Both techniques establish a need to gather more data to fully establish the effectiveness of the recovery system.

5. CONCLUSIONS

Based on the information presented in this report, the following conclusions have been made about the monitoring and operation of the site:

- The third quarterly monitoring well gauging event demonstrates a site-wide groundwater gradient to the southeast which is consistent with previous well gauging events.

- Monitoring well sampling and gauging results suggest little LNAPL and dissolved hydrocarbon plume migration. Dissolved constituents were identified in only the cross-gradient monitoring wells OMW-3 and OMW-10 at low concentrations. Dissolved constituents were not identified in the down-gradient monitoring wells.

- Although the recovery system appears to demonstrate an effectiveness, capture zone analysis techniques demonstrate the need for additional data to fully establish the effectiveness of the remediation system.

6. RECOMMENDATIONS

Based on the conclusions made about the monitoring and remediation performed at the site, the following recommendations are presented:

- Monitoring of the existing monitoring wells and recovery wells should be continued on a bi-monthly basis.

- A graphical trend analysis reviewing potentiometric surfaces through time should be conducted. The analysis would allow any variations through time to be identified.

- Based upon the results of the graphical trend analysis, carefully placed piezometers could establish the effectiveness of the existing remediation system. Fluid levels in the piezometers would be gauged regularly with monitoring and recovery wells.

REFERENCES

Leppert, Shawn C., 1990, Capture Zones in Transient Flow Fields: Simulations and Analyses, Master of Geological Sciences in Hydrology Thesis, New Mexico Institute of Mining and Technology, Socorro, New Mexico.

TABLES

TABLE 1

Water Level/LNAPL Data
Union Pacific Railroad
Oakland Fueling Area

Well No.	Date	Well Elev. Above M.S.L. (FT)	Depth to Product (FT)	Depth to Water (FT)	Water Level Elevation (FT)	Product Thickness (FT)	Corr Water Level Elevation* (FT)
OMW-1	04/09/91	8.79		5.54	3.25		3.25
	06/19/91			6.89	1.90		1.90
	05/11/92			6.34	2.45		2.45
	06/09/92			6.91	1.88		1.88
	07/07/92			7.21	1.58		1.58
	08/11/92			7.55	1.24		1.24
	09/04/92			7.82	0.97		0.97
	10/13/92			7.96	0.83		0.83
	11/12/92			7.64	1.15		1.15
	12/17/92			6.64	2.15		2.15
	03/18/93			5.98	2.81		2.81
	05/14/93			6.39	2.40		2.40
	07/13/93			7.12	1.67		1.67
	09/30/93			7.84	0.95		0.95
	11/10/93			8.08	0.71		0.71
	01/24/94			7.54	1.25		1.25
	03/23/94			6.69	2.10		2.10
	05/02/94			6.61	2.18		2.18
	07/29/94			7.32	1.47		1.47
	09/26/94			7.67	1.12		1.12
OMW-2	04/09/91	5.88		2.10	3.78		3.78
	06/19/91			3.59	2.29		2.29
	05/11/92			3.22	2.66		2.66
	06/09/92			3.97	1.91		1.91
	07/07/92			4.21	1.67		1.67
	08/11/92			4.46	1.42		1.42
	09/04/92			4.77	1.11		1.11
	10/13/92			4.96	0.92		0.92
	11/12/92			4.08	1.80		1.80
	12/17/92			1.70	4.18		4.18
	03/18/93			1.94	3.94		3.94
	05/14/93			3.29	2.59		2.59
	07/13/93			4.28	1.60		1.60
	09/30/93			4.99	0.89		0.89
	11/10/93			5.23	0.65		0.65
	01/24/94			3.30	2.58		2.58
	03/23/94			3.55	2.33		2.33
	05/02/94			4.95	0.93		0.93
	07/29/94			4.49	1.39		1.39
	09/26/94			4.92	0.96		0.96
OMW-3	04/09/91	7.16		3.93	3.23		3.23
	06/19/91			5.33	1.83		1.83
	05/11/92			5.92	1.24		1.24
	06/09/92			5.48	1.68		1.68
	07/07/92			5.78	1.38		1.38
	08/11/92			6.09	1.07		1.07
	09/04/92			6.33	0.83		0.83
	10/13/92			6.55	0.61		0.61
	11/12/92			6.16	1.00		1.00
	12/17/92			5.15	2.01		2.01
	03/18/93			2.58	4.58		4.58
	05/14/93			4.91	2.25		2.25
	07/13/93			5.70	1.46		1.46
	09/30/93			6.43	0.73		0.73

TABLE 1 (cont.)

Water Level/LNAPL Data
Union Pacific Railroad
Oakland Fueling Area

Well No.	Date	Well Elev. Above M.S.L. (FT)	Depth to Product (FT)	Depth to Water (FT)	Water Level Elevation (FT)	Product Thickness (FT)	Corr Water Level Elevation* (FT)
OMW-3 (cont.)	11/10/93			6.92	0.24		0.24
	01/24/94			3.50	3.66		3.66
	03/23/94			5.90	1.26		1.26
	05/02/94			5.84	1.32		1.32
	07/29/94			5.98	1.18		1.18
	09/26/94			6.32	0.84		0.84
OMW-4	04/09/91	7.41	3.79	6.23	1.18	2.44	3.23
	06/19/91		4.44	8.68	-1.27	4.24	2.29
	05/11/92						not available
	06/09/92		5.88	9.81	-2.40	3.93	0.90
	07/07/92		6.00	9.88	-2.47	3.88	0.79
	08/11/92		6.13	8.23	-0.82	2.10	0.94
	09/04/92		6.78	8.37	-0.96	1.59	0.38
	10/13/92**			6.58	0.83		0.83
	11/12/92		5.74	7.33	0.08	1.59	1.42
	12/17/92		5.77	7.28	0.13	1.51	1.40
	03/18/93		3.82	5.73	1.68	1.91	3.28
	05/14/93		5.76	8.45	-1.04	2.69	1.22
	07/13/93		5.94	7.78	-0.37	1.84	1.18
	09/30/93		6.85	8.17	-0.76	1.32	0.35
	11/10/93		7.03	7.59	-0.18	0.56	0.29
	01/24/94		6.15	6.76	0.65	0.61	1.16
	03/23/94		6.09	6.80	0.61	0.71	1.21
	05/02/94		5.25	5.54	1.87	0.29	2.11
	07/29/94		6.40	7.15	0.26	0.75	0.89
	09/26/94		6.31	6.93	0.48	0.62	1.00
OMW-5	04/09/91	7.62		4.64	2.98		2.98
	06/19/91			5.35	2.27		2.27
	05/11/92			5.18	2.44		2.44
	06/09/92			5.85	1.77		1.77
	07/07/92			6.02	1.60		1.60
	08/11/92			6.18	1.44		1.44
	09/04/92			6.59	1.03		1.03
	10/13/92			6.54	1.08		1.08
	11/12/92			6.23	1.39		1.39
	12/17/92			5.23	2.39		2.39
	03/18/93			3.33	4.29		4.29
	05/14/93			5.06	2.56		2.56
	07/13/93			5.96	1.66		1.66
	09/30/93			6.70	0.92		0.92
	11/10/93			5.92	1.70		1.70
	01/24/94			NA	7.62		7.62
	03/23/94			5.74	1.88		1.88
	05/02/94			5.71	1.91		1.91
	07/29/94			6.27	1.35		1.35
	09/26/94			6.56	1.06		1.06
OMW-6	04/09/91	5.78		7.60	-1.82		-1.82
	06/19/91			6.98	-1.20		-1.20
	05/11/92			7.41	-1.63		-1.63
	06/09/92			7.18	-1.40		-1.40
	07/07/92			6.61	-0.83		-0.83
	08/11/92			7.14	-1.36		-1.36
	09/04/92			6.58	-0.80		-0.80
	10/13/92**			6.16	-0.38		-0.38

TABLE 1 (cont.)

Water Level/LNAPL Data
Union Pacific Railroad
Oakland Fueling Area

Well No.	Date	Well Elev. Above M.S.L. (FT)	Depth to Product (FT)	Depth to Water (FT)	Water Level Elevation (FT)	Product Thickness (FT)	Corr Water Level Elevation* (FT)
OMW-6 (cont.)	11/12/92			6.91	-1.13		-1.13
	12/17/92			6.16	-0.38		-0.38
	03/18/93			7.31	-1.53		-1.53
	05/14/93			6.59	-0.81		-0.81
	07/13/93			6.58	-0.80		-0.80
	09/30/93			5.49	0.29		0.29
	11/10/93			5.08	0.70		0.70
	01/24/94			5.40	0.38		0.38
	03/23/94			6.90	-1.12		-1.12
	05/02/94			7.44	-1.66		-1.66
	07/29/94			5.65	0.13		0.13
	09/26/94			6.88	-1.10		-1.10
OMW-7	04/09/91	7.03	3.26	7.48	-0.45	4.22	3.09
	06/19/91		4.13	7.66	-0.63	3.53	2.34
	05/11/92		3.70	7.32	-0.29	3.62	2.75
	06/09/92		5.79	7.78	-0.75	1.99	0.92
	07/07/92		5.98	7.88	-0.85	1.90	0.75
	08/11/92		6.01	9.22	-2.19	3.21	0.51
	09/04/92		6.53	8.92	-1.89	2.39	0.12
	10/13/92		5.97	8.00	-0.97	2.03	0.74
	11/12/92		5.29	8.69	-1.66	3.40	1.20
	12/17/92		5.60	8.66	-1.63	3.06	0.94
	03/18/93		3.93	7.97	-0.94	4.04	2.45
	05/14/93		5.34	8.21	-1.18	2.87	1.23
	07/13/93		5.95	7.49	-0.46	1.54	0.83
	09/30/93		6.65	9.75	-2.72	3.10	-0.12
	11/10/93		6.75	9.12	-2.09	2.37	-0.10
	01/24/94		6.00	7.87	-0.84	1.87	0.73
	03/23/94		5.79	8.56	-1.53	2.77	0.80
	05/02/94		4.79	6.64	0.39	1.85	1.94
	07/29/94		6.15	8.46	-1.43	2.31	0.51
	09/26/94		6.14	7.11	-0.08	0.97	0.73
OMW-8	04/09/91	7.52		4.25	3.27		3.27
	06/19/91			5.27	2.25		2.25
	05/11/92			5.05	2.47		2.47
	06/09/92			6.25	1.27		1.27
	07/07/92			6.33	1.19		1.19
	08/11/92			6.48	1.04		1.04
	09/04/92			7.00	0.52		0.52
	10/13/92			6.23	1.29		1.29
	11/12/92			6.34	1.18		1.18
	12/17/92			6.10	1.42		1.42
	03/18/93			4.51	3.01		3.01
	05/14/93			5.78	1.74		1.74
	07/13/93			6.26	1.26		1.26
	09/30/93			7.06	0.46		0.46
	11/10/93			7.12	0.40		0.40
	01/24/94			6.58	0.94		0.94
	03/23/94			6.15	1.37		1.37
	05/02/94			6.06	1.46		1.46
	07/29/94			6.47	1.05		1.05
	09/26/94			6.50	1.02		1.02

TABLE 1 (cont.)

Water Level/LNAPL Data
Union Pacific Railroad
Oakland Fueling Area

Well No.	Date	Well Elev. Above M.S.L. (FT)	Depth to Product (FT)	Depth to Water (FT)	Water Level Elevation (FT)	Product Thickness (FT)	Corr Water Level Elevation* (FT)
OMW-9	05/11/92	6.64	3.41	7.65	-1.01	4.24	2.55
	06/09/92		5.09	8.17	-1.53	3.08	1.06
	07/07/92		5.28	8.42	-1.78	3.14	0.86
	08/11/92		5.29	9.45	-2.81	4.16	0.68
	09/04/92		5.70	9.56	-2.92	3.86	0.32
	10/13/92		5.70	6.88	-0.24	1.18	0.75
	11/12/92		5.23	6.44	0.20	1.21	1.22
	12/17/92		5.08	6.40	0.24	1.32	1.35
	03/18/93		3.01	6.69	-0.05	3.68	3.04
	05/14/93		4.38	10.37	-3.73	5.99	1.30
	07/13/93		5.57	6.79	-0.15	1.22	0.87
	09/30/93		5.86	9.81	-3.17	3.95	0.15
	11/10/93		6.06	9.61	-2.97	3.55	0.01
	01/24/94		5.41	7.71	-1.07	2.30	0.86
	03/23/94		4.91	9.10	-2.46	4.19	1.06
	05/02/94		4.52	4.54	2.10	0.02	2.12
	07/29/94		5.46	8.40	-1.76	2.94	0.71
	09/26/94		5.74	6.39	0.25	0.65	0.80
OMW-10	05/11/92	7.56		4.76	2.80		2.80
	06/09/92			5.42	2.14		2.14
	07/07/92			5.58	1.98		1.98
	08/11/92			5.83	1.73		1.73
	09/04/92			6.18	1.38		1.38
	10/13/92**			5.30	2.26		2.26
	11/12/92			5.41	2.15		2.15
	12/17/92			4.20	3.36		3.36
	03/18/93		3.93	4.00	3.56	0.07	3.62
	05/14/93		4.83	4.92	2.64	0.09	2.72
	07/13/93		5.64	5.67	1.89	0.03	1.92
	09/30/93		6.36	6.38	1.18	0.02	1.20
	11/10/93			6.55	1.01		1.01
	01/24/94			5.55	2.01		2.01
	03/23/94			4.81	2.75		2.75
	05/02/94			5.06	2.50		2.50
	07/29/94			6.94	0.62		0.62
	09/26/94			6.36	1.20		1.20
ORW-1	06/19/91	6.59	3.91	9.36	-2.77	5.45	1.81
	05/11/92		NOT GAUGED				
	06/09/92		NOT GAUGED				
	07/07/92		NOT GAUGED				
	08/11/92			8.39	-1.80		-1.80
	09/04/92			8.35	-1.76		-1.76
	10/13/92		6.95	8.15	-1.56	1.20	-0.55
	11/12/92		NOT GAUGED				
	12/17/92		8.30	8.35	-1.76	0.05	-1.72
	03/18/93		3.60	7.39	-0.80	3.79	2.38
	05/14/93			8.63	-2.04		-2.04
	07/13/93			8.60	-2.01		-2.01
	09/30/93		NOT GAUGED				
	11/10/93		NOT GAUGED				
	01/24/94		NOT GAUGED				

TABLE 1 (cont.)

Water Level/LNAPL Data
Union Pacific Railroad
Oakland Fueling Area

Well No.	Date	Well Elev. Above M.S.L. (FT)	Depth to Product (FT)	Depth to Water (FT)	Water Level Elevation (FT)	Product Thickness (FT)	Corr Water Level Elevation* (FT)
ORW-1 (cont.)	03/23/94		NOT GAUGED				
	05/02/94		NOT GAUGED				
	07/29/94		NOT GAUGED				
	09/26/94		NOT GAUGED				
ORW-2	06/19/91	6.79	4.36	4.38	2.41	0.02	2.43
	05/11/92		3.55	6.34	0.45	2.79	2.79
	06/09/92		NOT GAUGED				
	07/07/92		NOT GAUGED				
	08/11/92			9.30	-2.51		-2.51
	09/04/92			9.31	-2.52		-2.52
	10/13/92		8.20	9.20	-2.41	1.00	-1.57
	11/12/92		NOT GAUGED				
	12/17/92			9.45	-2.66		-2.66
	03/18/93		2.94	7.48	-0.69	4.54	3.12
	05/14/93			8.21	-1.42		-1.42
	07/13/93		9.30	9.41	-2.62	0.11	-2.53
	09/30/93		NOT GAUGED				
	11/10/93		NOT GAUGED				
	01/24/94		NOT GAUGED				
	03/23/94		NOT GAUGED				
	05/02/94		NOT GAUGED				
	07/29/94		NOT GAUGED				
	09/26/94		NOT GAUGED				
ORW-3	06/19/91	6.30	4.07	4.10	2.20	0.03	2.23
	05/11/92		3.24	5.31	0.99	2.07	2.73
	06/09/92		NOT GAUGED				
	07/07/92		NOT GAUGED				
	08/11/92			8.90	-2.60		-2.60
	09/04/92			8.75	-2.45		-2.45
	10/13/92			8.59	-2.29		-2.29
	11/12/92		NOT GAUGED				
	12/17/92			8.35	-2.05		-2.05
	03/18/93		2.90	5.71	0.59	2.81	2.95
	05/14/93			8.16	-1.86		-1.86
	07/13/93		9.08	9.46	-3.16	0.38	-2.84
	09/30/93		NOT GAUGED				
	11/10/93		NOT GAUGED				
	01/24/94		NOT GAUGED				
	03/23/94		NOT GAUGED				
	05/02/94		NOT GAUGED				
	07/29/94		NOT GAUGED				
	09/26/94		NOT GAUGED				

* Corrected water level elevation assumes product density of 0.84 g/cm3

** Gauging data for these may have been switched.

M.S.L. = Mean Sea Level

TABLE 2

Analytical Results
Groundwater Monitoring Wells
Union Pacific Railroad
Oakland Fueling Area

TEH

Well Number	Date Sampled	Total Petroleum Hydrocarbons (mg/L)	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)
OMW-1	05/11/92	<0.050	<0.0005	<0.0005	<0.0005	<0.0005
	08/11/92	0.060	<0.0005	<0.0005	<0.0005	<0.0005
	11/13/92	0.067	<0.0005	0.00061*	<0.0005	<0.0005
	05/14/93	<0.050	<0.0003	<0.0003	<0.0003	<0.0009
	11/10/93	<0.050	<0.0003	<0.0003	<0.0003	<0.0009
	05/02/94	<0.050	<0.0005	<0.0005	<0.0005	<0.0005
OMW-2	05/11/92	4.5	<0.0005	<0.0005	<0.0005	<0.0005
	08/11/92	2.7	<0.0005	<0.0005	<0.0005	<0.0005
	11/13/92	3.4	<0.0005	0.00057*	0.0011	0.0033
	05/14/93	<0.050	<0.0003	<0.0003	<0.0003	<0.0009
	11/10/93	<0.050	<0.0003	<0.0003	<0.0003	<0.0009
	05/02/94	<0.050	<0.0005	<0.0005	<0.0005	<0.0005
OMW-3	05/11/92	2.3	.0003J	0.0013	.0003J	0.0034
	08/11/92	5.8	<0.0005	0.00071	<0.0005	.0017
	11/13/92	110	<0.0005	0.00089*	0.0015	.0084
	05/14/93	0.180	<0.0003	0.036	<0.0003	.0027
	11/10/93	1.80	<0.0003	0.0005	<0.0003	<0.0009
	05/02/94	1.80	<0.0005	0.0023	<0.0005	0.00089
OMW-5	05/11/92	2.1	<0.0005	.0004J	<0.0005	0.0003
	08/11/92	2.1	<0.0005	<0.0005	<0.0005	<0.0005
	11/13/92	4.4	<0.0005	0.00078*	<0.0005	<0.0005
	05/14/93	11	<0.0003	0.0018	<0.0003	<0.0009
	11/10/93	<0.050	<0.0003	0.0006	<0.0003	<0.0009
	05/02/94	<0.050	<0.0005	<0.0005	<0.0005	<0.0005
OMW-6	05/11/92	0.52	<0.0005	<0.0005	<0.0005	0.0016
	08/11/92	0.55	<0.0005	<0.0005	<0.0005	<0.0005
	11/13/92	6.0	<0.0005	0.00077*	<0.0005	<0.0005
	05/14/93	0.18	<0.0003	<0.0003	<0.0003	<0.0009
	11/10/93	<0.050	<0.0003	<0.0003	<0.0003	<0.0009
	05/02/94	<0.050	<0.0005	<0.0005	<0.0005	<0.0005
OMW-8	05/11/92	0.24	<0.0005	<0.0005	<0.0005	<0.0005
	08/11/92	0.22	<0.0005	<0.0005	<0.0005	<0.0005
	11/13/92	0.26	<0.0005	0.00058*	<0.0005	<0.0005
	05/14/93	<0.050	<0.0003	<0.0003	<0.0003	<0.0009
	11/10/93	<0.050	<0.0003	<0.0003	<0.0003	<0.0009
	05/02/94	<0.050	<0.0005	<0.0005	<0.0005	<0.0005

TABLE 2 (cont.)

Analytical Results
Groundwater Monitoring Wells
Union Pacific Railroad
Oakland Fueling Area

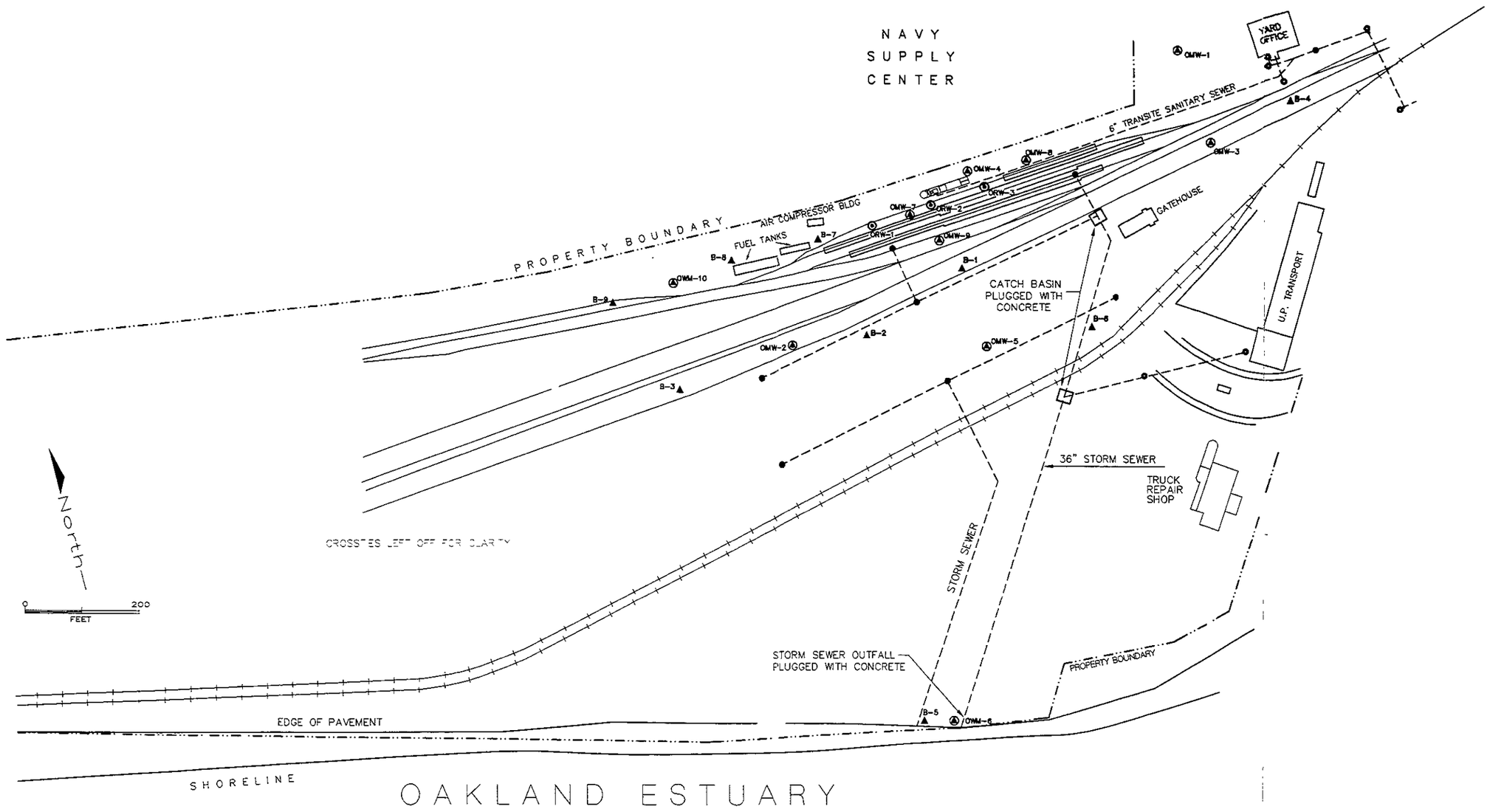
Well Number	Date Sampled	Total Petroleum Hydrocarbons (mg/L)	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)
OMW-10	05/11/92	2.1	0.033	<0.0005	<0.0005	0.0027
	08/11/92	1.3	0.0096	<0.0005	<0.0005	.00062
	11/13/92	2.8	0.0066	0.00084*	<0.0005	.00062
	05/14/93	****** NOT SAMPLED – Well Contained Product**********				
	11/10/93	2.6	0.0043	0.0011	<0.0003	.00012
	05/02/94	2.6 =2,600	0.00052	<0.0005	<0.0005	<0.0005

NOTES J = Estimated value below reporting limit.

Due to the presence of product, recovery wells ORW-1, ORW-2, ORW-3, and monitoring wells OMW-4, OMW-7, and OMW-9 are not sampled.

* 0.00062 mg/L was detected in the Trip Blank.

FIGURES

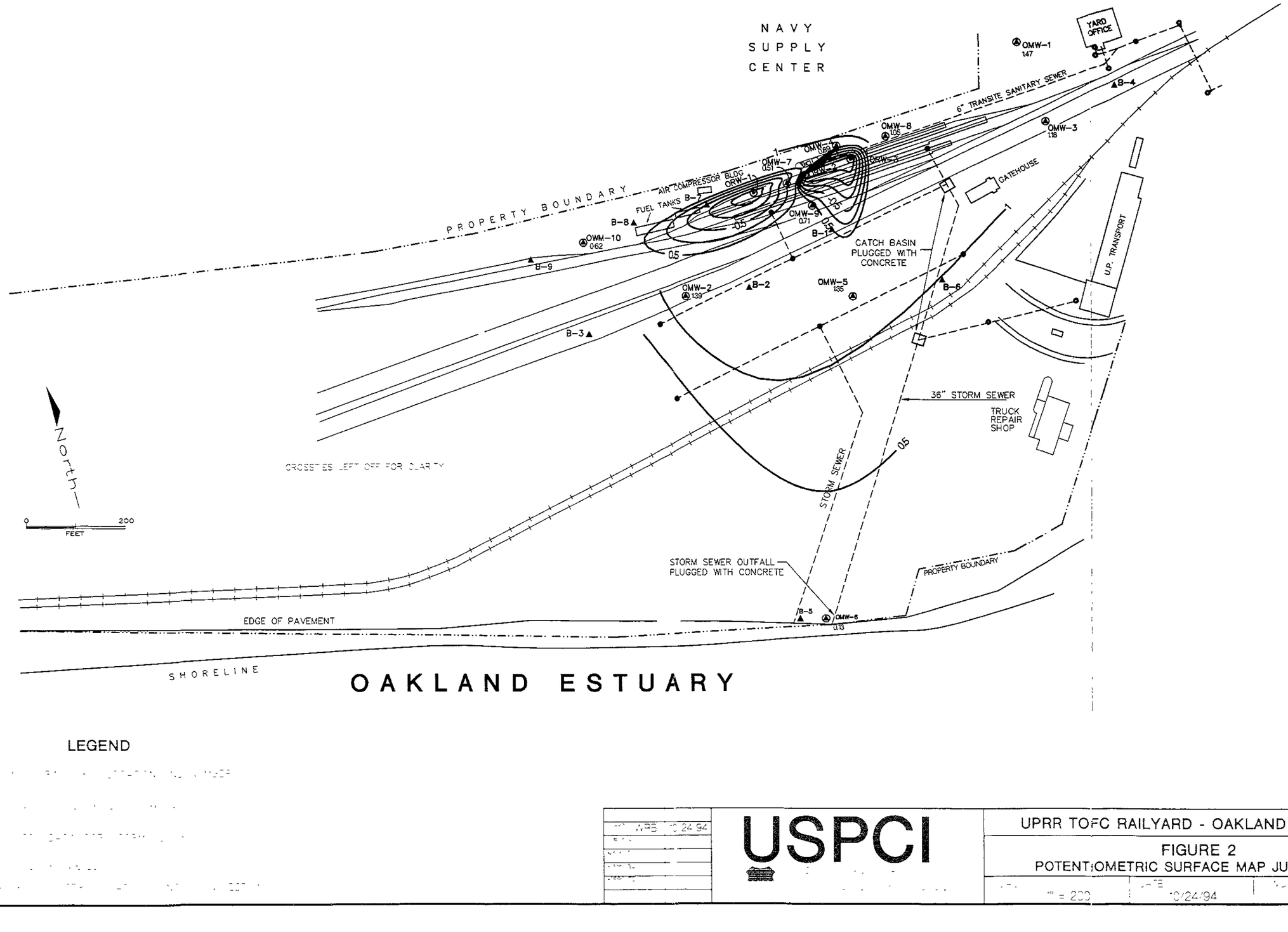


LEGEND

USPCI

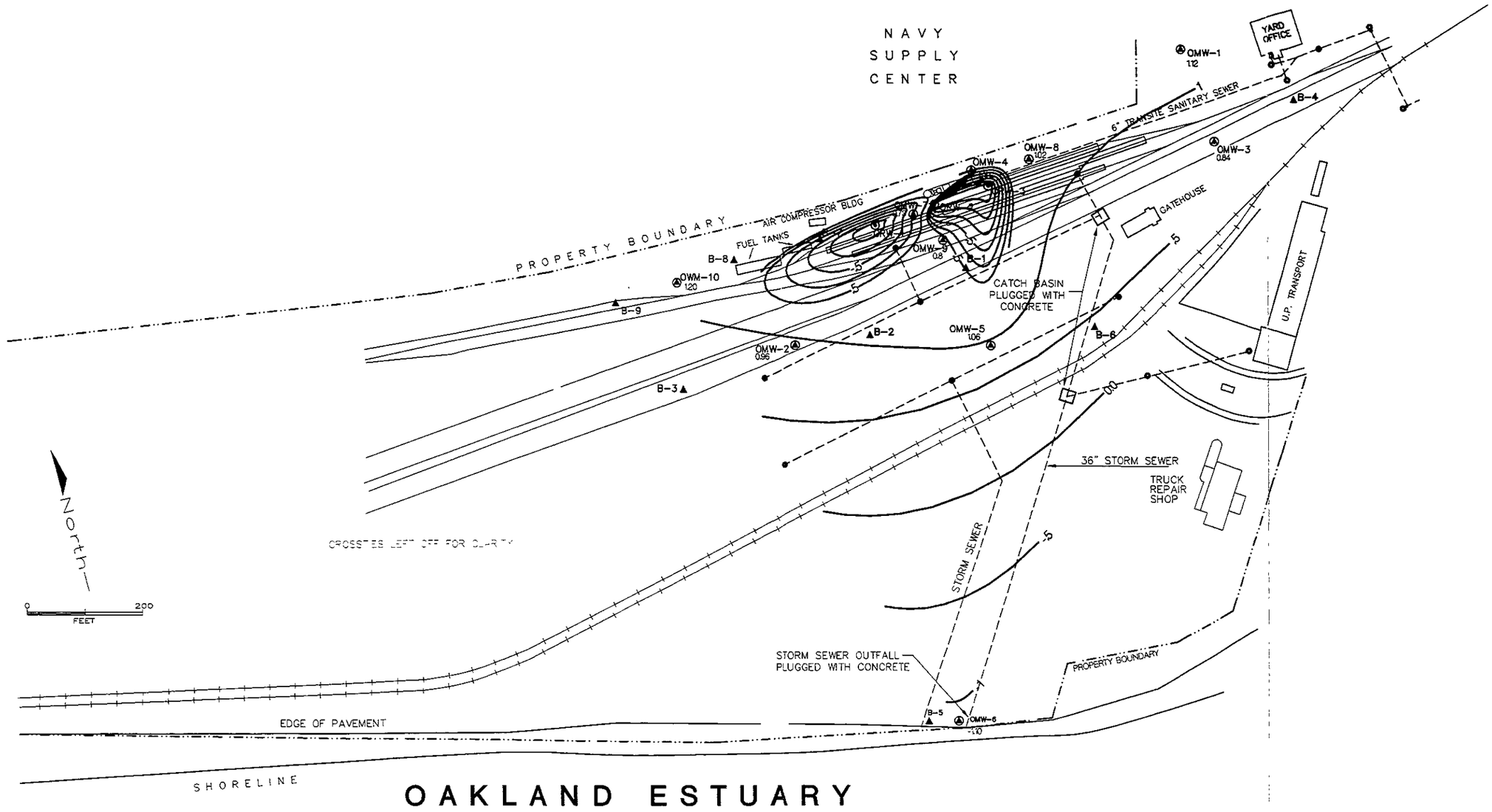
UPRR TOFC RAILYARD - OAKLAND CALIFORNIA

FIGURE 1
SITE MAP



LEGEND

		USPCI	UPRR TOFC RAILYARD - OAKLAND CALIFORNIA
			FIGURE 2 POTENTIOMETRIC SURFACE MAP JULY 29, 1994
			1" = 200 | 10/24/94 | 96199-41



LEGEND

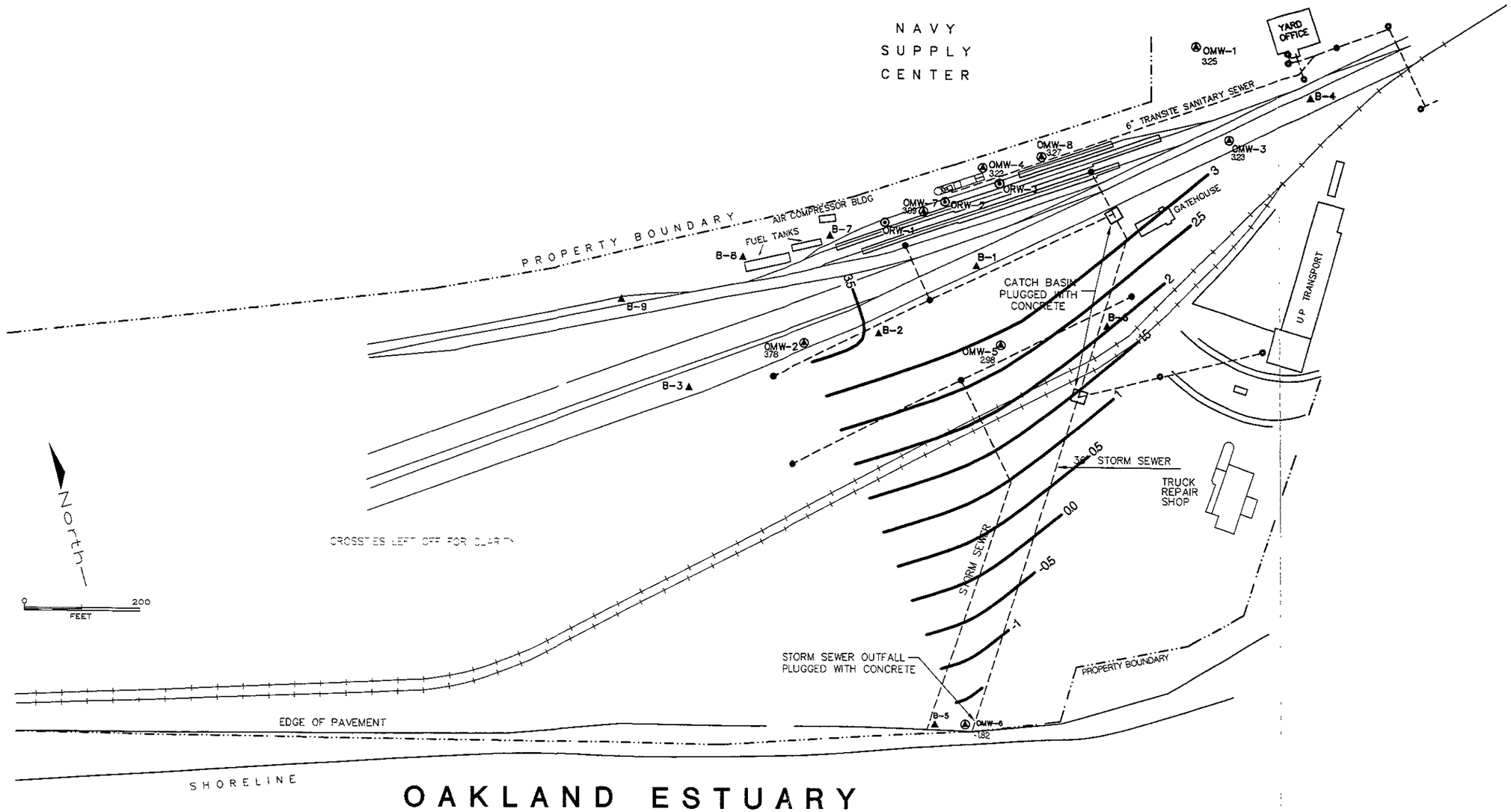
		WRB	10/24/94

USPCI

UPRR TOFC RAILYARD - OAKLAND CALIFORNIA

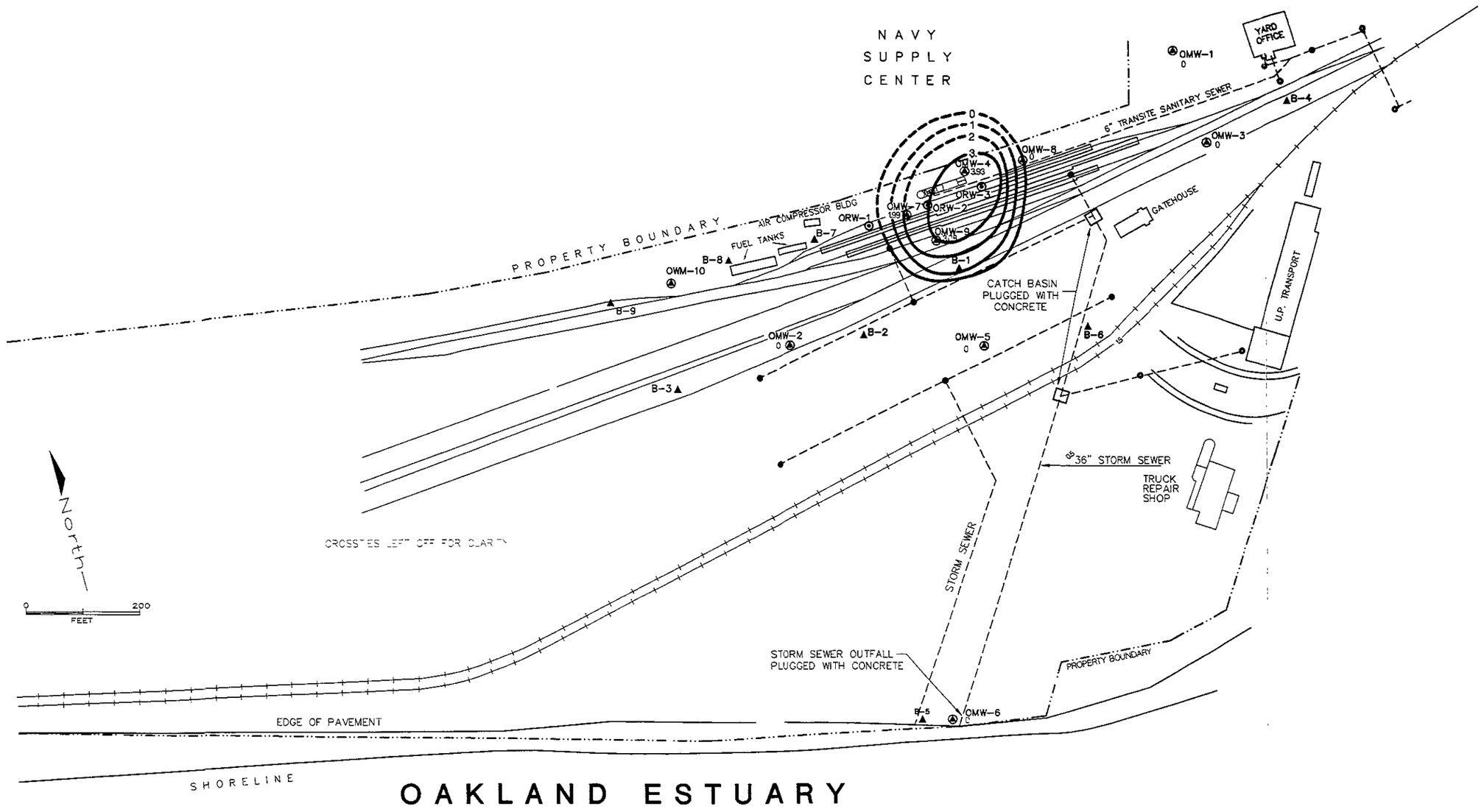
FIGURE 3
POTENTIOMETRIC SURFACE MAP SEPT. 26, 1994

1" = 200	10/24/94	96'99-40



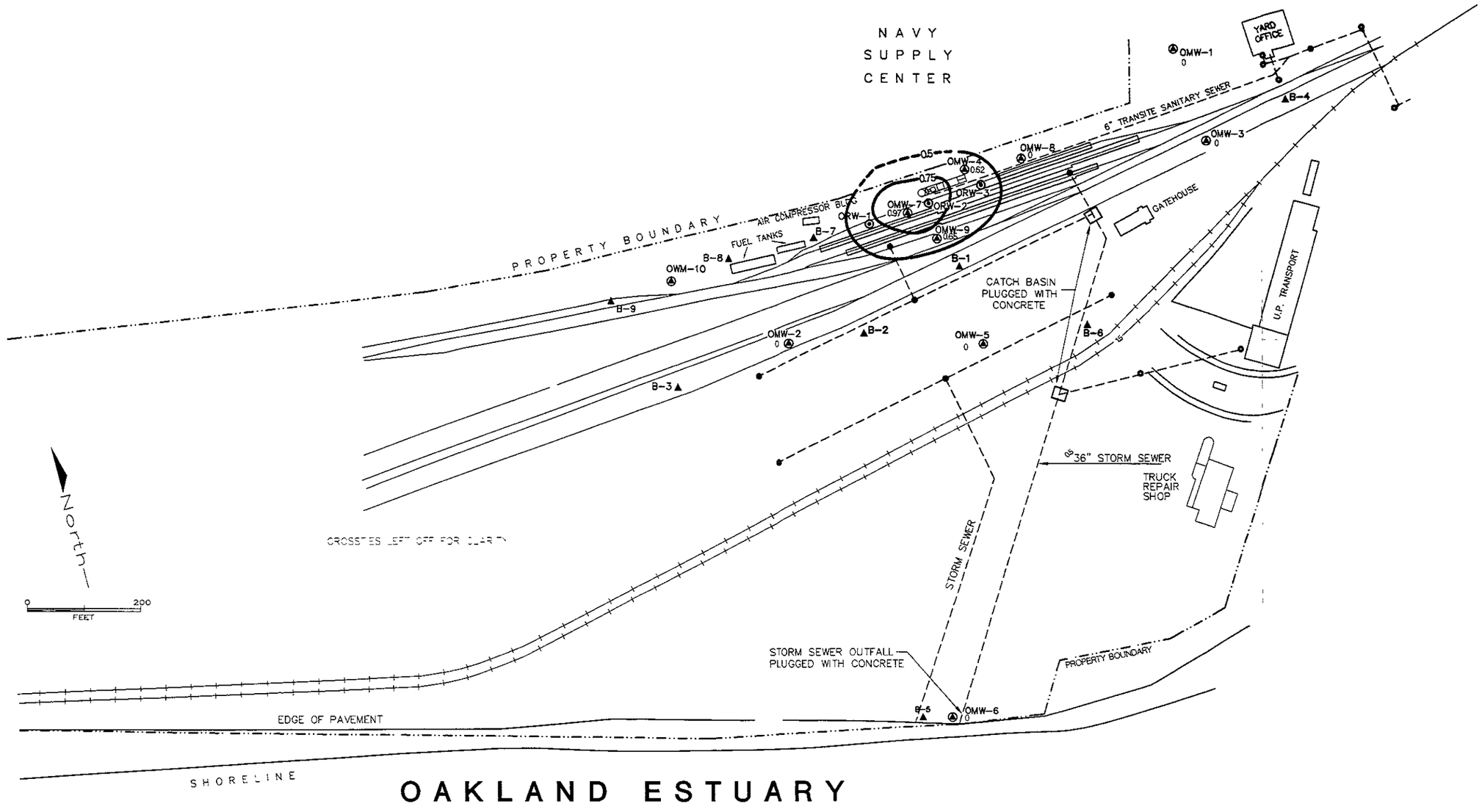
LEGEND

	USPCI	UPRR TOFC RAILYARD - OAKLAND CALIFORNIA
		FIGURE 4 POTENTIOMETRIC SURFACE MAP APRIL 9, 1991
		1" = 200' | 10/26/94 | 96199-36



LEGEND

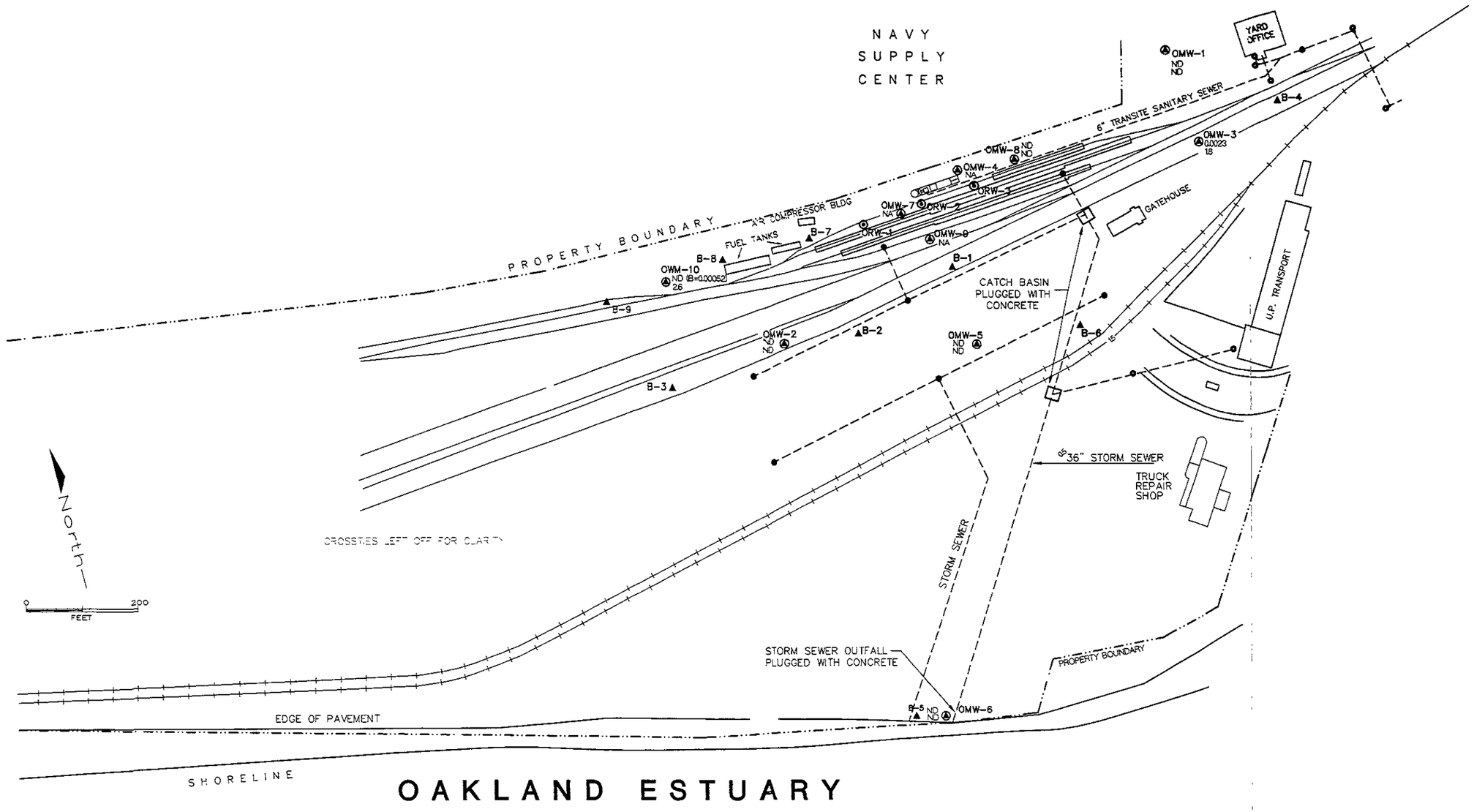
	USPCI	UPRR TOFC RAILYARD - OAKLAND CALIFORNIA
		FIGURE 5 LNAPL THICKNESS MEASURED IN MONITORING WELLS JUNE 1992
		1" = 200 | 12/21/94 | 96199-38



LEGEND

▲	[illegible]
▲	[illegible]
○	[illegible]
◉	[illegible]
⁄	[illegible]
—	[illegible]

APP 10/21/94	USPCI	UPRR TOFC RAILYARD - OAKLAND CALIFORNIA
		FIGURE 6 LNAPL THICKNESS MEASURED IN MONITORING WELLS SEPT 1994
		SCALE 1" = 200' | DATE 10/21/94 | JOB # 96199-39



LEGEND

▲ [illegible]

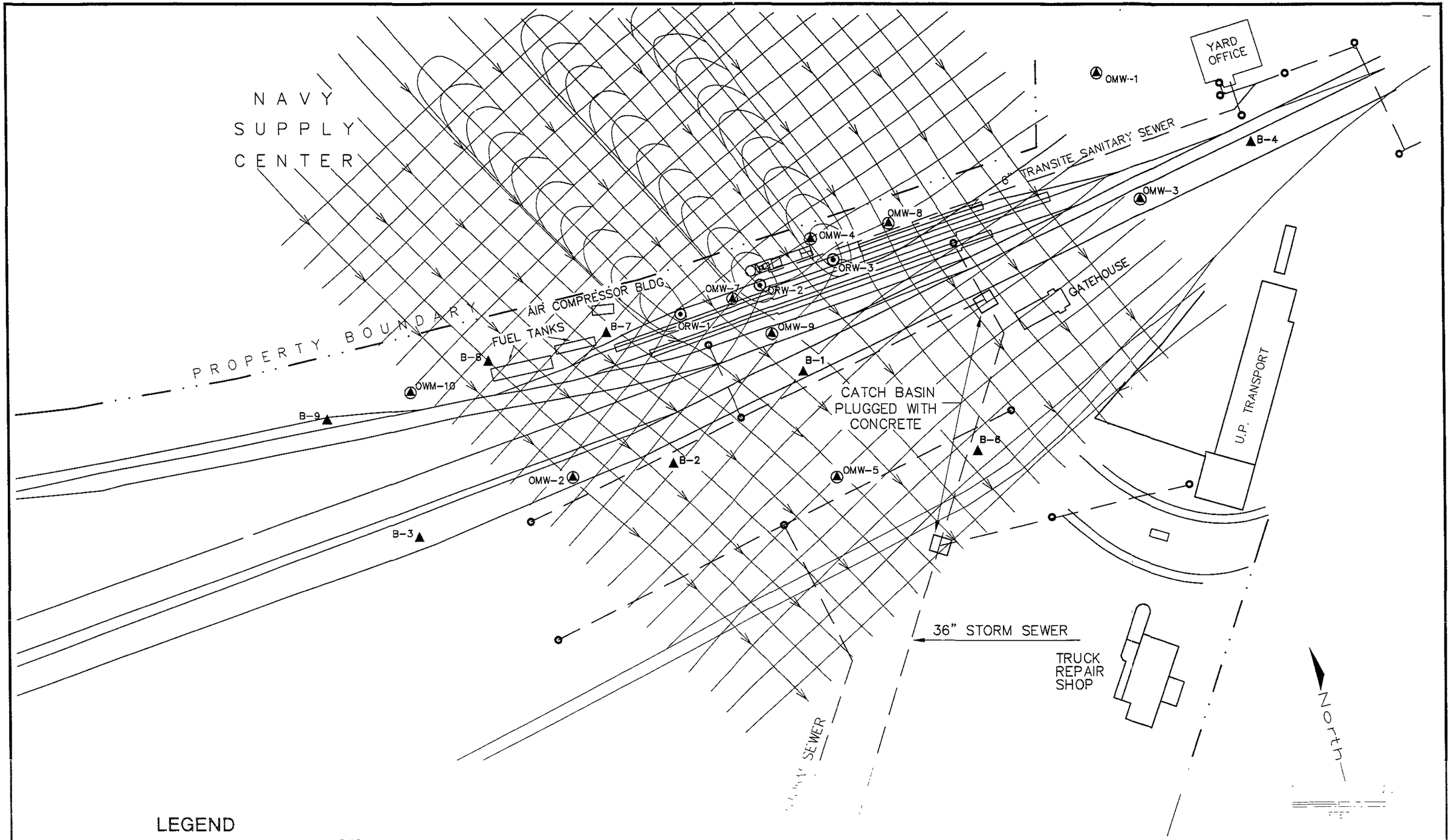
▲ [illegible]

○ [illegible]

◉ [illegible]

OMW-3 [illegible]

DRN APR 0 2'94	USPCI	UPRR TOFC RAILYARD - OAKLAND CALIFORNIA	
		FIGURE 7 DISSOLVED BTEX AND TPH IN MONITORING WELLS, MAY 1994	
		SCALE 1" = 200	DATE 10/21/94
			DWG NO 96199-37



USPCI

UPRR TOFC RAILYARD - OAKLAND, CALIFORNIA

FIGURE 8
RESULTS OF THE PATHLINE SIMULATION

SCALE 1" = 120'

DWG. NO. 96199-43