

QUARTERLY GROUNDWATER REPORT

**5800 CHRISTIE AVENUE,
EMERYVILLE, CALIFORNIA**

FEBRUARY 22, 1993

SUBMITTED TO:

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PREPARED FOR :

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February 22, 1993

Mr. Dick Herring
President
Croley & Herring Investment Company
448 Tharp Avenue,
Moraga, California 94556

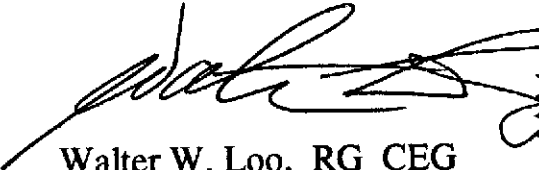
Subject: Quarterly Groundwater Report
5800 Christie Avenue, Emeryville, California

Dear Mr. Herring:

Enclosed please find a copy of the quarterly groundwater report for the January, 1993 water sampling period at the subject facility.

Please contact me if you have any question about this report.

Sincerely,


Walter W. Loo, RG CEG
President

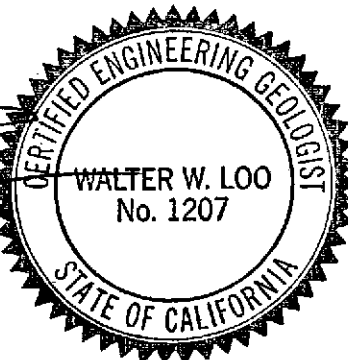


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1.0 INTRODUCTION

Environmental & Technology Services(ETS) was retained by Croley & Herring Investment Company to perform the 14th quarterly groundwater monitoring for the facility located at 5800 Christie Street in Emeryville, California. The subject facility is currently leased to an electronic merchandise retailer. Prior to leasing, soil contamination was identified at the subject facility. The contaminated soil was removed with the exception of that which was underlying the building because of safety concerns. The removed soil was remediated on-site and properly disposed of with the approval of the regulatory agencies.

A vapor extraction system(VES) was installed immediately adjacent to the northeastern side of the building to mitigate the residual volatile hydrocarbons contained in the soil. The residual volatile organic chemicals(VOCs) were remediated from an average VOCs concentration of about 660 ppm to a satisfactory level at an average of 0.82 ppm in soil. A soil closure plan was submitted(11/15/91) and approval of closure was received on 1/21/92 after submittal of confirmation soil sampling results. The soil vapor extraction system was decommissioned and the Bay Area Air Quality Management District was notified on 12/16/91. The final VES closure report was completed on August 29, 1992.

As part of the site activities, a quarterly groundwater monitoring program has been implemented. Previous quarterly monitoring events were conducted on November 6, 1989, February 20, 1990, May 31, 1990, September 7, 1990, December 4, 1990, April 16, 1991, July 3, 1991, October 12, 1991, January 26, 1992, April 8, 1992, July 15, 1992, and October 19, 1992 respectively. This quarterly monitoring event was conducted on January 11, 1993. Water samples were taken from the monitoring wells and sent to a State-certified laboratory for analysis under proper chain-of-custody procedures.

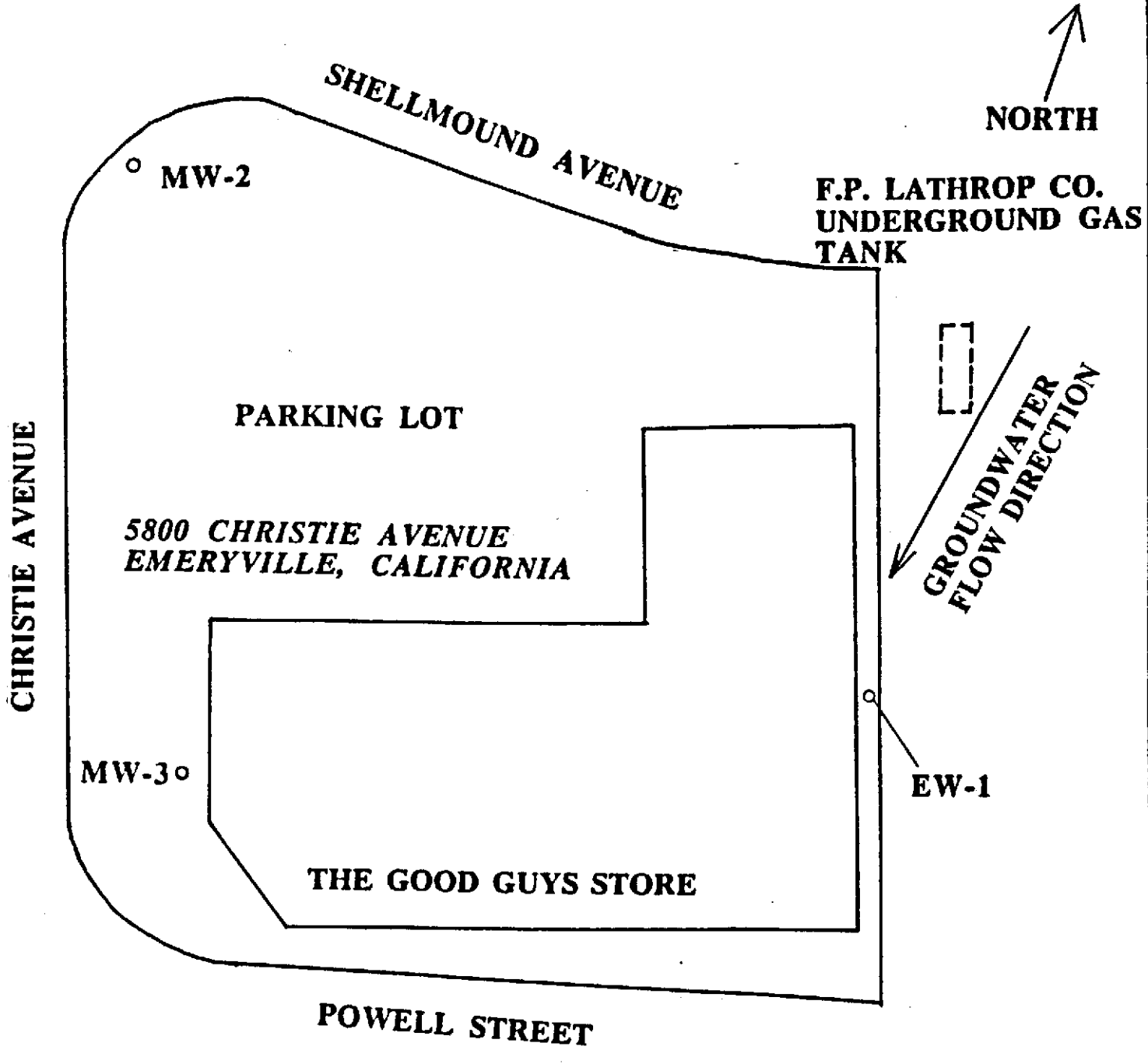
This report presents the results of this quarterly groundwater monitoring event on well EW-1 including laboratory analytical results, groundwater movement analysis, summary of findings, and conclusions and discussions.

2.0 GROUNDWATER MOVEMENT ANALYSIS

Prior to sample collection of this quarterly sampling, depth-to-water table in each of the three existing monitoring wells at the facility was measured for the analysis of groundwater movement. Table 1 presents a summary of the water levels in the three wells (EW-1, MW-2, and MW-3) from the groundwater monitoring events prepared by ETS.

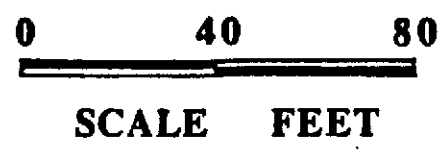
From the result of the water level measurements on January 11, 1993, elevation of water levels were increased in the three wells, as compared to the data collected in November 1992. Nevertheless, the groundwater flow direction remained in the same direction, flowing towards south (Figure 1). The hydraulic gradient was 0.011 feet per horizontal foot.

Groundwater movement across the facility remains in a similar pattern, as compared to the result from the previous sampling event. Data of flow direction and hydraulic gradient are summarized in Table 1.



LEGEND

○ MONITORING WELLS



ETS
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FIGURE 1
LOCATION MAP

TABLE 1

SUMMARY OF WATER LEVEL DATA

WELL Name	Elev. of TOC (Ft-MSL)	11/6/89		2/20/90		5/31/90		9/7/90	
		DTW Ft.	SWL Ft.	DTW Ft.	SWL Ft.	DTW Ft.	SWL Ft.	DTW Ft.	SWL Ft.
EW-1	8.62	6.15	2.47	5.93	2.69	5.86	2.76	6.30	2.32
MW-2	7.42	4.37	3.05	4.26	3.16	4.26	3.16	4.60	2.82
MW-3	6.42	5.10	1.32	5.42	1.00	4.93	1.49	5.15	1.17

WELL Name	12/4/90		4/16/91		7/3/91		10/14/91		1/9/92	
	DTW Ft.	SWL Ft.	DTW Ft.	SWL Ft.	DTW Ft.	SWL Ft.	DTW Ft.	SWL Ft.	DTW Ft.	SWL Ft.
EW-1	7.39	2.23	6.02	2.60	6.20	2.42	6.5	2.12	6.20	2.42
MW-2	4.67	2.75	4.31	3.11	4.52	2.9	3.92	3.5	4.43	3.10
MW-3	5.96	1.35	5.25	1.17	5.33	1.09	4.63	1.79	6.50	-0.08

WELL Name	7/15/92		10/19/92		1/11/93	
	DTW Ft.	SWL Ft.	DTW Ft.	SWL Ft.	DTW Ft.	SWL Ft.
EW-1	6.10	2.52	6.1	2.52	5.5	3.12
MW-2	4.42	3.00	4.77	2.65	2.9	4.92
MW-3	5.23	1.19	5.37	1.05	3.6	2.82

Note: TOC top of casing
 DTW depth to water table
 SWL static water level above MSL
 MSL mean sea level

TABLE 2

GROUNDWATER MOVEMENT ANALYSIS

Date	4/25/89	11/6/89	2/20/90	5/31/90	9/7/90	12/4/90	
Flow Towards	SW	S	S	S	S	S	
Gradient	0.001	0.012	0.016	0.0125	0.0115	0.045	
Date	4/16/91	7/3/91	10/14/91	1/9/92	7/15/92	10/19/92	
Flow Towards	S	S	S	SW	S	S	
Gradient	0.014	0.013	0.011	0.0238	0.013	0.0127	
Date	1/11/93						
Flow Towards	S						
Gradient	0.011						

3.0 GROUNDWATER QUALITY

On January 11, 1993, ETS field personnel visited the facility and collected water samples from monitoring well EW-1 for laboratory analysis. These groundwater samples were sent to a state-certified laboratory for analyses of halocarbons using EPA method 601, total petroleum hydrocarbons (TPH) as gasoline and gasoline constituents benzene, toluene, ethylbenzene, and total xylenes (BTEX) using EPA method 602.

From the results of the laboratory analysis (Appendix A), water sample taken from well EW-1 contained some volatile organic compounds. The VOCs detected in well EW-1 from the January 11, 1993 sampling episode are presented in Table 3.

TABLE 3

SUMMARY OF QUARTERLY GROUNDWATER QUALITY RESULTS OF WELL EW-1
5800 CHRISTIE AVENUE,
EMERYVILLE, CALIFORNIA

CONCENTRATIONS IN MG/L

COMPOUNDS	5/8/89	11/6/89	2/20/90	5/31/90	9/7/90	12/4/90	4/6/91	7/3/91	10/12/91	1/8/92	4/8/92
TPH as GASOLINE	NA	0.74	12.0	24.0	25.0	7.4	51.0	23.0	39.0	<5.0	12.0
BENZENE	ND	0.18	1.3	0.056	1.1	0.18	3.0	0.65	ND	ND	4.0
TOLUENE	0.19	0.039	3.6	6.1	0.8	3.2	12.0	8.7	1.3	0.58	ND
XYLENES	0.17	0.067	0.047	0.14	0.042	ND	ND	ND	ND	ND	ND
ETHYLBENZENE	ND	0.0008	0.0071	0.017	ND	ND	ND	ND	ND	ND	ND
HALOCARBONS	0.718	1.1861	4.701	6.876	6.661	3.762	10.6	6.49	2.794	4.459	6.8
TCE	0.64	0.74	1.1	0.83	0.49	1.5	1.3	0.13	0.73	1.7	2.8
1,1 DCE	0.078	0.0023	0.014	0.069	0.036	ND	ND	ND	ND	ND	ND
1,2 DCE	ND	0.35	2.5	0.11	2.4	1.5	3.7	2.0	0.62	1.52	ND
1,1,1 TCA	ND	0.026	0.55	1.2	0.51	0.072	2.9	0.2	0.47	0.089	ND
1,1 DCA	ND	0.034	0.46	1.9	1.3	0.46	1.8	2.0	0.63	0.42	1.3
1,2 DCA	ND	0.0048	0.034	0.033	0.053	ND	ND	ND	0.12	0.25	2.7
VINYL CHLORIDE	ND	0.029	ND	2.6	1.7	0.23	0.9	1.99	0.17	0.48	ND
CHLOROETHANE	ND	ND	0.029	0.094	0.15	ND	ND	0.17	0.054	ND	ND
MET. CHLORIDE	ND	ND	0.014	0.04	0.022	ND	ND	ND	ND	ND	ND
TOTAL VOCs	1.078	1.9261	16.701	30.876	31.661	11.162	61.6	29.49	41.794	<9.459	18.8

NA NOT ANALYSED

ND NOT DETECTED OR BELOW DETECTION LIMITS

VOCs VOLATILE ORGANIC COMPOUNDS (TPH PLUS TOX)

TABLE 3(CONTINUE)

SUMMARY OF QUARTERLY GROUNDWATER QUALITY RESULTS OF WELL EW-1
5800 CHRISTIE AVENUE,
EMERYVILLE, CALIFORNIA

CONCENTRATIONS IN MG/L

COMPOUNDS	7/15/92	10/19/92	1/11/93
TPH as GASOLINE	100.0	26.0	20.0
BENZENE	ND	ND	ND
TOLUENE	4.7	12.5	7.5
XYLENES	ND	ND	ND
ETHYLBENZENE	ND	ND	0.075
HALOCARBONS	2.461	5.07	0.065
PCE	ND	ND	0.042
TCE	0.68	0.27	0.023
1,1 DCE	ND	4.8	ND
1,2 DCE	0.6	ND	ND
1,1,1 TCA	0.42	ND	ND
1,1 DCA	0.6	ND	ND
1,2 DCA	0.11	ND	ND
VINYL CHLORIDE	0.15	ND	ND
CHLOROETHANE	ND	ND	ND
MET. CHLORIDE	ND	ND	ND
TOTAL VOCs	102.461	31.07	20.065

NA NOT ANALYSED

ND NOT DETECTED OR BELOW DETECTION LIMITS

VOCs VOLATILE ORGANIC COMPOUNDS (TPH PLUS TOX)

4.0 SUMMARY OF FINDINGS

Table 3 presents a summary of analytical results of well EW-1 in time series. There are several factors that affect the changes in the hydrocarbon concentration. These factors are variations in water table, chemical breakdown due to biodegradation, and unidentified off-site sources.

An experiment was tried to desorb the organic chemicals from the clayey material and oxidize them in places near well EW-1 by the application of direct electrical current flow in the subsurface without pumping the groundwater. The experiment showed successful control of the flow of groundwater in the area and the total volatile organic compounds (VOCs) at one time reached below 4 ppm due to the induced electrochemical reactions between electrodes. The degree of the effectiveness and success cannot be assessed at this time because the readings were interfered with by the spreading of the upgradient gasoline plume.

Also, there are indications that strong biodegradation activities are taking place in the subsurface. Prescribed amounts of glucose was added to the groundwater underlying the area to stimulate cometabolic biodegradation of the chlorinated solvents. The results of groundwater analysis showed reduction of the chlorinated solvents since the addition of the glucose.

APPENDIX A

GROUNDWATER LABORATORY ANALYSIS REPORT