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JAMES RIVER CORPORATION

SECOND YEAR, FOURTH QUARTER GROUNDWATER MONITORING RESULTS, COATED PRODUCTS DIVISION

NOVEMBER 19, 1992

26-89-064

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DEPT OF ENVIRONMENTAL QUALITY
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November 19, 1992

Mr. David Ernst
Plant Maintenance Manager
James River Corporation
3400 North Marine Drive
Portland, Oregon 97217

13-5935-03

Subject: Second Year, Fourth Quarter, Groundwater Monitoring Results, Coated Products Division, James River Corporation, North Portland Facility

Dear Mr. Ernst:

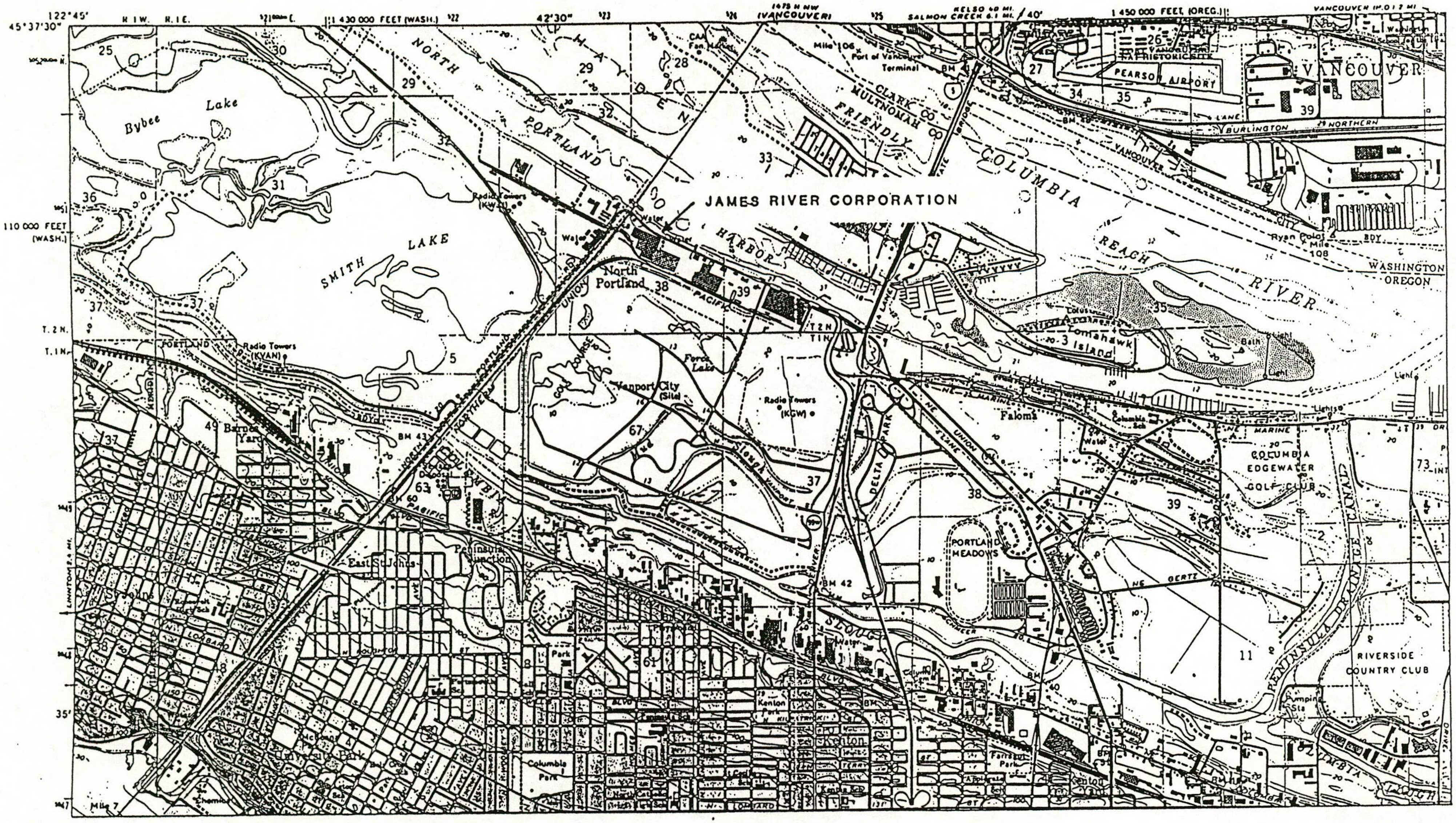
This report presents the results of the second year, fourth quarter, groundwater monitoring (QGWM) event conducted at the Coated Products Division (CPD) of the James River Corporation (JRC), North Portland facility (Figure 1). This round of QGWM is part of the continuing QGWM program which was initiated at the CPD by Brown and Caldwell Consultants (BCC) in February 1990. The purpose of the QGWM program is to monitor the degree and extent of shallow groundwater contamination beneath the Press Room and Gasoline UST areas of the CPD in connection with seasonal groundwater fluctuations.

This CPD sampling event was completed by BCC on February 6, 1992. The work was authorized under Purchase Order No. 90106761 and was performed in accordance with the July 6, 1989, contract between JRC and BCC.

This report includes a brief summary of previous investigations completed at the CPD followed by a detailed discussion of the groundwater monitoring results for this sampling event.

INVESTIGATIVE HISTORY

Previous investigations and remedial activities at the CPD have included the decommissioning of six underground storage tanks (USTS), a follow-up soil and groundwater investigation, and one year of QGWM.



JAMES RIVER CORPORATION

VICINITY SITE MAP

FIGURE 1

CPD Tank Decommissioning - April 1989

In April 1989 five alcohol-solvent USTs were excavated from the Press Room UST area and one gasoline UST was excavated from the Gasoline UST area of the CPD (Figures 2 and 3). Laboratory analysis of soil samples collected from the Press Room UST excavation revealed elevated concentrations of methanol, ethanol, normal propanol, isopropanol, butanol, hexanol, acetone, toluene, methyl isobutyl ketone (MIBK), and ethyl acetate. Analysis of soil and groundwater samples collected from the Gasoline UST excavation indicated the presence of benzene, toluene, ethylbenzene, and xylene (BTEX). A detailed summary of this investigation is included in Appendix B-1 of the November 28, 1989, BCC report entitled, "Soil and Groundwater Investigation Coated Products Division Portland, Oregon."

Contaminated soils that were removed from each excavation were placed in separate piles and allowed to aerate until October 1989. Subsequent laboratory analysis of soil samples from each aeration pile confirmed the effectiveness of aeration, and upon approval by the Oregon Department of Environmental Quality (DEQ), the soils were used to backfill the respective UST excavations.

Follow-Up CPD Soil and Groundwater Investigation - September 1989

In response to the soil and groundwater contamination documented during CPD tank decommissioning procedures, BCC conducted a follow-up soil and groundwater investigation in the areas surrounding the former Press Room and Gasoline UST excavations. The investigation included a soil vapor survey, installation of six groundwater monitoring wells, soil and groundwater sampling and analysis, and measurement of groundwater elevations to determine the shallow groundwater gradient. A detailed discussion of this investigation is included in the November 28, 1989, BCC report entitled, "Soil and Groundwater Investigation Coated Products Division, Portland, Oregon."

Press Room UST Area. Based on the results of the soil vapor survey, groundwater monitoring wells JR-1, JR-2 and JR-3 were installed near the former Press Room UST excavation (Figure 2). JR-1 and JR-3 were completed at a depth of 25 feet below grade (bg) and screened from 10 to 25 feet bg; JR-2 was completed at a depth of 23 feet bg and screened from 8 to 23 feet bg.

Laboratory analysis of soil samples collected during the construction of these wells detected toluene concentrations between 0.2 ppm and 0.3 ppm in samples collected at 2 feet bg from JR-1 and JR-3, and 10 feet bg from JR-2. The JR-2 sample also contained isopropyl alcohol, acetone, MIBK, and methyl ethyl ketone (MEK) at concentrations of 1,333 ppm, 14 ppm, 9 ppm, and 1 ppm, respectively.

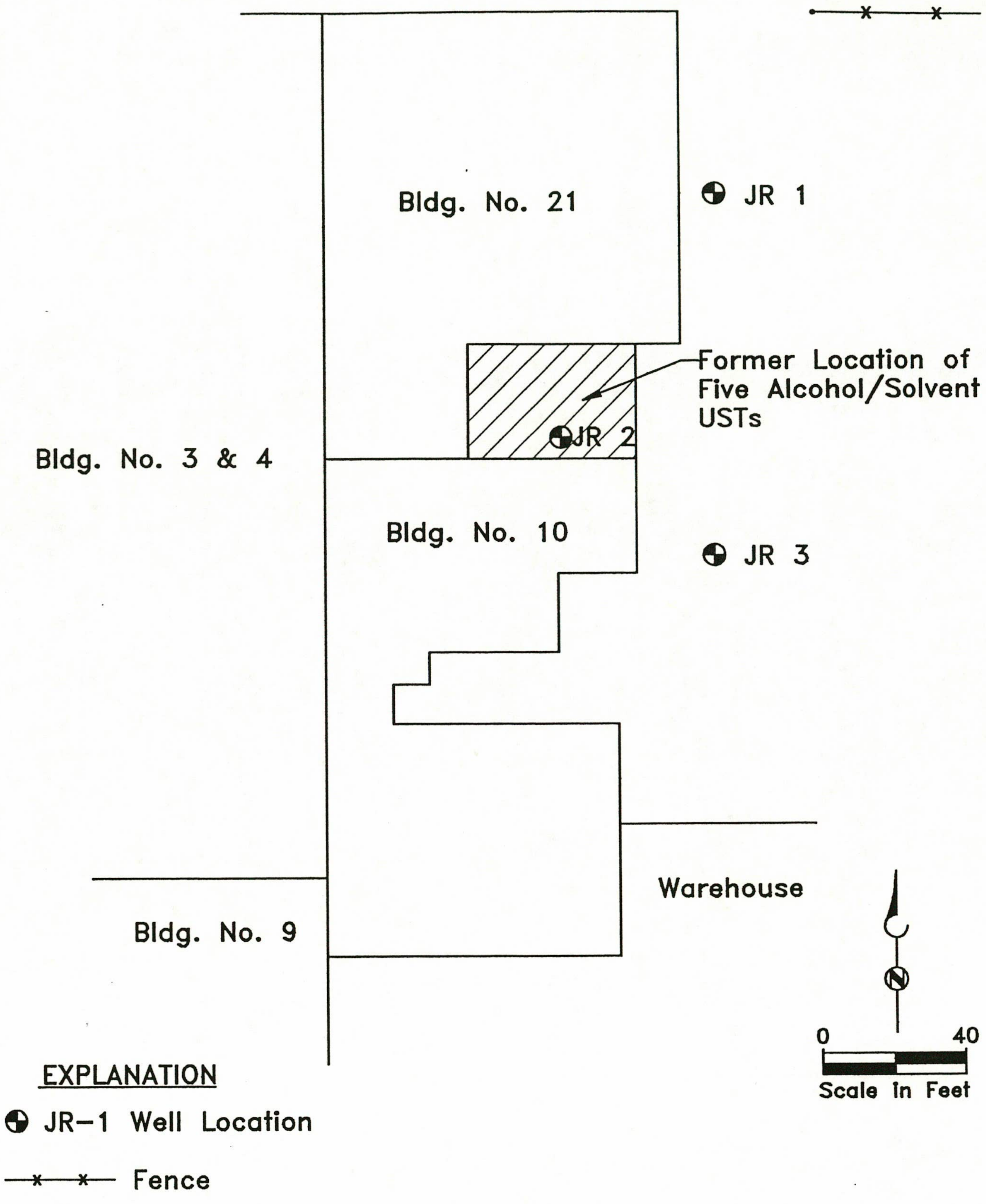


FIGURE 2
PRESS ROOM AREA
COATED PRODUCTS
MONITORING WELL LOCATIONS

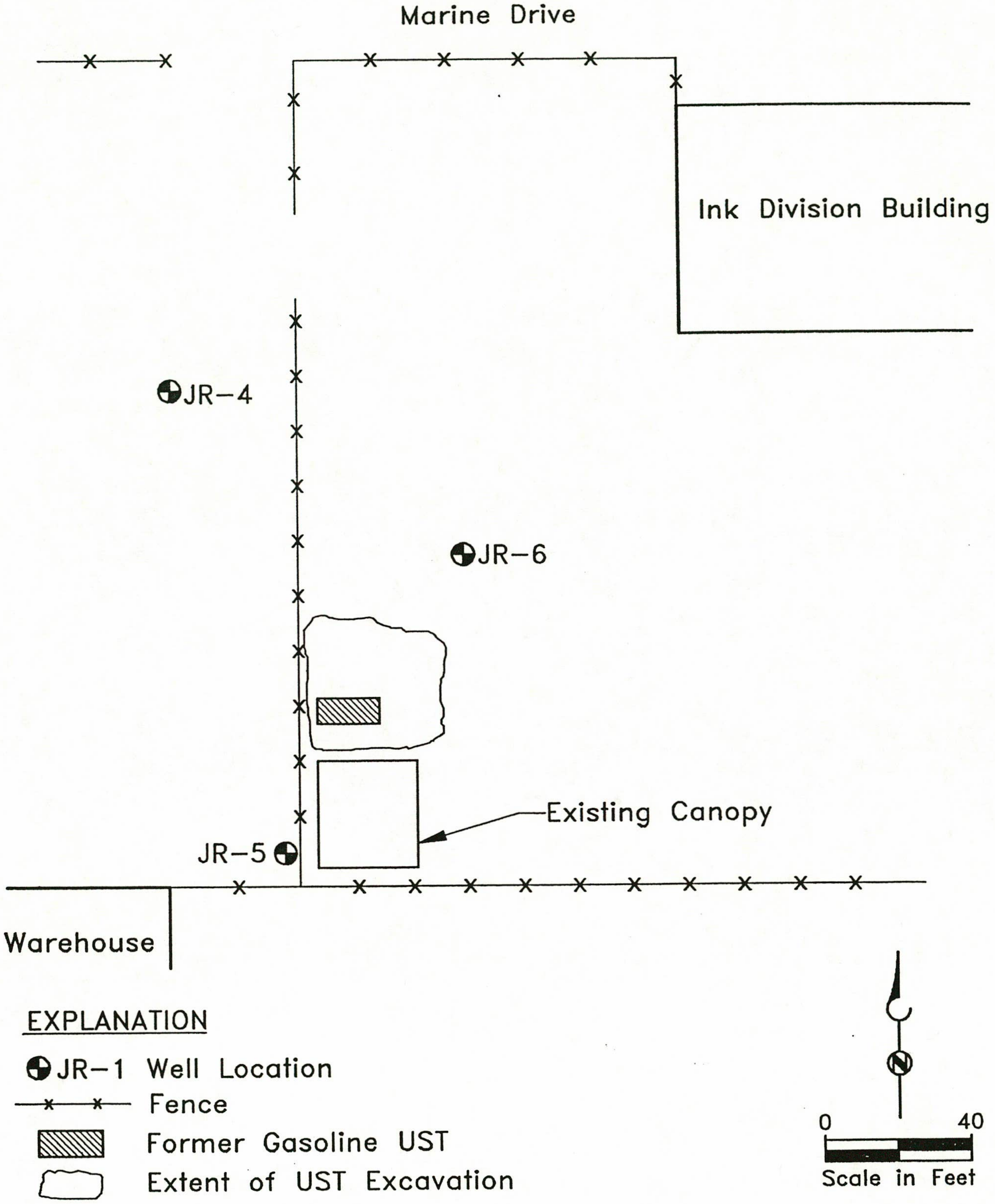


FIGURE 3
GASOLINE UST AREA
COATED PRODUCTS
MONITORING WELL LOCATIONS

Laboratory analysis of groundwater samples collected from JR-1, JR-2, and JR-3, revealed elevated concentrations of isopropyl alcohol (7,800 ppb), acetone (1,500 ppb), and MIBK (440 ppb) in JR-2. No compounds were identified above laboratory method detection limits (MDL) in groundwater samples from JR-1 and JR-3.

Groundwater elevations in the three Press Room monitoring wells were 11.98 feet in JR-1, 12.24 feet in JR-2, and 12.30 feet in JR-3. These measurements indicated a gently sloping groundwater gradient of 0.23 feet per 100 feet with groundwater flowing from south-southwest to north-northeast (N18°E).

Gasoline UST Area. Groundwater monitoring wells JR-4, JR-5 and JR-6 were installed near the former gasoline UST excavation (Figure 3). Each of these wells were completed at a depth of 20 feet bg and screened from 5 to 15 feet bg.

Laboratory analysis of soil samples collected during the construction of these wells detected TPH concentrations of 140 ppm and 360 ppm in samples collected at 2 feet bg from JR-5 and JR-6, respectively. Samples collected from JR-4, JR-5 and JR-6 at 5 feet bg had lower TPH concentrations of 17 ppm, 100 ppm and 17 ppm, respectively. The hydrocarbon identification (HCID) analysis, performed on samples from JR-5 and JR-6 did not indicate the presence of hydrocarbons within a carbon range of C_6 - C_{25}.

Laboratory analysis of groundwater samples collected from JR-4, JR-5, and JR-6, revealed elevated concentrations of benzene (120 ppb), ethylbenzene (14 ppb), and xylene (960 ppb) in JR-5. No BTEX constituents were identified above laboratory MDLs in groundwater samples from JR-4 and JR-6.

Groundwater elevations in the three Gasoline UST area monitoring wells were 16.55 feet in JR-4, 16.83 feet in JR-6, and 17.53 feet in JR-5. These measurements indicated a gently sloping groundwater gradient of 0.70 feet per 100 feet with groundwater flowing from south-southwest to north-northeast (N10°E).

QUARTERLY GROUNDWATER MONITORING

QGWM at the Press Room and Gasoline UST areas consisted of seven sampling events conducted in February, June, and September 1990, and January, April, August, and November 1991. During each sampling event, groundwater elevations were recorded, and groundwater samples were collected and analyzed from JR-1, JR-2, JR-3, JR-4, JR-5, and JR-6. Groundwater elevations measured during each of the QGWM events are listed in Appendix A. Analytical results for previous QGWM events are included in the February 4, 1992, BCC report entitled, "Second Year, Third Quarter, Monitoring Results Coated Products Division, James River Corporation, North Portland Facility."

Second Year, Fourth Quarter, Groundwater Monitoring Event

This groundwater monitoring event was conducted by BCC on February 6, 1992. Field activities included the measurement of static water levels (SWL), and the purging and sampling of groundwater from the monitoring wells in the Press Room UST area (JR-1, JR-2 and JR-3) and the Gasoline UST area (JR-4, JR-5 and JR-6). In addition, five quality control (QC) samples including duplicate samples from JR-2 and JR-5, a trip blank, and two rinsate blanks were collected.

Fieldwork and Sampling Methodology. Sampling was performed according to EPA guidelines described in the *Compendium of Superfund Field Operations Methods* (EPA 1987). After SWLs in all of the monitoring wells were recorded, 3 to 6 well volumes were purged from each well using a stainless steel bailer. Purging was continued until groundwater parameters (temperature, pH, and specific conductance) stabilized to within a 10 percent variance. A record of the groundwater parameters measured during the purging and sampling of each well is included in Appendix B.

After purging was completed, groundwater samples were collected with a teflon bailer and then transferred into the appropriate sampling containers using a controlled flow valve. Excess water generated during purging and sampling was stored in 55-gallon drums for subsequent disposal by JRC.

Teflon and stainless steel bailers were decontaminated prior to sampling each well. The decontamination procedure included an Alconox detergent wash followed by a tap water rinse and a deionized water rinse. Two QC rinsate blanks were collected to test the effectiveness of the decontamination process. The rinsate blanks were prepared from laboratory grade deionized water which had been passed through a freshly decontaminated teflon bailer.

A QC trip blank, which consisted of two 40 milliliter VOA vials filled with laboratory grade deionized water, was prepared by Pacific Environmental Laboratory Inc., (PEL) in Beaverton, Oregon. The trip blank was transported to the site in the sample cooler, and remained on site throughout the QGWM event. After sampling was completed, the trip blank was returned to PEL with the rest of the QGWM samples.

All QGWM samples were preserved in ice immediately after collection and delivered to PEL for analysis. A copy of the sample chain-of-custody document is included in Appendix C.

Analytical Program. The analytical program for this investigation was designed in accordance with Environmental Protection Agency (EPA) handling and analytical requirements outlined in the *User's Guide to the Contract Laboratory Program* (EPA 1986). Gasoline UST samples 1001 (trip blank), 1002 (rinsate blank), 1003 (JR-4), 1004 (JR-6), 1005 (JR-5), 1006 (JR-5 duplicate) were analyzed for aromatic volatile organic compounds (BTEX) using EPA Method 8020. Samples 1003, 1004, 1005, and 1006 were also analyzed for ethylene dibromide (EDB) using GC/MS purge-and-trap method and for organic lead using the "organo-lead" method. Samples 1003 and 1004 were also analyzed for carcinogenic polynuclear aromatic hydrocarbons (PAH) using EPA Method 8270 Modified. Press Room UST samples 1007 (JR-1), 1008 (JR-3), 1009 (JR-2), 1010 (JR-2 duplicate) and 1011 (rinsate blank) were analyzed for volatile organic compounds using EPA Method 8240.

Press Room UST Area Analytical Results. The second year, fourth quarter analytical results for samples collected from the Press Room UST area are included in Appendix D and summarized in Table 1.

Table 1. Second Year, Fourth Quarter, Groundwater Analytical Results Summary
Press Room UST Area - February 1992

	Volatile Organic Compound Analysis[a]				
Sample No.	Sample location	Acetone	MIBK[c]	Isopropyl Alcohol	Ethanol
1007	JR-1	<10	<5.0	<100	<100
1008	JR-3	<10	<5.0	<100	<100
1009	JR-2	<10	<5.0	<100	<100
1010	JR-2[b]	<10	<5.0	<100	<100
1011	Rinsate Blank	<10	<5.0	<100	<100

[a] EPA Method 8240, concentrations in parts per billion (ppb).
[b] Duplicate sample.
[c] MIBK is reported as 4-methyl-2 pentanone in laboratory analytical report.

Acetone, MIBK, isopropyl alcohol and ethanol were not detected in JR-1, JR-2, and JR-3 at or above laboratory MDLs of 10 ppb, 5.0 ppb, 100 ppb, and 100 ppb, respectively. However, Z-Butanone (MEK) was detected in JR-1 and JR-3 at 15 ppb and 11 ppb, respectively.

Analysis of the rinsate blank (1011), and duplicate sample of JR-2 (1010) did not indicate any apparent quality control problems resulting from sample handling, field decontamination or analytical procedures.

Groundwater elevations in the three Press Room UST area wells during the second year, fourth QGWM event were 11.70 feet in JR-1, 12.06 feet in JR-2, and 12.11 feet in JR-3. These measurements indicated a relatively gentle groundwater gradient of 0.41 feet per 100 feet with groundwater flowing from south-southwest to north-northeast (N23°E) (Figure 4).

Gasoline UST Area Analytical Results. The analytical results for samples collected from the Gasoline UST area are included in Appendix D and summarized in Table 2.

Table 2. Groundwater Analytical Results Summary, Press Room UST Area
Coated Products Division, February 1992

Sample No.	Sample location	Aromatic Volatile Organic Compound Analysis[a]				EDB[b]	PAH[c]	Organic lead[d]
		Benzene	Toluene	Ethylebenzene	Total Xylenes			
1001	Trip Blank	<0.50	<0.50	<0.50	0.50	-	-	-
1002	Rinsate Blank	<0.50	0.50	<0.50	0.50	-	-	-
1003	JR-4	<1.0	<1.0	<1.0	<1.0	<1.0	<0.10	<100
1004	JR-6	<1.0	<1.0	<1.0	<1.0	<1.0	<0.10	<100
1005	JR-5	84	9.1	<5.0	130	<1.0	<0.10	<100
1006	JR-5[e]	83	7.2	<5.0	120	<1.0	<0.10	<100
DEQ-MCL[f]		5	2,000	700	10,000	5	0.10-0.40	5

[a] Volatile aromatic analysis (benzene, toluene, ethylbenzene, total xylenes) by EPA Method 8020,2 concentration in parts per billion (ppb).

[b] Ethylene dibromide analysis by GC/MS purge-and-trap method, concentration in ppb.

[c] Carcinogenic polynuclear aromatic hydrocarbon analysis by EPA Method 8270 Modified, concentration in ppb.

[d] Organic lead analysis by the "organo-lead" method, concentration in ppb.

[e] QA/QC duplicate sample collected from JR-5.

[f] DEQ maximum contaminant levels, based on EPA's primary drinking water standards, concentrations in ppb.

- Analysis not required.

CAD DWG 5935FIG4

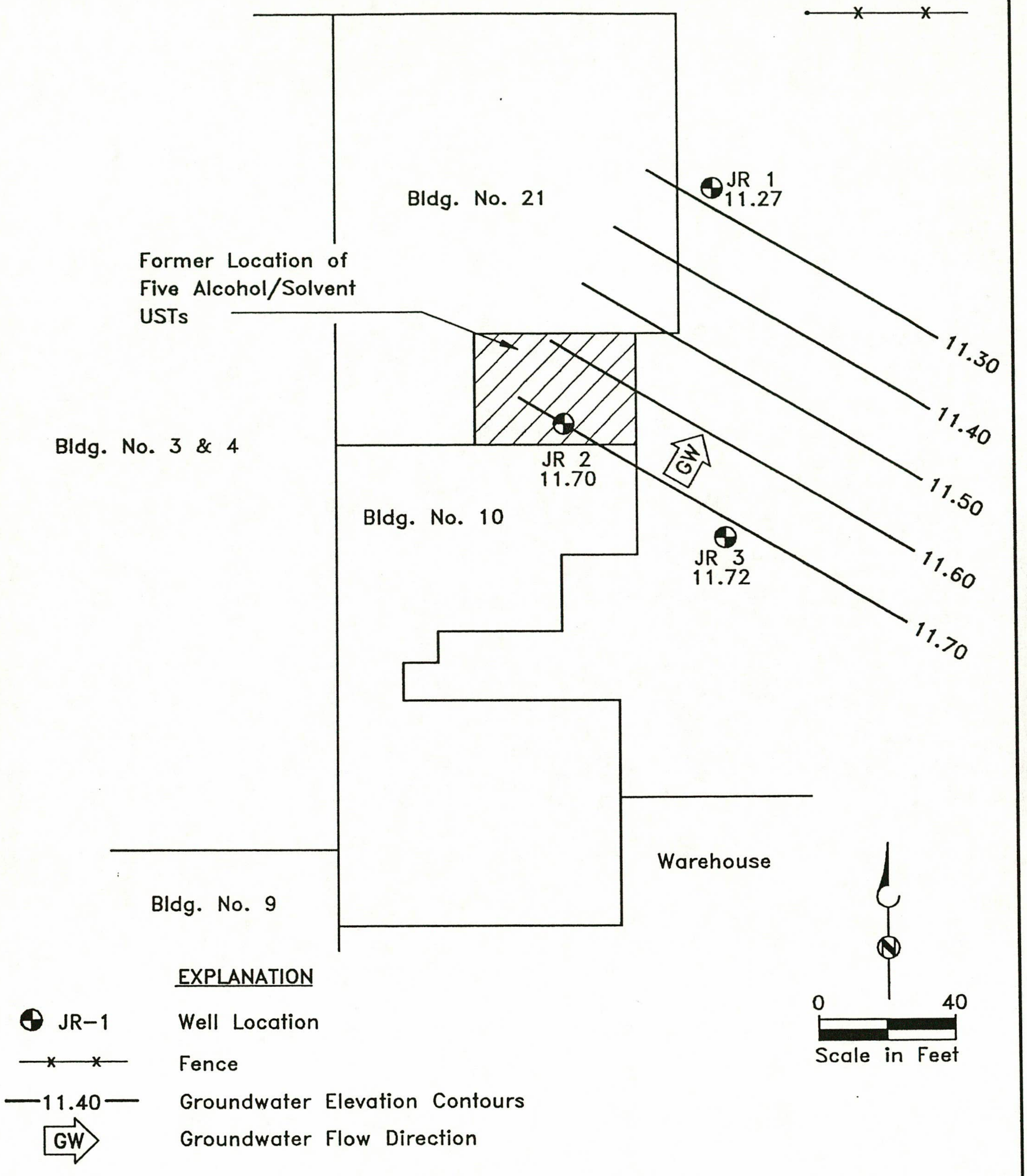


FIGURE 4
PRESS ROOM AREA
SECOND YEAR THIRD QUARTER
GROUNDWATER ELEVATION MAP

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Consultants

Analytical results identified benzene, toluene, and total xylenes in JR-5 at concentrations of 84 ppb, 9.1 ppb, and 130 ppb, respectively. Aromatic volatile organic compounds were not detected at or above laboratory MDLs in groundwater samples from JR-4 and JR-6. Variable laboratory MDLs for BTEX were due to variable dilution factors that were necessary to screen out matrix background interference in these samples. Organic lead, carcinogenic PAHs, and EDB concentrations were not detected in any of the wells at or above laboratory MDLs.

Analysis of the trip blank (1001), rinsate blank (1002), and duplicate sample of JR-5 (1006) did not indicate any apparent quality control problems resulting from sample handling, field decontamination or analytical procedures.

Groundwater elevations in the three Gasoline UST area wells during the second year, second QGWM event, were 14.39 feet in JR-4, 17.27 feet in JR-5, and 14.82 feet in JR-6. These measurements indicated a relatively steep groundwater gradient of 2.27 feet per 100 feet with groundwater flowing from south-southwest to north-northeast (N18°E) (Figure 5).

Discussion

A discussion of these results as they pertain to both the Press Room UST area and the Gasoline UST area follows.

Press Room UST Area. Since the initiation of groundwater monitoring in the Press Room UST area, significant groundwater contamination has only been identified in samples collected from JR-2. Table 3 contains a list of the analytical results from all the JR-2 groundwater samples collected to date.

During the second year, third quarter, acetone and MIBK concentrations decreased significantly in JR-2 compared to the previous monitoring events. The second year, fourth quarter analytical results indicate that this trend has continued in the Press Room UST area. The high acetone and MIBK levels detected during the first year through the second year, second quarter of monitoring decreased to below laboratory MDLs. The sudden decrease in acetone and MIBK levels may be related to groundwater levels, movement of a "slug" of contamination past our wells, or simply degradation by naturally occurring organisms in the soil. The DEQ generally needs a complete year of monitoring to confirm that water quality remains at acceptable levels in cases like this. Isopropyl alcohol concentrations appear to have stabilized below laboratory MDLs as compared to the relatively high levels detected in the first year QGWM events. Ethanol remained below laboratory MDLs despite its occurrence during the second and third quarters of the first year at concentrations of 22,000 ppb and 23,000 ppb respectively (Table 3).

CAD DWG 5935FIG5

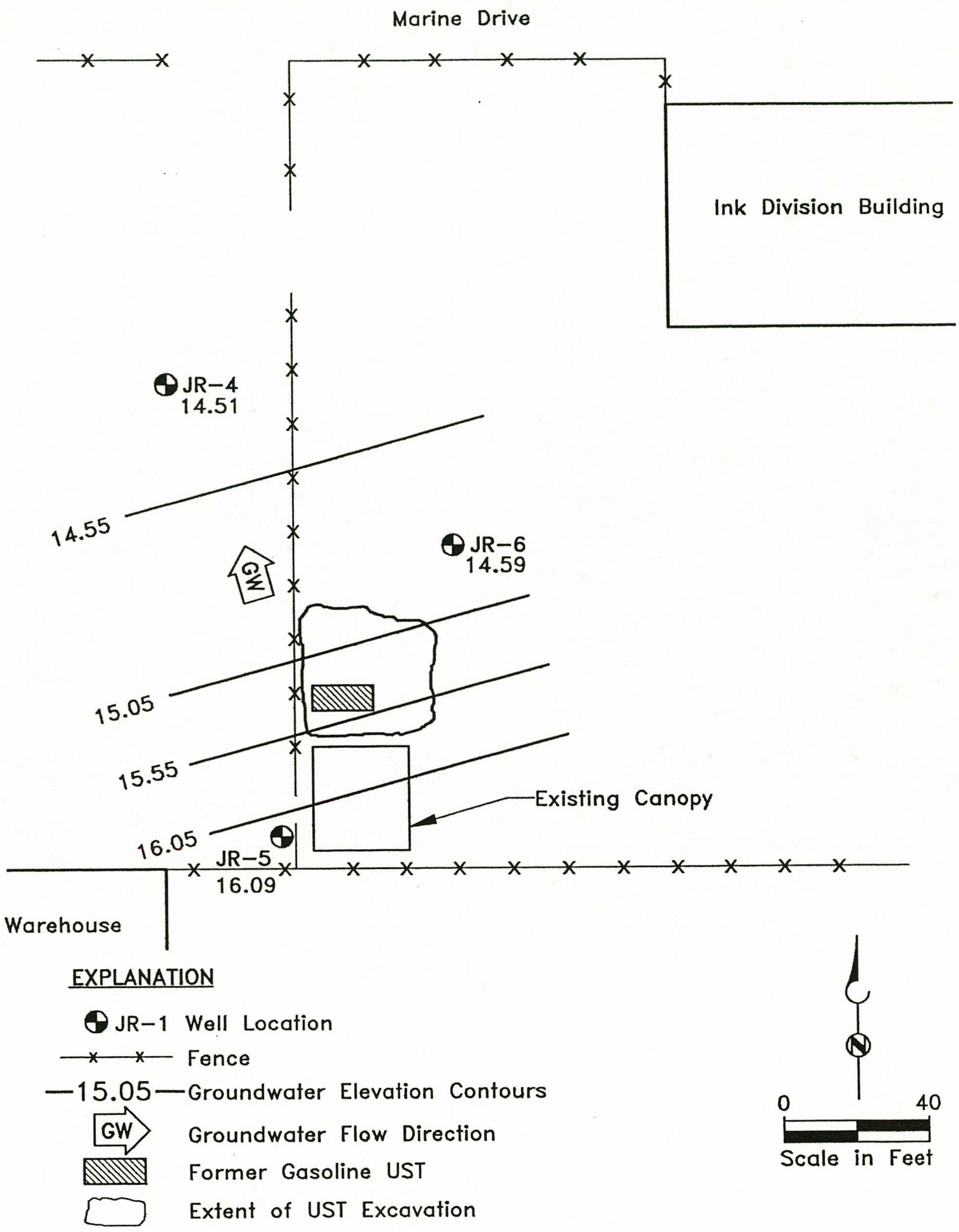

FIGURE 5
GASOLINE UST AREA
SECOND YEAR THIRD QUARTER
GROUNDWATER ELEVATION MAP

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Table 3. Groundwater Analytical Results Summary
Well No. JR-2 Press Room UST Area

		Volatile Organic Compound Analysis[a]			
Investigation	Date	Acetone	MIBK[b]	Isopropyl Alcohol	Ethanol
Initial Investigation (Duplicate)[c]	9/89	1,500[d] (1,700)[d]	440[d] (430)[d]	7,800[d] (7,600)[d]	<100[d] (<100)[d]
1st year, 1st quarter (Duplicate)	2/90	8,000 (6,200)	900 (920)	14,400 (14,100)	<100 (<100)
1st year, 2nd quarter (Duplicate)	6/90	620 (360)	130 (95)	5,100 (3,900)	22,000 (15,000)
1st year, 3rd quarter (Duplicate)	9/90	6,200 (7,100)	1,400 (1,400)	69,000 (50,000)	23,000 (25,000)
1st year, 4th quarter (Duplicate)	1/91	1,500 (2,900)	150 (260)	2,900 (5,600)	<500 (<500)
2nd year, 1st quarter (Duplicate)	4/91	1,900 (1,900)	220 (220)	<100 (<100)	<100 (<100)
2nd year, 2nd quarter (Duplicate)	8/91	2,900 (4,200)	430 (520)	<1,000 (<2,000)	(<1,000) (<2,000)
2nd year, 3rd quarter (Duplicate)	11/91	14 (<10)	(<1.0) (<1.0)	(<50) (<50)	(<50) (<50)
2nd year,4th quarter (Duplicate)	2/92	<10 (<10)	<5.0 (<5.0)	<100 (<100)	<100 (<100)

[a] EPA method 8240, concentration in parts per billion (ppb).
[b] MIBK reported as 4-Methyl-2-Pentanone in laboratory reports.
[c] QAQC duplicate sample collected from JR-2.
[d] EPA Method 8310, concentrations in ppb.

Fluctuations in groundwater elevation during the monitoring period (see Appendix A) appear to lag behind seasonal variations in precipitation; the rainy season lasting from October through May, and the dry season from June through September. Table 4 shows that since most of the JRC facility is paved, the lagging groundwater elevations in the Press Room area may reflect a recharge lag. The nearest local recharge point is the four acre grass field which occupies the southwest corner of the JRC site and is separated from the Press Room wells by over 500 feet of pavement.

Table 4. Groundwater Gradient Summary
Press Room UST Area

Investigation	Date	Flow direction	Gradient (feet/100 feet)	Elevation change[a]
Initial Investigation	9/89	N18°E	0.23	--
1st year, 1st quarter	2/90	N2°W	0.23	Increase
1st year, 2nd quarter	6/90	N51°W	0.01	Increase[b]
1st year, 3rd quarter	9/90	N7°W	0.63	Decrease
1st year, 4th quarter	1/91	N0°W	0.28	Decrease[c]
2nd year, 1st quarter	4/91	N7°W	0.24	Increase[d]
2nd year, 2nd quarter	8/91	N82°W	2.50	Decrease
2nd year, 3rd quarter	11/91	N33°E	0.45	Decrease[e]
2nd year, 4th quarter	2/92	N23°E	0.41	Increase

[a] Change in groundwater elevation relative to previous monitoring event.
[b] Highest groundwater elevation recorded during the first year of QGWM.
[c] Lowest groundwater elevation recorded during the first year of QGWM.
[d] Highest groundwater elevation recorded during the second year of QGWM.
[e] Lowest groundwater elevation recorded during the second year of QGWM.

Groundwater flow direction and gradient have remained relatively consistent during wet months (October through May). Flow directions during the first and fourth quarters of the first year, stayed within 0 and 7 degrees west of north with an average gradient of 0.25 feet/100 feet. During the second year, third quarter, however, the flow direction shifted to the east while the gradient decreased significantly. The dry months (June through September) were typically characterized by dramatic shifts in flow direction and gradient. The second year, fourth quarter flow direction continued in an easterly direction, staying within 10 degrees of the previous quarter with a gradient of 0.41 feet/100 feet. The average gradient during the second year was 0.90 feet/100 feet.

Unfortunately, there is not enough QGWM data at this time to show any detailed relationships between groundwater dynamics and the concentrations of acetone, MIBK, and isopropyl alcohol documented in the groundwater beneath the Press Room UST area.

Gasoline UST Area. Since the initiation of groundwater monitoring in the Gasoline UST area, significant groundwater contamination has only been identified in samples collected from JR-5. Table 5 contains a list of the analytical results from all the JR-5 groundwater samples collected to date. Compared to the previous QGWM event, the second year, fourth quarter, analytical results indicate slight increases in benzene, toluene, and total xylene levels. Benzene concentrations increased from 64 ppb to

84 ppb; toluene concentrations increased from below laboratory MDLs to 9.1 ppb; and total xylenes increased from 44 ppb to 130 ppb. Ethylbenzene continues to remain below laboratory MDLs.

Table 5. Groundwater Analytical Results Summary
Well No. JR-5 Gasoline UST Area

		Volatile Hydrocarbon Analysis[a]						
Investigation	Date	Benzene	Toluene	Ethylbenzene	Total Xylenes	EDB[b]	Total lead[c]	Organic lead[d]
Initial Investigation	9/89	120	<1	14	960	e	e	-
1st year, 1st quarter	2/90	120	11	<1	500	e	e	-
(Duplicate)[f]		(140)	(14)	(<1)	(580)	e	e	-
1st year, 2nd quarter	6/90	89	5	<1	230	e	e	-
(Duplicate)		(76)	(5)	(<1)	(220)	e	e	-
1st year, 3rd quarter	9/90	160	19	95	400	e	e	-
(Duplicate)		(150)	(18)	(88)	(400)	e	e	-
1st year, 4th quarter	1/91	180	22	85	820	e	e	-
2nd year, 1st quarter	4/91	51	27	250	1,200	e	e	-
(Duplicate)		(57)	(27)	(250)	(1,200)	e	e	-
2nd year, 2nd quarter	8/91	94	12	290	700	e	e	-
(Duplicate)		(99)	(15)	(390)	(920)	e	e	-
2nd year, 3rd quarter	11/91	64	<5.0	<5.0	44	<2.0	14	-
(Duplicate)		(70)	(<5.0)	(<5.0)	(57)	(<2.0)	(31)	-
2nd year, 4th quarter	11/91	84	9.1	<5.0	130	<1.0	-	<100
(Duplicate)		(83)	(7.2)	(<5.0)	(120)	(<1.0)	-	(<100)
DEQ MCLs[g]		5	2,000	700	10,000	1.0	5	5

[a] Volatile hydrocarbon analysis (benzene, toluene, ethylbenzene, total xylenes) by EPA Method 8020, concentration in parts per billion (ppb).

[b] Ethylene dibromide analysis by GC/MS purge-and-trap method, concentration in ppb.

[c] Total lead analysis by EPA Method SW846, 3005, 7421, concentration in ppb.

[d] Organic lead analysis by the "organo-lead" method, concentration in ppb.

[e] Not analyzed during this monitoring event.

[f] QA/QC duplicate sample collected from JR-5.

[g] DEQ maximum contaminant levels, based on EPA's primary drinking water standards, concentrations in ppb.

General trends throughout the monitoring period are as follows. Benzene and xylene have been detected above laboratory MDLs during all of the sampling events completed to date. Benzene concentrations fluctuated from a minimum of 51 ppb to a maximum of 180 ppb and have remained above the Oregon DEQ's Maximum Contaminant Level of 5 ppb since the initiation of monitoring. Xylene concentrations have also fluctuated during the monitoring period but have never exceeded the MCL of 10,000 ppb. Toluene was not identified in JR-5 during the initial soil and groundwater investigation but occurred during all of the subsequent QGWM events at concentrations well below the MCL of 2,000 ppb. Ethylbenzene concentrations have steadily increased over the course of the monitoring program, but have dropped below laboratory MDLs during the previous and current monitoring events. Ethylbenzene concentrations in JR-5 have never exceeded the MCL of 700 ppb.

Fluctuations in groundwater elevation in the Gasoline UST area (see Appendix A) appear to be consistent with seasonal variations in precipitation. Table 6 shows that steady increases in groundwater elevation occur through the rainy season (October through May), and steady decreases occur through the dry season (June through September). Furthermore, as groundwater elevation increases, the groundwater gradient increases. During the second year, fourth quarter, groundwater flow shifted 34 degrees to the east and groundwater gradient increased to 2.27 feet/100 feet. Fluctuations in groundwater flow appear to be greatly influenced by recharge from the vacant grass field, located immediately south of the gasoline UST area.

This apparent mounding of groundwater suggests the presence of a perched aquifer beneath the Gasoline UST area. Increased recharge during the rainy season causes groundwater mounding, steeper groundwater gradient, and greater fluctuations in groundwater flow. The existence of this perched aquifer is supported by boring logs from JR-4, JR-5, and JR-6 which indicate the presence of a sandy clay bed at the base of each well. The boring logs are included in Appendix C of the November 28, 1989, BCC report referenced earlier in this report.

Unfortunately, there is not enough QGWM data at this time to show detailed relationships between groundwater dynamics and the concentrations of BTEX in the groundwater beneath the Gasoline UST area.

Table 6. Groundwater Gradient Summary Gasoline UST Area

Investigation	Date	Flow direction	Gradient (feet/100 feet)	Elevation change[a]
Initial Investigation	9/89	N10°E	0.70	--
1st year, 1st quarter	2/90	N65°W	2.61	Increase
1st year, 2nd quarter	6/90	N84°W	1.40	Decrease
1st year, 3rd quarter	9/90	N5°W	0.81	Decrease
1st year, 4th quarter	1/91	N73°W	2.29	Increase
2nd year, 1st quarter	4/91	N79°W	3.60	Increase
2nd year, 2nd quarter	8/91	N87°W	2.88	Decrease
2nd year, 3rd quarter	11/91	N17°W	1.21	Decrease
2nd year, 4th quarter	2/92	N17°E	2.27	Increase

[a] Change in groundwater elevation relative to previous monitoring event.

CONCLUSIONS

The results of this groundwater monitoring event provided an evaluation of the degree and extent of shallow groundwater contamination beneath the Press Room and Gasoline UST areas of the CPD in connection with seasonal groundwater fluctuations.

Since the initiation of the groundwater monitoring program in September of 1989, significant groundwater contamination in the Press Room area has only been documented in samples collected from JR-2. During this monitoring event, no volatile organic compounds were detected at or above laboratory MDLs in JR-2. Compared to the previous quarterly monitoring events these results indicate a significant decrease in acetone and MIBK concentrations. Ethanol, which was detected in JR-2 during the second and third quarters of the first year, remained below laboratory MDLs during this sampling event. In addition, isopropyl alcohol, which was detected at concentrations ranging between 2,900 and 69,000 ppb during the first year of QGWM, was not detected at or above laboratory MDLs during this sampling event.

During wet months, groundwater flow direction in the Press Room area appears to stay within 0 and 7 degrees west of north with an average gradient of 0.40 feet/100 feet. In contrast, dry months are characterized by 48 to 75 degree westerly shifts in flow direction associated with gradients as low as 0.01 feet/100 feet or as high as 2.50 feet/100 feet. The 48 degree westerly shift in flow noted during the second quarter of the first year was associated with the maximum groundwater elevation and the first occurrence of ethanol in JR-2 suggesting the presence of ethanol contaminated soils in the unsaturated zone east of JR-2.

Since the initiation of the groundwater monitoring program in the Gasoline UST area, significant groundwater contamination has only been documented in samples collected from JR-5. During the second year, fourth quarter, monitoring event, benzene, toluene, and total xylenes were detected in JR-5 at concentrations of 84 ppb, 9.1 ppb, and 130 ppb, respectively. Ethylbenzene was not detected at or above laboratory MDLs. Compared to the previous monitoring event, these results indicate a slight increase in benzene, toluene, and total xylene concentrations.

The DEQ's MCLs for benzene, toluene, ethylbenzene, and xylene are 5 ppb, 2,000 ppb, 700 ppb, and 10,000 ppb. Benzene is the only compound that has consistently exceeded the MCL during all of the monitoring events. Concentrations of toluene, ethylbenzene, and xylene have not exceeded the MCLs during any of the monitoring events completed to date.

Organic lead, EDB, and PAHs levels were not detected in JR-4, JR-5, and JR-6 above laboratory MDLs of 0.10 ppm, 1.0 ppb, and 0.10 ppb, respectively.

Fluctuations in groundwater elevation in the Gasoline UST area are consistent with seasonal variations in precipitation. Groundwater elevation and gradient data in conjunction with geologic information from boring logs indicate the presence of a perched aquifer beneath the Gasoline UST area. Recharge during the rainy season causes groundwater mounding and steeper groundwater gradients. During the dry season, the mound recedes and groundwater gradient decreases.

Unfortunately, there is not enough QGWM data at this time to show detailed relationships between groundwater dynamics and the concentrations of BTEX in the groundwater beneath the Gasoline UST area.

Please contact me if you have any questions concerning the findings of this investigation.

Very truly yours,

BROWN AND CALDWELL

Timothy F. O'Gara, R.G.
Project Manager

TFO:ljw

A

APPENDIX A
GROUNDWATER ELEVATIONS OF UNDERGROUND STORAGE TANK AREAS

APPENDIX A

Press Room UST Area

	Groundwater Elevation (feet)								
		1st Year				2nd Year			
Well No.	Initial Investigation 9/89	1st Quarter 2/90	2nd Quarter 6/90	3rd Quarter 9/90	4th Quarter 1/91	1st Quarter 4/91	2nd Quarter 8/91	3rd Quarter 11/91	4th Quarter 2/91
JR-1	11.98	12.49	13.96	12.47	12.48	13.60	16.35	11.27	11.70
JR-2	12.24	12.67	13.97	12.75	12.70	13.77	12.36	11.70	12.06
JR-3	12.30	12.76	14.03	12.92	12.81	13.88	13.43	11.72	12.11

Gasoline UST Area

	Groundwater Elevation (feet)								
		1st Year				2nd Year			
Well No.	Initial Investigation 9/89	1st Quarter 2/90	2nd Quarter 6/90	3rd Quarter 9/90	4th Quarter 1/91	1st Quarter 4/91	2nd Quarter 8/91	3rd Quarter 11/91	4th Quarter 2/91
JR-4	16.55	17.28	17.79	16.64	17.39	18.04	16.34	14.51	14.39
JR-5	17.53	19.29	18.49	17.76	19.16	20.28	17.32	16.09	17.27
JR-6	16.83	19.68	19.18	17.10	‘9.84	21.72	18.50	14.59	14.82

B

APPENDIX B
GROUNDWATER PARAMETERS MONITORED DURING WELL PURGING

APPENDIX B

Press Room UST Area

Well No.	pH	Temperature	Specific Conductance
JR-1	6.3	12.5	615
JR-2	6.3	12.6	770
JR-3	6.4	13.3	700

Gasoline UST Area

Well No.	pH	Temperature	Specific Conductance
JR-4	7.6	12.9	1,215
JR-5	7.5	11.8	620
JR-6	7.2	13.3	975

C

APPENDIX C
CHAIN-OF-CUSTODY DOCUMENT

PACIFIC ENVIRONMENTAL LABORATORY INC.

9405 S.W. Nimbus Ave.
Beaverton, OR 97005
(503) 644- 0660
Fax (503) 644-2202

CHAIN OF CUSTODY RECORD

COMPANY Brown & Caldwell
PROJECT NAME JRC GGWM
LAB PROJECT NUMBER 92-0418
PROJECT MANAGER Tim O'Gara
PROJECT NUMBER 5935
COLLECTED BY Cliff Herman
P.O. NUMBER
RUSH ☐ YES ☒ NO

COMMENTS

SAMPLES RECEIVED AT 4°C ☐ YES ☐ NO
SAMPLES IN APPROPRIATE CONTAINERS ☐ YES ☐ NO
PROVIDE VERBAL RESULTS ☐ YES ☒ NO
PROVIDE PRELIMINARY FAX RESULTS ☒ YES ☐ NO
PROVIDE FINAL FAX RESULTS ☐ YES ☒ NO

PEL NO.	SAMPLE I.D.	DATE	TIME	SAMPLE DESCRIPTION	MATRIX SOIL	MATRIX WATER	MATRIX OTHER	NUMBER OF CONTAINERS	TPH - HCID OAR/DEQ	TPH - Gasoline OAR/DEQ	TPH - Diesel OAR/DEQ	TPH - 418.1 Modified OAR/DEQ	HCID - Fuel Scan GC/FID	TPH 418.1	BTEX 602/8020	Halogenated Volatiles 601/8010	Volatiles 624/8240 *	Semivolatiles 625/8270	PCB's 608/8080	Chlorinated Pesticides 608/8080	TCLP (8) Metals	EDB	ORGANO-LEAD	PAH			REMARKS
	1001	2/6/92	0830			X		2							X												* All 8240 tests
	1002		1340			X		2							X												should also
	1003		1315			X		6							X							X	X	X			include
	1004		1335			X		5							X							X	X	X			isopropyl alcohol
	1005		1400			X		4							X							X	X				& ethanol.
	1006		1400			X		4							X							X	X				
	1007		1135			X		2									X										
	1008		1005			X		2									X										
	1009		1050			X		2									X										
	1010		1050			X		2									X										
	1011		1030			X		2									X										

RELINQUISHED BY Cliff Herman	COMPANY Brown & Caldwell	DATE/TIME 2/6/92 1500	RECEIVED BY	COMPANY PEL
RELINQUISHED BY	COMPANY	DATE/TIME	RECEIVED BY	COMPANY
RELINQUISHED BY	COMPANY	DATE/TIME	RECEIVED BY	COMPANY

D

APPENDIX D
LABORATORY ANALYTICAL REPORT

PACIFIC
ENVIRONMENTAL
LABORATORY INC.

February 14, 1992

Brown & Caldwell
9620 S.W. Barbur Boulevard
Suite 200
Portland, OR 97219

Attn: Tim O'Gara

Re: JOB #5935
PROJECT - JRC QGWM
PEL #92-0418

Enclosed is the lab report for your samples which were received on February 6, 1992.

I. Sample Description

Eleven Water Samples

The samples were received under a chain of custody.

The samples were received in containers consistent with EPA protocol.

II. Quality Control

No project specific QC was requested. In-house QC data is available upon request.

III. Analytical Results

Test methods may include minor modifications of published methods such as detection limits or parameter lists. Solid and waste samples are reported on an "as received" basis unless otherwise noted.

Compounds not detected are listed under results as ND.

Sincerely,

Howard B Holmes
Howard Holmes
Project Manager

Robert R. May
Rob May
Project Manager

9405 S.W. Nimbus Ave. ■ Beaverton, OR 97005 ■ (503) 644-0660 ■ FAX # (503) 644-2202

METHOD: Organic Lead
Results in mg/L (ppm)

Sample I.D.	Organic Lead
1003	ND
1004	ND
1005	ND
1006	ND
Detection Limit	0.1

METHOD: Volatiles per EPA 8240
Results in ug/L (ppb)

Compound	1011	Lab Blank	Detection Limit
Acetone	ND	ND	10
Acrolein	ND	ND	100
Acrylonitrile	ND	ND	50
Benzene	ND	ND	2.0
Bromodichloromethane	ND	ND	2.0
Bromoform	ND	ND	2.0
Bromomethane	ND	ND	10
2-Butanone	ND	ND	7.5
Carbon disulfide	ND	ND	2.0
Carbon tetrachloride	ND	ND	2.0
Chlorobenzene	ND	ND	2.0
Chlorodibromomethane	ND	ND	2.0
Chloroethane	ND	ND	10
Chloroform	ND	ND	2.0
Chloromethane	ND	ND	10
Dibromomethane	ND	ND	2.0
Dichlorobenzenes	ND	ND	2.0
Dichlorodifluoromethane	ND	ND	5.0
1,1-Dichloroethane	ND	ND	2.0
1,2-Dichloroethane	ND	ND	2.0
1,1-Dichloroethene	ND	ND	2.0
cis-1,2-Dichloroethene	ND	ND	2.0
trans-1,2-Dichloroethene	ND	ND	2.0
1,2-Dichloropropane	ND	ND	2.0
cis-1,3-Dichloropropene	ND	ND	2.0
trans-1,3-Dichloropropene	ND	ND	2.0
Ethylbenzene	ND	ND	2.0
2-Hexanone	ND	ND	5.0
Methylene chloride	ND	ND	2.0
4-Methyl-2-pentanone	ND	ND	5.0
Styrene	ND	ND	2.0
1,1,2,2-Tetrachloroethane	ND	ND	2.0
Tetrachloroethene	ND	ND	2.0
Toluene	ND	ND	2.0
1,1,1-Trichloroethane	ND	ND	2.0
1,1,2-Trichloroethane	ND	ND	2.0
Trichloroethene	ND	ND	2.0
Trichlorofluoromethane	ND	ND	2.0
1,2,3,-Trichloropropane	ND	ND	2.0
Vinyl acetate	ND	ND	10
Vinyl chloride	ND	ND	5.0
Xylene	ND	ND	2.0
Isopropyl Alcohol	ND	ND	100
Ethanol	ND	ND	100

METHOD: Volatiles per EPA 8240
Results in ug/L (ppb)

Compound	1007	1008	1009	1010
Acetone	ND	ND	ND	ND
Acrolein	ND	ND	ND	ND
Acrylonitrile	ND	ND	ND	ND
Benzene	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND
2-Butanone	15	11	ND	ND
Carbon disulfide	ND	ND	ND	ND
Carbon tetrachloride	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Chlorodibromomethane	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND
Dibromomethane	ND	ND	ND	ND
Dichlorobenzenes	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND
cis-1,2-Dichloroethene	ND	ND	ND	ND
trans-1,2-Dichloroethene	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND
Styrene	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND
Toluene	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND
1,2,3,-Trichloropropane	ND	ND	ND	ND
Vinyl acetate	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND
Xylene	ND	ND	ND	ND
Isopropyl Alcohol	ND	ND	ND	ND
Ethanol	ND	ND	ND	ND

8240 Surrogate Recoveries (%)

Sample I.D.	1,2-Dichloro-ethane-d4	Toluene-d8	4-Bromofluoro-benzene
1007	94	96	102
1008	93	99	94
1009	94	98	95
1010	94	101	94
1011	94	99	96
Lab Blank	94	102	100
Limits	76-114	88-110	86-115

METHOD: BTEX per EPA 8020 by GC/MS
Results in ug/L (ppb)

Sample I.D.	Benzene	Toluene	Ethyl Benzene	Total Xylene	Detection Limit
1003	ND	ND	ND	ND	1.0
1004	ND	ND	ND	ND	1.0
1005	84	9.1	ND	130	5.0
1006	83	7.2	ND	120	5.0
Lab Blank	ND	ND	ND	ND	1.0

8020 Surrogate Recoveries (%)

Sample I.D.	1,2-Dichloroethane-d4 (76-114%)	4-Bromofluorobenzene (86-115%)
1003	91	92
1004	88	92
1005	92	95
1006	90	96
Lab Blank	94	100

METHOD: EDB/EDC by GC/MS Purge-and-Trap
Results in ug/L (ppb)

Sample I.D.	Ethylene Dibromide	Ethylene Dichloride
1003	ND	ND
1004	ND	ND
1005	ND	ND
1006	ND	ND
Lab Blank	ND	ND
Detection Limit	1.0	1.0

METHOD: BTEX per EPA 8020
Water results in ug/L (ppb)

Sample I.D.	Benzene	Toluene	Ethyl Benzene	Total Xylene	Detection Limit
1001	ND	ND	ND	ND	0.50
1002	ND	ND	ND	ND	0.50
Lab Blank	ND	ND	ND	ND	0.50

8020 Surrogate Recoveries (%)

Sample I.D.	4-Bromofluorobenzene (75-120%)
1001	94
1002	89
Lab Blank	76

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METHOD: PAH's by EPA 8270 Modified (GC/MS in SIM Mode)
Results in ug/L (ppb)

Compounds	1003*	1004	Lab Blank	Detection Limit
Acenaphthylene	ND	ND	ND	0.10
Acenaphthene	ND	ND	ND	0.10
Anthracene	ND	ND	ND	0.10
Benzo(a)anthracene	ND	ND	ND	0.10
Benzo(a)pyrene	ND	ND	ND	0.10
Benzo(b)fluoranthene	ND	ND	ND	0.10
Benzo(ghi)perylene	ND	ND	ND	0.10
Benzo(k)fluoranthene	ND	ND	ND	0.10
Chrysene	ND	ND	ND	0.10
Dibenzo(ah)anthracene	ND	ND	ND	0.10
Fluoranthene	ND	ND	ND	0.10
Fluorene	ND	ND	ND	0.10
Indeno(1,2,3-cd)pyrene	ND	ND	ND	0.20
2-Methylnaphthalene	ND	ND	ND	0.10
Naphthalene	ND	ND	ND	0.10
Phenanthrene	ND	ND	ND	0.10
Pyrene	ND	0.24	ND	0.10

* Detection limits for these samples are 1.5 times the listed value due to matrix interferences.

8270 Surrogate Recoveries (%)

Compounds	1003	1004	Lab Blank	EPA Limits
d5-Nitrobenzene	64	54	88	35-114
2-Fluorobiphenyl	65	52	74	43-116
d14-Terphenyl	67	55	96	33-141

Analysis for PAH's is done using EPA method 8270 and a GC/MS in SIM mode. Detection limits are from SIM analysis. This method is equivalent to method 8310 for Oregon UST Fuels Program, per Rick Gates, Oregon DEQ.