A Report Prepared for

Carnation Company
800 North Brand Boulevard
Glendale, California 91203

QUARTERLY MONITORING REPORT
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CARNATION FACILITY
OAKLAND, CALIFORNIA

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by

Daniel J. Craig
Senior Hydrogeologist

R. Bruce Scheibach
Principal Hydrogeologist

Harding Lawson Associates
7655 Redwood Boulevard
P.O. Box 578
Novato, California 94948
415/892-0821

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1.0 INTRODUCTION

From 1929 to 1991, Carnation Company operated a dairy production facility at 1310 14th Street, Oakland, California (Plate 1). The facility was used for dairy product processing and for vehicle maintenance. An "L" shaped building consisting of a warehouse with four vehicle service bays occupies the northern and western sides of the site (Plate 2). In January 1989, Carnation excavated an underground waste oil tank, two underground gasoline tanks, and two underground diesel storage tanks, which were located beneath and south of the warehouse building. During removal of the tanks, gasoline and diesel were observed to be present as a separate phase floating in the excavations. Carnation investigated the extent of the hydrocarbons and implemented several interim remedial measures. The chemicals detected, which include free-phase gasoline, diesel, waste oil, and their dissolved chemical components, are believed to have been released from the leaking underground waste oil tank and from piping connected to the four underground fuel storage tanks. In addition to the petroleum hydrocarbons, polychlorinated biphenyls (PCBs) were detected in oil floating on the groundwater table at one location. Animal fats were also reported to have been found floating on the groundwater table beneath the facility.

In April 1991, Carnation retained Harding Lawson Associates (HLA) to conduct additional site investigations, and to perform an engineering analysis of remediation alternatives. A Work Plan for the quarterly monitoring and other site investigation work was submitted to the Alameda County Department of Environmental Health and the California Regional Water Quality Control Board in May 1991 (*HLA, 1991a*). All field work was conducted in accordance with the Quality Assurance/Quality Control (QA/QC) Plan contained in the Work Plan. This report presents the results of the second quarterly

groundwater chemistry monitoring round for the period September through November 1991. A more comprehensive analysis of soil and groundwater chemistry at the facility is presented in the Site Characterization Report (*HLA, 1991b*).

2.0 WATER-LEVEL ELEVATION AND FREE-PHASE PETROLEUM PRODUCT MEASUREMENTS AND GROUNDWATER CHEMISTRY MONITORING

2.1 Water-Level Elevation and Free-Phase Petroleum Product Measurements

HLA conducted water-level elevation and free-phase petroleum product thickness measurements on September 17, October 16, and November 13, 1991 to monitor groundwater elevations and the thickness and distribution of free-phase petroleum product. All accessible monitoring wells and selected product recovery wells were measured during each monitoring event. Water-level and free-phase product measurements were conducted using an electrical oil-water interface probe calibrated with a steel tape. Measurement procedures are described in detail in the QA/QC Plan (*HLA, 1991a*).

2.2 Groundwater Chemistry Monitoring

On September 16, 1991, groundwater samples were collected for chemical analysis from 8 onsite and offsite monitoring wells: Wells MW-3, MW-25, MW-26, MW-27, MW-28, MW-29, MW-30, and MW-32. QA/QC procedures followed during sampling are described in detail in the QA/QC Plan (*HLA, 1991a*). As described in the QA/QC Plan, one field blank and one duplicate water sample (from Well MW-26) were collected on the day of sampling.

Chemical analyses of the groundwater samples were performed by National Environmental Testing, Inc. (NET), Santa Rosa, California. All groundwater samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) using EPA Test Method 8020. Samples from two wells (MW-26 and MW-32) and the field blank were analyzed for chlorinated hydrocarbons by EPA Test Method 8010.

The groundwater generated during the sampling was contained onsite and will be discharged to the sanitary sewer under permit from the East Bay Municipal Utility District (EBMUD).

3.0 RESULTS OF INVESTIGATIONS

3.1 Water-Level Elevations

Table 1 contains the groundwater elevation data collected on September 17, October 16, and November 13, 1991. All accessible monitoring wells and selected product recovery wells were used to monitor groundwater elevations and free-phase petroleum product thicknesses.

Plate 3 presents a groundwater elevation contour map using data collected on September 17, 1991. Note that in Table 1, corrected groundwater elevations for wells containing free-phase petroleum product were calculated using an assumed product density of 0.80 grams per cubic centimeter. These calculated groundwater elevation data were not used in contouring.

The groundwater elevation data collected each month indicate groundwater flow is to the northwest beneath the southern portion of the site, and is to the south and southwest beneath the northern portion of the site (Plate 3). The hydraulic gradient beneath the northern portion of the site is approximately 8.9×10^{-3} to 1.2×10^{-2} foot/foot (ft/ft) in a southwest direction from 16th Street onto the site. The hydraulic gradient beneath the southern portion of the site is approximately 5.6×10^{-4} to 1.0×10^{-3} ft/ft in a northwest direction. This convergent flow appears to result in a net westerly flow direction in the chemical-bearing area (Plate 3).

3.2 Distribution of Free Product

Table 1 contains the free-product thickness data collected on September 17, October 16, and November 13, 1991. Due to a malfunction of the oil-interface probe, the September 17, 1991 free-product thicknesses were determined using a lucite bailer. These data are considered less reliable than the October 16 and November 13, 1991 free-product thickness data. The distribution of free-phase product measured on

October 16, 1991, is shown on Plate 4. In general, the horizontal extent of free-phase product during October 1991 was similar to the thicknesses measured in May, July, and August, 1991. The apparent product thickness was greatest in Well MW-22 (5.21 feet), near the northern wall of the warehouse building (Plate 4). However, product was not and has not been observed in the five offsite wells (MW-25 through MW-29), all of which are located relatively close to the Carnation warehouse. The consistent lack of free-phase petroleum product in the offsite wells and the wells on the west side of the property (MW-3, MW-14, MW-15, and MW-16) suggests that the product continues to be restricted to the onsite area and has not migrated offsite.

3.3 Results of Groundwater Chemistry Sampling

Eight wells were sampled on September 16, 1991, with a duplicate sample collected from MW-26. Well MW-14 was not sampled during this sampling round. Future groundwater sampling rounds will include Well MW-14. Chemical results for the groundwater samples are summarized in Table 2 and presented on Plate 5. Groundwater sampling forms are contained in Appendix A. Laboratory data sheets are contained in Appendix B.

3.3.1 Distribution of Petroleum Hydrocarbons in Groundwater

Dissolved BTEX compounds were found in 5 of the 9 samples. Plate 5 shows the dissolved BTEX results.

3.3.2 Distribution of Chlorinated Hydrocarbons in Groundwater

Two chlorinated hydrocarbons, 1,2-dichloroethane (1,2-DCA) and chlorobenzene, were detected in samples from two wells. 1,2-DCA was detected in offsite Well MW-26 (at a concentration of 610 μg/l) and onsite Well MW-32 (at a concentration of 8.1 μg/l). Chlorobenzene was detected in Well MW-32 at a

concentration of 0.6 μg/l. HLA recommends continued monitoring of these two wells and analysis of samples for chlorinated hydrocarbons to monitor the presence of these compounds.

3.3.3 Groundwater QA/QC Data

Field quality control samples consisted of 1 field blank and 1 duplicate sample. Analytical results are presented in Table 2, and the certified laboratory data sheets are presented in Appendix B.

Field blanks consist of organic-free deionized water that is poured into sample containers under field conditions. Field blanks are prepared and analyzed to check for potential contamination during sample collection in the field. The field blank was poured on September 16, 1991 and transported to the analytical laboratory with the groundwater samples. No analytes were detected at or above the reported detection limits in the field blank.

A duplicate sample was collected from Well MW-26 and was analyzed using EPA Test Method 8020. The purpose of duplicate samples is to evaluate analytical laboratory precision. Precision is assessed by calculating the relative percent difference (RPD) between the initial sample results (X_1) and the duplicate sample results (X_2); a low RPD indicates high precision. The equation used to calculate RPD is:

$$RPD = \frac{|X_1 - X_2|}{(X_1 + X_2)/2} \times 100$$

RPDs were calculated for 4 sets of data where analytes were detected above the reporting limit in the duplicate samples. Only 1 of the RPDs (ethylbenzene for the samples from Well MW-26) exceeded the quality assurance goal of 100 percent specified in the QA/QC Plan *(HLA, 1991a)*.

Laboratory quality control data included surrogate recoveries and blank spike recoveries. Laboratory data sheets are presented in Appendix B. In general, surrogate recoveries and blank spike recoveries were all close to 100 percent indicating good accuracy.

4.0 GROUNDWATER MONITORING PLAN

Carnation will continue to monitor groundwater elevations and free-phase petroleum product thicknesses monthly, and will monitor groundwater chemistry quarterly. The nine wells on the quarterly sampling list are: Wells MW-3, MW-14, MW-25, MW-26, MW-27, MW-28, MW-29, MW-30, and MW-32. These wells will continue to be sampled for aromatic hydrocarbons using EPA Test Method 8020. Additionally, samples from Wells MW-26 and MW-32 will continue to be analyzed for chlorinated hydrocarbons using EPA Test Method 8010. Quality assurance/quality control samples will be collected in accordance with the QA/QC Plan (*HLA, 1991a*).

5.0 REFERENCES

Harding Lawson Associates, 1991a. *Work Plan, Carnation Facility, Oakland, California.* May.

_____, 1991b. *Site Characterization Report, Carnation Facility, Oakland, California.* September.

TABLES

Table 1. Groundwater Elevations and Free-Phase Petroleum Product Thicknesses Harding Lawson Associates

Well Number	Measuring Point Elevation (ft AMSL)	Date	Depth to Water (ft BGS)	Depth to Product (ft BGS)	Product Thickness (ft)	Water Level Elevation* (ft AMSL)
MW- 1	16.49	4/16/91	10.27			6.22
	16.49	5/24/91	10.66			5.83
	16.49	7/9/91	11.25			5.24
	16.49	8/15/91	11.61			4.88
	16.49	9/17/91	11.79			4.70
	16.49	10/16/91	12.00			4.49
	16.49	11/13/91	12.01			4.48
MW- 2	15.11	4/16/91	9.15			5.96
	15.11	5/24/91	9.48			5.63
	15.11	7/9/91	10.02			5.09
	15.11	8/15/91	10.33			4.78
	15.11	9/17/91	10.49			4.62
	15.11	10/16/91	10.67			4.44
	15.11	11/13/91	10.66			4.45
MW- 3	14.30	4/16/91	8.44			5.86
	14.30	5/24/91	8.75			5.55
	14.30	7/9/91	9.26			5.04
	14.30	8/15/91	9.57			4.73
	14.30	9/17/91	9.70			4.60
	14.30	10/16/91	9.84			4.46
	14.30	11/13/91	9.65			4.65
MW- 4	14.42	4/16/91	8.46			5.96
	14.42	5/24/91	Dry			-
	14.42	7/9/91	9.38			5.04
	14.42	8/15/91	9.71			4.71
	14.42	9/17/91	9.89			4.53
	14.42	10/16/91	Dry			-
	14.42	11/13/91	10.04			4.38
MW- 5	14.41	4/16/91	8.48			5.93
	14.41	5/24/91	8.81			5.60
	14.41	7/9/91	9.32			5.09
	14.41	8/15/91	9.60			4.81
	14.41	9/17/91	9.72			4.69
	14.41	10/16/91	9.87			4.54
	14.41	11/13/91	9.83			4.58
MW- 6	14.12	4/16/91	8.15			5.97
	14.12	5/24/91	8.46			5.66
	14.12	7/9/91	8.95			5.17
	14.12	8/15/91	9.21			4.91
	14.12	9/17/91	9.28			4.84
	14.12	10/16/91	9.45			4.67
	14.12	11/13/91	9.41			4.71

Table 1. Groundwater Elevations and Free-Phase Petroleum Product Thicknesses (cont.)

Well Number	Measuring Point Elevation (ft AMSL)	Date	Depth to Water (ft BGS)	Depth to Product (ft BGS)	Product Thickness (ft)	Water Level Elevation* (ft AMSL)
MW- 7	14.29	4/16/91	11.22	8.32	2.90	5.39
	14.29	5/24/91	10.79	7.72	3.07	5.96
	14.29	7/9/91	10.30	8.33	1.97	5.57
	14.29	8/15/91	11.04	8.40	2.64	5.36
	14.29	9/17/91	10.45	8.45	2.00	5.44
	14.29	10/16/91	11.43 est.	8.54	2.89	5.17
	14.29	11/13/91	11.40	8.50	2.90	5.21
MW- 8	14.20	4/16/91	8.15			6.05
	14.20	5/24/91	8.83	8.40	0.43	5.71
	14.20	7/9/91	9.43	8.85	0.58	5.23
	14.20	8/15/91	9.68	9.12	0.56	4.97
	14.20	9/17/91	9.71	9.21	0.50	4.89
	14.20	10/16/91	9.79	9.30	0.49	4.80
	14.20	11/13/91	9.76	9.25	0.51	4.85
MW- 9	14.96	5/24/91	9.31			5.65
	14.96	7/9/91	9.86			5.10
	14.96	8/15/91	10.19			4.77
	14.96	9/17/91	10.36			4.60
	14.96	10/16/91	10.55			4.41
	14.96	11/13/91	10.57			4.39
MW-10	15.73	4/16/91	9.71			6.02
	15.73	5/24/91	10.06			5.67
	15.73	7/9/91	10.62			5.11
	15.73	8/15/91	10.78			4.95
	15.73	9/17/91	11.12			4.61
	15.73	10/16/91	11.32			4.41
	15.73	11/13/91	11.20			4.53
MW-11	14.55	5/24/91	8.85			5.70
	14.55	7/9/91	9.43			5.12
	14.55	8/15/91	9.74			4.81
	14.55	9/17/91	9.92			4.63
	14.55	10/16/91	10.09			4.46
	14.55	11/13/91	10.06			4.49
MW-12	15.28	4/16/91	9.24			6.04
	15.28	5/24/91	9.59			5.69
	15.28	7/9/91	10.14			5.14
	15.28	8/15/91	10.42			4.86
	15.28	9/17/91	10.61			4.67
	15.28	10/16/91	10.81			4.47
	15.28	11/13/91	10.80			4.48
MW-13	14.85	4/16/91	8.84			6.01
	14.85	5/24/91	9.19			5.66
	14.85	7/9/91	9.73			5.12
	14.85	8/15/91	10.12			4.73
	14.85	11/13/91	10.38			4.47

Table 1. Groundwater Elevations and Free-Phase Petroleum Product Thicknesses (cont.)

Well Number	Measuring Point Elevation (ft AMSL)	Date	Depth to Water (ft BGS)	Depth to Product (ft BGS)	Product Thickness (ft)	Water Level Elevation* (ft AMSL)
MW-14	14.10	7/9/91	9.16			4.94
	14.10	8/15/91	9.45			4.65
	14.10	10/16/91	Dry			-
MW-15	14.17	7/9/91	9.24			4.93
	14.17	8/15/91	9.53			4.64
	14.17	10/16/91	Dry			-
MW-16	14.11	4/16/91	8.76			5.35
	14.11	5/24/91	8.61			5.50
	14.11	7/9/91	9.14			4.97
	14.11	8/15/91	9.40			4.71
	14.11	9/17/91	9.50			4.61
	14.11	10/16/91	9.67			4.44
	14.11	11/13/91	9.62			4.49
MW-22	14.44	4/16/91	12.58	7.52	5.06	5.91
	14.44	5/24/91	13.05	7.77	5.28	5.61
	14.44	7/9/91	13.43	8.27	5.16	5.14
	14.44	8/15/91	13.69	8.53	5.16	4.88
	14.44	9/17/91	13.77 est.	8.61	5.16	4.80
	14.44	10/16/91	13.92	8.71	5.21	4.69
	14.44	11/13/91	13.78	8.68	5.10	4.74
MW-23	14.48	5/24/91	9.97	8.53	1.44	5.66
	14.48	7/9/91	10.67	8.93	1.74	5.20
	14.48	8/15/91	10.91	9.26	1.65	4.89
	14.48	9/17/91	10.74	9.29	1.45	4.90
	14.48	10/16/91	10.99	9.53	1.46	4.66
	14.48	11/13/91	10.82	9.54	1.28	4.68
MW-24	14.67	4/16/91	8.75			5.92
	14.67	5/24/91	9.76	8.83	0.93	5.65
	14.67	8/15/91	11.24	9.44	1.80	4.87
	14.67	9/17/91	11.20	9.61	1.59	4.74
	14.67	10/16/91	11.38	9.67	1.71	4.66
	14.67	11/13/91	11.23	9.71	1.52	4.66
MW-25	12.86	4/17/91	7.79			5.07
	12.86	5/24/91	7.70			5.16
	12.86	7/9/91	7.42			5.44
	12.86	8/15/91	7.72			5.14
	12.86	9/17/91	7.81			5.05
	12.86	10/16/91	8.24			4.62

Table 1. Groundwater Elevations and Free-Phase Petroleum Product Thicknesses (cont.)

Well Number	Measuring Point Elevation (ft AMSL)	Date	Depth to Water (ft BGS)	Depth to Product (ft BGS)	Product Thickness (ft)	Water Level Elevation* (ft AMSL)
MW-26	12.71	4/17/91	6.93			5.78
	12.71	5/24/91	6.95			5.76
	12.71	7/9/91	7.40			5.31
	12.71	8/15/91	7.53			5.18
	12.71	9/17/91	7.91			4.80
	12.71	10/16/91	7.67			5.04
	12.71	11/13/91	7.65			5.06
MW-27	14.04	4/17/91	9.01			5.03
	14.04	5/24/91	8.23			5.81
	14.04	7/9/91	8.71			5.33
	14.04	8/15/91	8.75			5.29
	14.04	9/17/91	8.89			5.15
	14.04	10/16/91	9.03			5.01
MW-28	13.45	4/17/91	7.55			5.90
	13.45	5/24/91	7.67			5.78
	13.45	7/9/91	8.08			5.37
	13.45	8/15/91	8.22			5.23
	13.45	9/17/91	8.29			5.16
	13.45	10/16/91	8.35			5.10
	13.45	11/13/91	8.33			5.12
MW-29	12.60	4/17/91	7.04			5.56
	12.60	5/24/91	6.90			5.70
	12.60	7/9/91	7.24			5.36
	12.60	8/15/91	7.42			5.18
	12.60	9/17/91	7.53			5.07
	12.60	10/16/91	7.56			5.04
	12.60	11/13/91	7.52			5.08
MW-30	14.54	8/15/91	9.75			4.79
	14.54	10/16/91	9.98			4.56
	14.54	11/13/91	9.90			4.64
MW-31	14.92	8/15/91	10.14			4.78
	14.92	9/17/91	10.29			4.63
	14.92	10/16/91	10.47			4.45
	14.92	11/13/91	10.46			4.46
MW-32	14.76	8/15/91	10.02			4.74
	14.76	9/17/91	10.08			4.68
	14.76	10/16/91	10.31			4.45
	14.76	11/13/91	10.31			4.45
MW-33	NA	9/17/91	10.17			-
	NA	10/16/91	10.33			-
	NA	11/13/91	10.33			-

Table 1. Groundwater Elevations and Free-Phase Petroleum Product Thicknesses (cont.)

Well Number	Measuring Point Elevation (ft AMSL)	Date	Depth to Water (ft BGS)	Depth to Product (ft BGS)	Product Thickness (ft)	Water Level Elevation* (ft AMSL)
PR-20	14.36	4/16/91	9.06	7.90	1.16	6.23
	14.36	5/24/91	9.94	8.10	1.84	5.89
	14.36	7/9/91	10.07	8.74	1.33	5.35
	14.36	8/15/91	10.32	9.03	1.29	5.07
	14.36	9/17/91	10.38	9.18	1.20	4.94
	14.36	10/16/91	10.45	9.97	0.48	4.29
	14.36	11/13/91	10.43	9.46	0.97	4.71
PR-22	14.43	4/16/91	9.68	8.01	1.67	6.09
	14.43	5/24/91	10.20	8.30	1.90	5.75
	14.43	7/9/91	10.44	8.83	1.61	5.28
	14.43	8/15/91	10.61	9.01	1.60	5.10
	14.43	9/17/91	10.60	9.30	1.30	4.87
	14.43	10/16/91	10.63	9.37	1.26	4.81
	14.43	11/13/91	10.58	9.35	1.23	4.83
PR-24	14.32	4/16/91	8.40			5.92
PR-27	NA	5/24/91	8.58			-
	NA	7/9/91	9.10			-
	NA	8/15/91	9.36			-
	NA	9/17/91	9.53			-
	NA	10/16/91	9.72			-
	NA	11/13/91	9.62			-
PR-31	14.08	4/16/91	7.92			6.16
	14.08	9/17/91	8.36	8.35	0.01	5.73
	14.08	11/13/91	8.60			5.48
PR-33	14.36	4/16/91	7.78			6.58
	14.36	5/24/91	8.30			6.06
	14.36	7/9/91	8.78			5.58
	14.36	8/15/91	9.07			5.29
	14.36	9/17/91	9.25			5.11
	14.36	10/16/91	9.49			4.87
	14.36	11/13/91	9.44			4.92
PR-35	14.55	4/16/91	8.98	8.26	0.72	6.15
	14.55	9/17/91	10.80	9.31	1.49	4.94
PR-38	14.47	4/16/91	8.58			5.89
PR-40	NA	4/16/91	8.58			-
PR-41	NA	5/24/91	7.13	6.67	0.46	-
	NA	7/9/91	7.76	7.13	0.63	-
	NA	8/15/91	9.11	7.40	1.71	-
	NA	9/17/91	9.54 est.	7.54	2.00	-
	NA	10/16/91	8.39	7.69	0.70	-
	NA	11/13/91	8.36	7.62	0.74	-

Table 1. Groundwater Elevations and Free-Phase Petroleum Product Thicknesses (cont.)

Well Number	Measuring Point Elevation (ft AMSL)	Date	Depth to Water (ft BGS)	Depth to Product (ft BGS)	Product Thickness (ft)	Water Level Elevation* (ft AMSL)
PR-43	NA	5/24/91	8.85			-
	NA	7/9/91	9.20			-
	NA	8/15/91	9.87			-
	NA	9/17/91	9.63	9.62	0.01	-
	NA	10/16/91	9.79			-
	NA	11/13/91	9.76			-
PR-44	NA	5/24/91	8.26	6.69	1.57	-
	NA	7/9/91	9.10	7.69	1.41	-
	NA	8/15/91	10.56	8.22	2.34	-
	NA	9/17/91	9.98	8.48	1.50	-
	NA	10/16/91	9.76	8.61	1.15	-
	NA	11/13/91	9.83	9.65	0.18	-
PR-45	NA	5/24/91	8.93	8.85	0.08	-
	NA	7/9/91	9.50	9.30	0.20	-
	NA	8/15/91	9.72	9.53	0.19	-
	NA	9/17/91	9.83	9.68	0.15	-
	NA	10/16/91	9.92	9.85	0.07	-
	NA	11/13/91	9.94	9.88	0.06	-
PR-46	NA	7/9/91	8.60			-
	NA	8/15/91	8.95			-
	NA	9/17/91	9.09			-
	NA	10/16/91	9.16			-
	NA	11/13/91	9.13			-
PR-48	NA	4/16/91	8.75	8.65	0.10	-
PR-49	NA	5/24/91	7.62			-
PR-52	NA	5/24/91	9.26	8.76	0.50	-
	NA	7/9/91	9.74	9.17	0.57	-
	NA	8/15/91	10.03	9.38	0.65	-
	NA	9/17/91	10.44	9.54	0.90	-
	NA	10/16/91	10.26	9.66	0.60	-
	NA	11/13/91	10.30	9.67	0.63	-
PR-53	NA	5/24/91	10.45	8.25	2.20	-
	NA	7/9/91	10.57	8.85	1.72	-
	NA	8/15/91	10.73	9.20	1.53	-
	NA	9/17/91	10.23	9.53	0.70	-
	NA	10/16/91	10.86	9.41	1.45	-
	NA	11/13/91	10.89	9.39	1.50	-

Table 1. Groundwater Elevations and Free-Phase Petroleum Product Thicknesses (cont.)

Well Number	Measuring Point Elevation (ft AMSL)	Date	Depth to Water (ft BGS)	Depth to Product (ft BGS)	Product Thickness (ft)	Water Level Elevation* (ft AMSL)
PR-55	NA	5/24/91	9.51	8.59	0.92	-
	NA	7/9/91	10.26	8.82	1.44	-
	NA	8/15/91	10.58	9.07	1.51	-
	NA	9/17/91	10.35	9.18	1.17	-
	NA	10/16/91	10.98	9.31	1.67	-
	NA	11/13/91	10.94	9.44	1.50	-
PR-56	NA	7/9/91	10.86	9.02	1.84	-
	NA	8/15/91	10.93	9.33	1.60	-
	NA	9/17/91	10.08	9.68	0.40	-
	NA	10/16/91	11.00	9.58	1.42	-
	NA	11/13/91	10.62	9.64	0.98	-
PR-57	NA	4/16/91	7.69			-
PR-58	NA	4/16/91	8.99	8.03	0.96	-
	NA	5/24/91	9.39	8.39	1.00	-
	NA	7/9/91	10.03	8.86	1.17	-
	NA	8/15/91	10.37	9.13	1.24	-
	NA	9/17/91	10.59	9.36	1.23	-
	NA	10/16/91	10.69	9.48	1.21	-
	NA	11/13/91	10.68	9.51	1.17	-
PR-59	NA	4/16/91	8.09			-
	NA	5/24/91	8.41			-
	NA	7/9/91	9.03			-
	NA	8/15/91	8.83			-
	NA	9/17/91	9.42			-
	NA	10/16/91	9.67			-
	NA	11/13/91	9.25			-
PR-61	NA	5/24/91	9.06	8.94	0.12	-
	NA	7/9/91	9.55	9.43	0.12	-
	NA	8/15/91	9.89	9.71	0.18	-
	NA	9/17/91	10.02	9.88	0.14	-
	NA	10/16/91	10.14	9.97	0.17	-
	NA	11/13/91	10.16	9.99	0.17	-
PR-63	NA	5/24/91	8.98	8.96	0.02	-
	NA	7/9/91	9.46	9.45	0.01	-
	NA	8/15/91	9.77	9.75	0.02	-
	NA	9/17/91	9.84	9.83	0.01	-
	NA	10/16/91	10.05	9.94	0.11	-
	NA	11/13/91	10.05	9.95	0.10	-
PR-65	NA	5/24/91	8.76	8.68	0.08	-
PR-67	NA	4/16/91	8.77	8.03	0.74	-

Table 1. Groundwater Elevations and Free-Phase Petroleum Product Thicknesses (cont.)

Well Number	Measuring Point Elevation (ft AMSL)	Date	Depth to Water (ft BGS)	Depth to Product (ft BGS)	Product Thickness (ft)	Water Level Elevation* (ft AMSL)
PR-69	NA	4/16/91	7.08			-
	NA	5/24/91	7.47			-
	NA	7/9/91	8.13			-
	NA	8/15/91	8.04			-
	NA	9/17/91	8.44			-
	NA	10/16/91	8.61			-
	NA	11/13/91	8.76			-
PR-70	NA	4/16/91	8.86	7.46	1.40	-
PR-71	NA	4/16/91	8.71			-
PR-72	NA	4/16/91	9.03			-
PR-77	NA	5/24/91	8.65			-
	NA	7/9/91	9.18			-
	NA	8/15/91	9.38			-
	NA	9/17/91	9.54			-
	NA	10/16/91	9.74			-
	NA	11/13/91	8.99			-
PR-81	NA	4/16/91	8.35			-

Notes:

* When product is present, the equivalent water-level elevation is calculated by adding 0.8 times the product thickness to the product/water interface elevation.

AMSL = Elevation Above Mean Sea Level
BGS = Below Ground Surface
NA = Data Not Available
est. = estimated

Carnation.wl
12/10/91

six well samples in 6-91 had hits

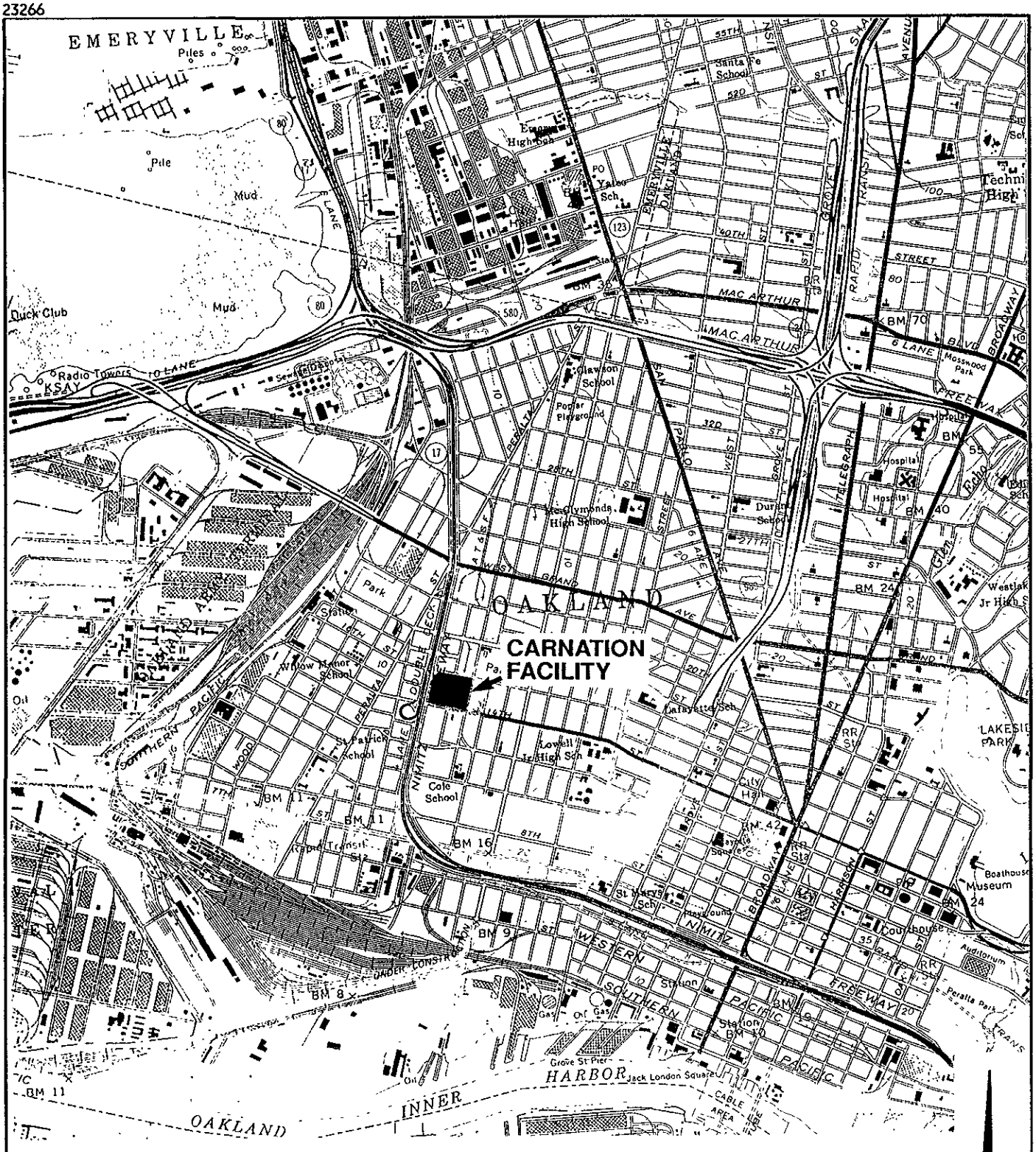
Table 2. Groundwater Analytical Data

	Well Number	Sample Number	Method 8020 Compounds Concentrations: Benzene	Toluene	Ethyl-Benzene	Xylenes (Total)	Method 8010 Compounds Concentrations
✓	MW-3	91091608	64	3.6	3.8	2.8	NT
✓	MW-25	91091601	3.5	5.7	1.3	6.6	NT
✓	MW-26	91091604	6200	5800	1.0	3900	610 (1,2-DCA)
	MW-26 dup	91091605	3300	2200	210	1700	NT
✓	MW-27	91091606	<0.5	<0.5	<0.6	<0.6	NT
	MW-28	91091603	<0.5	<0.5	<0.6	<0.6	NT
	MW-29	91091602	<0.5	<0.5	<0.6	<0.6	NT
	MW-30	91091607	<0.5	<0.5	<0.6	<0.6	NT
✓	MW-32	91091609	0.62	2.6	11	4.6	8.1 (1,2-DCA); 0.6 (Chlorobenzene)
	Field Blank	91091610	<0.5	<0.5	<0.5	<0.5	<0.4-<10

Notes: Concentrations reported in micrograms per liter (µg/l)
<0.5 - Chemical not detected above indicated reporting limit.
NT- Not Tested.

PLATES

23266



PLATE

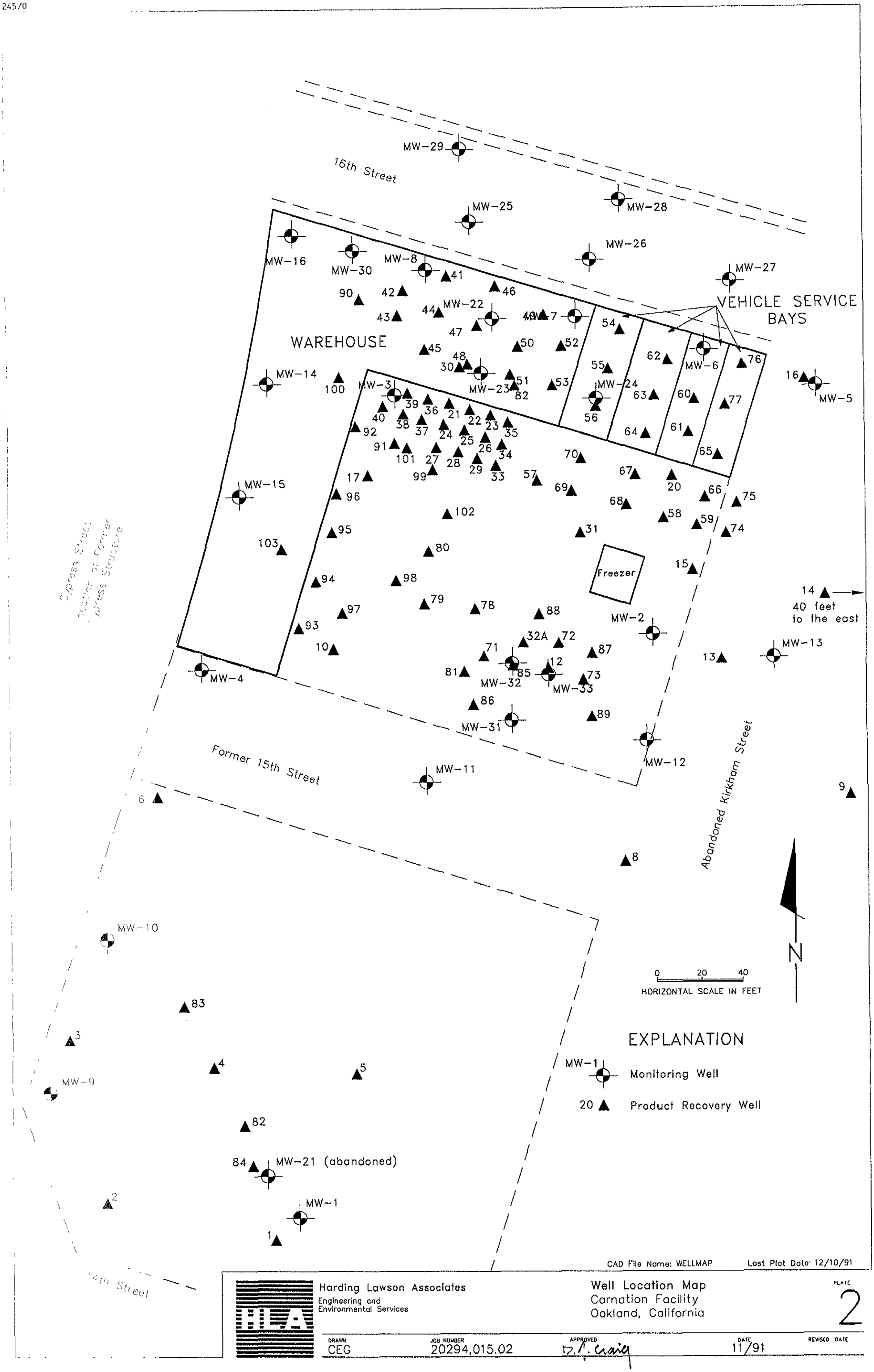
1

Harding Lawson Associates
Engineering and
Environmental Services

Site Location Map
Carnation Facility
Oakland, California

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	20294,005.02	D. J. Craig	9/91	

24570



CAD File Name: WELLMAP Last Plot Date: 12/10/91

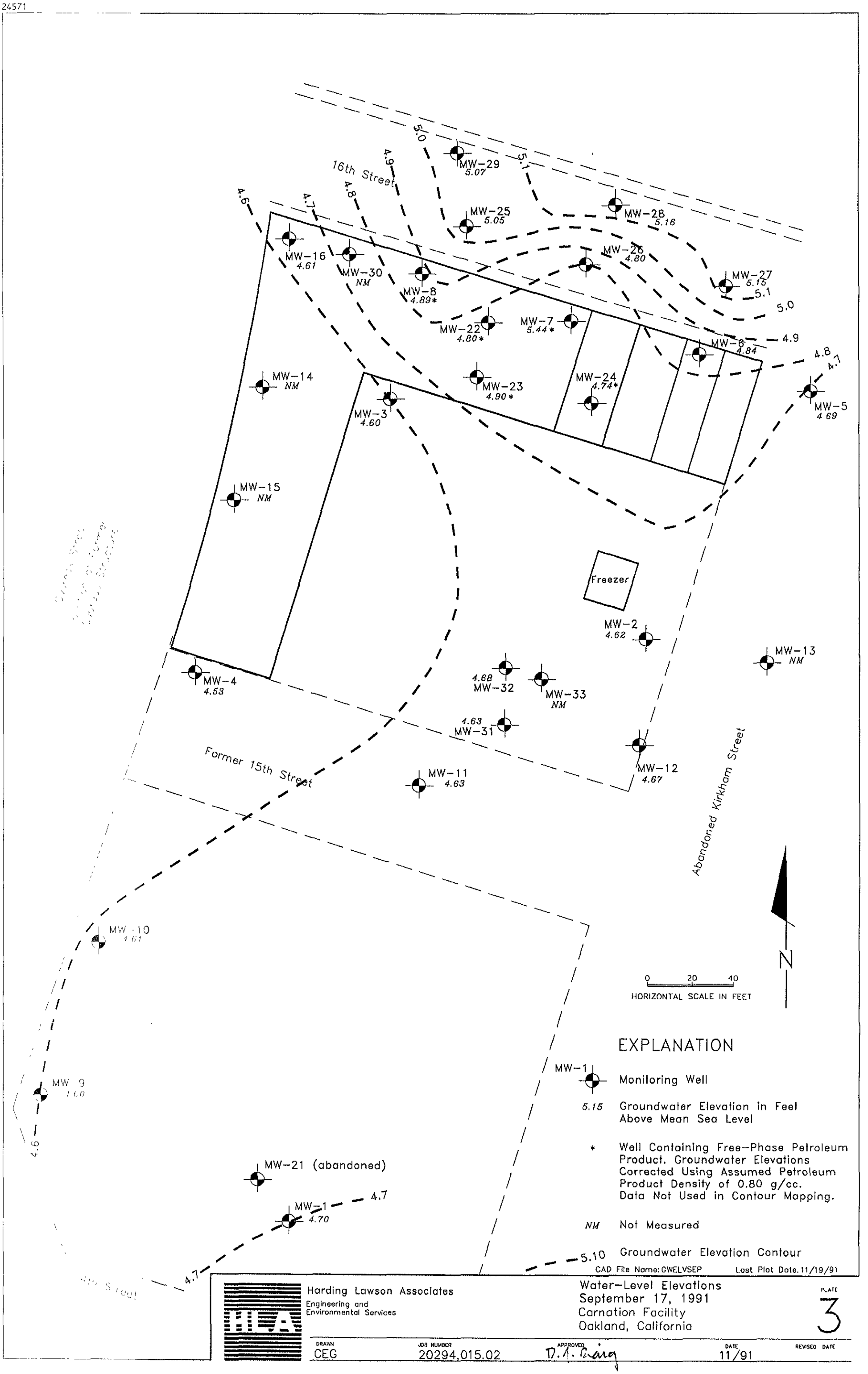
Harding Lawson Associates
Engineering and Environmental Services

Well Location Map
Carnation Facility
Oakland, California

PLATE 2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
CEG	20294,015.02	R. Craig	11/91	

24571



EXPLANATION

MW-1 — Monitoring Well

5.15 — Groundwater Elevation in Feet Above Mean Sea Level

* — Well Containing Free-Phase Petroleum Product. Groundwater Elevations Corrected Using Assumed Petroleum Product Density of 0.80 g/cc. Data Not Used in Contour Mapping.

NM — Not Measured

5.10 — Groundwater Elevation Contour

CAD File Name: GWELVSEP Last Plot Date: 11/19/91

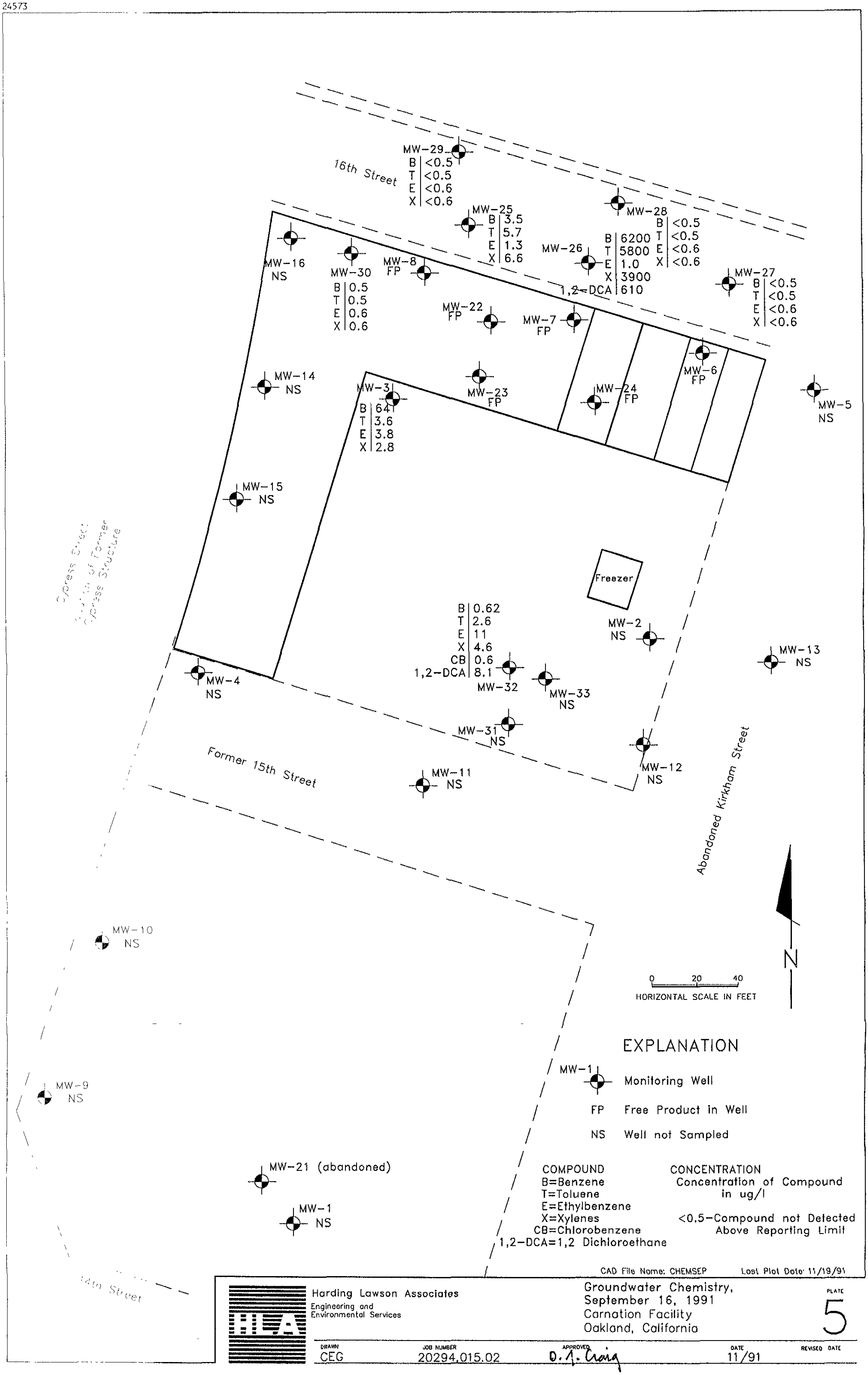
Harding Lawson Associates
Engineering and Environmental Services

Water-Level Elevations
September 17, 1991
Carnation Facility
Oakland, California

PLATE 3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
CEG	20294,015.02	D.A. Craig	11/91	

24573



CAD File Name: CHEMSEP Last Plot Date: 11/19/91

Harding Lawson Associates
Engineering and Environmental Services

Groundwater Chemistry,
September 16, 1991
Carnation Facility
Oakland, California

PLATE 5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
CEG	20294,015.02	D.J. Craig	11/91	

Appendix A

GROUNDWATER SAMPLING FORMS

Harding Lawson Associates
Engineers and Geoscientists

GROUND-WATER SAMPLING FORM

Well No. MW-3
Well Type: ☐ Monitor ☐ Extraction ☐ Other
Well Material: ☐ PVC ☐ St. Steel ☐ Other
Job Name Carnation
Job Number 20794.005.02
Date 9-16-91 Time 1410
Recorded by Rick Evans (Signature)
Sampled by RWE (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☐ 2-inch ☒ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 22.7
Water Level Depth (WL in feet BTOC): 9.23
Number of Well Volumes to be purged (# Vols)
☐ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE METHOD

☐ Bailer - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in feet (BTOC): from to

PURGE VOLUME CALCULATION

$$\left(\underset{\text{TD (feet)}}{22.7} - \underset{\text{WL (feet)}}{9.23}\right) \times \underset{\text{D (inches)}}{\left(\frac{4}{2}\right)^2} \times \underset{\text{\# Vols}}{3} \times 0.0408 = \underset{\text{Calculated Purge Volume}}{25} \text{ gallons}$$

PURGE TIME

1400 Start 1405 Stop 5 min Elapsed

PURGE RATE

Initial 5 gpm Final 5 gpm

ACTUAL PURGE VOLUME

25 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐°C ☐°F	Other turb
initial	6.8	900	22.5	>100
15 gals	6.7	950	21.0	
25 "	6.7	950	20.0	>100

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐°C ☐°F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): silty brown H2S odor
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☐ Other poly tank

WELL SAMPLING

SAMPLING METHOD

☐ Same As Above
☐ Bailer - Type: SS
☐ Grab - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

SAMPLE DISTRIBUTION

Sample Series: 9109

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
1609	3 VOA	8020	HCl	Net	

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

RL004

FIELD COPY

Harding Lawson Associates
Engineers and Geoscientists

GROUND-WATER SAMPLING FORM

Job Name: Carnation
Job Number: 20294.005.02
Recorded by: Bill Edmonson (Signature)

Well No.: MW-2S
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date: 9-16-91 Time: 1017
Sampled by: RWE (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☐ 2-inch ☒ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 19.5
Water Level Depth (WL in feet BTOC): 7.86
Number of Well Volumes to be purged (# Vols)
☐ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE METHOD

☐ Bailer - Type:
☐ Submersible ☐ Centrifugal ☒ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☒ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in feet (BTOC): from to

PURGE VOLUME CALCULATION

(19.5 (TD, feet) − 7.86 (WL, feet)) × 4² (D, inches) × 3 (# Vols) × 0.0408 = 23 gallons (Calculated Purge Volume)

PURGE TIME

1001 Start 1003 Stop Elapsed

PURGE RATE

Initial 5 gpm Final — gpm

ACTUAL PURGE VOLUME

10 gallons

dry @ 10 gals Final WL = 16.30 @ 1003

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐°C ☐°F	Other
initial	6.9	710	19.5	65 NTU

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐°C ☐°F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): clear
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other tank

WELL SAMPLING

SAMPLING METHOD

☐ Same As Above
☒ Bailer - Type: SS
☐ Grab - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

SAMPLE DISTRIBUTION

Sample Series: 9109

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
1001	2 VOA	8020	HCl	Nor	

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineers and Geoscientists

GROUND-WATER SAMPLING FORM

Well No. MW-36
Well Type: ☑ Monitor ☐ Extraction ☐ Other
Well Material: ☐ PVC ☐ St. Steel ☐ Other
Date 9-16-91 Time 1224
Sampled by [illegible] (Initials)

Job Name Carnation
Job Number 20294.005.07
Recorded by Rick Eckum (Signature)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☐ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 25
Water Level Depth (WL in feet BTOC): 7.95
Number of Well Volumes to be purged (# Vols)
☑ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE EQUIPMENT

☐ Bailer - Type:
☐ Submersible ☑ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☑ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in feet (BTOC): from to

PURGE VOLUME CALCULATION

(25 TD (feet) − 7.95 WL (feet)) X 4 D (inches)² X 3 # Vols X 0.0408 = 33 Calculated Purge Volume gallons

PURGE TIME

1207 Start 1241 Stop 34 Elapsed

PURGE RATE

Initial 8 gpm Final 8 gpm

ACTUAL PURGE VOLUME

33 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐°C ☐°F	Other [illegible]
initial	6.7	330	20.0	62 ppm
20+ gals	6.7	460	20.0	
33 "	6.7	460	19.5	56 ppm

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐°C ☐°F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): clear no odor
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☑ Other Tank

WELL SAMPLING

SAMPLING METHOD

☑ Bailer - Type: SS
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Same As Above
☐ Grab - Type:
☐ Other - Type:

SAMPLE DISTRIBUTION

Sample Series: 9109

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
1604	3 VOA	8010	-	WCT	
"	"	8020	HCl	"	

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.
1604	1605

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineers and Geoscientists

GROUND-WATER SAMPLING FORM

Job Name Carnation
Job Number 20294.005.02
Recorded by Rick Ellis (Signature)

Well No. MW-7
Well Type: ☐ Monitor ☐ Extraction ☐ Other
Well Material: ☐ PVC ☐ St. Steel ☐ Other
Date 9-16-91 Time 1309
Sampled by RES (Initials)

WELL PURGING

PURGE CALCULATION

Casing Diameter (D in inches): 2
☐ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 23.9
Water Level Depth (WL in feet BTOC): 8.91
Number of Well Volumes to be purged (# Vols)
☐ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE VOLUME CALCULATION

(23.9 TD (feet) − 8.91 WL (feet)) X 4 D (inches)^2 X 3 # Vols X 0.0408 = 2.9 Calculated Purge Volume gallons

PURGE METHOD

☐ Bailer - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen interval in feet (BTOC): from to

PURGE TIME 1256 Start 1326 Stop 90 Elapsed

PURGE RATE Initial 3 gpm Final 3 gpm

ACTUAL PURGE VOLUME 29 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐°C ☐°F	Other turb
initial	6.6	160	21.5	66 ntu
20 gals	7.1	180	20.5	
29 "	7.2	180	20.5	7 ntu

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐°C ☐°F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): clear ⇒ turbid
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☐ Other poly tank

WELL SAMPLING

SAMPLING METHOD

☐ Bailer - Type: SS
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Same As Above
☐ Grab - Type:
☐ Other - Type:

SAMPLE DISTRIBUTION Sample Series: 9109

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
MW-7	3 VOA	8020	HCl	ALS	

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

GROUND-WATER SAMPLING FORM

Harding Lawson Associates
Engineers and Geoscientists

Well No. MW-28
Well Type: ☐ Monitor ☐ Extraction ☐ Other
Well Material: ☐ PVC ☐ St. Steel ☐ Other
Job Name: Carnation
Job Number: 30194.005.02
Date: 9-16-91 Time: 1110
Recorded by: [signature] (Signature) Sampled by: TMC (Initials)

WELL PURGING

PURGE EQUIPMENT

Casing Diameter (D in inches): 2
☐ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 25
Water Level Depth (WL in feet BTOC): 8.32
Number of Well Volumes to be purged (# Vols):
☐ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE PUMP TYPE

☐ Bailer - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in feet (BTOC): from to

PURGE VOLUME CALCULATION

(25 TD (feet) − 8.32 WL (feet)) × 2 D (inches)² × 3 # Vols × 0.0408 = 33 Calculated Purge Volume gallons

PURGE TIME

1100 Start 1111 Stop 11 Elapsed

PURGE RATE

Initial 3 gpm Final 3 gpm

ACTUAL PURGE VOLUME

33 gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐°C ☐°F	Other turb
initial	6.3	180	260	>100
20 gals	6.3	160	20.5	
33 "	6.3	160	20.0	>100

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐°C ☐°F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): silty, brown
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☐ Other tank

WELL SAMPLING

SAMPLING METHOD

☐ Same As Above
☐ Bailer - Type: SS
☐ Grab - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

SAMPLE DISTRIBUTION

Sample Series: 9109

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
1007	3 VOA	8020	HCl	Net	

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineers and Geoscientists

GROUND-WATER SAMPLING FORM

Well No. MW-29
Well Type: ☒ Monitor ☒ Extraction ☐ Other
Well Material: ☐ PVC ☐ St. Steel ☐ Other
Job Name Connolly
Job Number 30659.005.02
Date 9-16-91 Time 1043
Recorded by (Signature)
Sampled by (Initials)

WELL PURGING

WELL CASING
Casing Diameter (D in inches):
☐ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 23
Water Level Depth (WL in feet BTOC): 7.53
Number of Well Volumes to be purged (# Vols)
☐ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE EQUIPMENT
☐ Bailer - Type:
☐ Submersible ☒ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING
☒ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in feet (BTOC): from to

PURGE VOLUME CALCULATION
(23 TD (feet) − 7.53 WL (feet)) X 4 D (inches)² X 3 # Vols X 0.0408 = 30 gallons
Calculated Purge Volume

PURGE TIME 1026 Start 1038 Stop 12 Elapsed

PURGE RATE Initial 5 gpm Final 3 gpm

ACTUAL PURGE VOLUME 30 gallons

FIELD PARAMETER MEASUREMENTS

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other turb
initial	6.6	150	21.0	80 NTU
20 gals	6.4	150	20.0	>100
30 "	6.4	150	20.0	>100

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): turbid
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other tank

WELL SAMPLING

SAMPLING METHOD
☐ Same As Above
☐ Bailer - Type: SS
☐ Grab - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

SAMPLE DISTRIBUTION Sample Series: 9109

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
1602	3 VOA	8020	HCl	NET	

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineers and Geoscientists

GROUND-WATER SAMPLING FORM

Well No. MW-30

Well Type: ☐ Monitor ☐ Extraction ☐ Other ______

Well Material: ☐ PVC ☐ St. Steel ☐ Other ______

Job Name Carnation

Date 9-16-91 Time 1342

Job Number 20194,005.02

Recorded by [signature] (Signature)

Sampled by RWE (Initials)

WELL PURGING

Casing Diameter (D in inches):

☒ 2-inch ☒ 4-inch ☐ 6-inch ☐ Other ______

Total Depth of Casing (TD in feet BTOC): 27

Water Level Depth (WL in feet BTOC): 9.95

Number of Well Volumes to be purged (# Vols)

☐ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other ______

☐ Bailer - Type: ______

☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.: ______

☐ Other - Type: ______

☐ Near Bottom ☐ Near Top ☐ Other ______

Depth in feet (BTOC): ______ Screen Interval in feet (BTOC): from ______ to ______

PURGE VOLUME CALCULATION

(27 TD (feet) − 9.95 WL (feet)) X 4" D (inches)² X 3 # Vols X 0.0408 = 32 Calculated Purge Volume gallons

PURGE TIME / **PURGE RATE** / **ACTUAL PURGE VOLUME**

1312 Start 1330 Stop 15 Elapsed Initial 4 gpm Final — gpm 10 gallons

FIELD PARAMETER MEASUREMENT dry @ 10 gals Final WL = 18.30

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐°C ☐°F	Other turb
initial	6.7	350	17.5	>100

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐°C ☐°F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): silty, brown

Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☐ Other poly tank

WELL SAMPLING

SAMPLING METHOD

☐ Bailer - Type: S.S.

☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.: ______

☐ Same As Above

☐ Grab - Type: ______

☐ Other - Type: ______

SAMPLE DISTRIBUTION Sample Series: 9109

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
1607	3 VOA	8020	HCL	Net	

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineers and Geoscientists

GROUND-WATER SAMPLING FORM

Well No. MW-32
Well Type: ☐ Monitor ☐ Extraction ☐ Other
Well Material: ☐ PVC ☐ St. Steel ☐ Other
Job Name Carnation
Job Number 20294.005.02
Date 9-16-91 Time 1450
Recorded by (Signature)
Sampled by RWE (Initials)

WELL PURGING

WELL CASING

Casing Diameter (D in inches):
☐ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 23.1
Water Level Depth (WL in feet BTOC): 10.14
Number of Well Volumes to be purged (# Vols)
☐ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE WATER DISPOSAL

☐ Bailer - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

WATER INTAKE DEPTH

☐ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in feet (BTOC): from to

PURGE VOLUME CALCULATION

(23.1 (TD, feet) − 10.14 (WL, feet)) × 4² (D, inches) × 3 (# Vols) × 0.0408 = 35 gallons (Calculated Purge Volume)

PURGE RATE

1438 Start 1443 Stop 5 Elapsed

PURGE RATE

Initial 5 gpm Final 5 gpm

TOTAL PURGE VOLUME

25 gallons

FIELD PARAMETER MEASUREMENTS

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐°C ☐°F	Other turb
initial	6.8	800	23.5	>1000
15 gals	6.7	750	22.0	
25 "	6.7	750	22.0	>1000

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐°C ☐°F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): silt, brown HC odor
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☐ Other poly tank

WELL SAMPLING

SAMPLING METHOD

☐ Same As Above
☐ Bailer - Type: SS
☐ Grab - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

SAMPLE DISTRIBUTION

Sample Series: 9109

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
1609	3 VOA	8010	-	Not	
"	"	8020	HCl	"	

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.
field	1610

Other Samples

Type	Sample No.

Appendix B

GROUNDWATER CHEMISTRY LABORATORY RESULTS AND CHAIN OF CUSTODY FORMS

NET®
NATIONAL
ENVIRONMENTAL
TESTING, INC.

NET Pacific, Inc.
435 Tesconi Circle
Santa Rosa, CA 95401
Tel: (707) 526-7200
Fax: (707) 526-9623

Dan Craig
Harding Lawson Associates
200 Rush Landing
Novato, CA 94947

Date: 10-02-91
NET Client Acct No: 281
NET Pacific Log No: 9858
Received: 09-17-91 1648

Client Reference Information

Carnation, Job: 20294.005.02

Sample analysis in support of the project referenced above has been completed and results are presented on following pages. Please refer to the enclosed "Key to Abbreviations" for definition of terms. Should you have questions regarding procedures or results, please feel welcome to contact Client Services.

Approved by:

Jules Skamarack
Laboratory Manager

JS:rct
Enclosure(s)

NET Pacific, Inc

Client No: 281 Date: 10-02-91
Client Name: Harding Lawson Associates
NET Log No: 9858 Page: 2

Ref: Carnation, Job: 20294.005.02

Parameter	Method	Reporting Limit	Descriptor, Lab No. and Results 91091601 09-16-91 1000 MW-25 97612	 91091602 09-16-91 1030 MW-29 97613	Units
METHOD 8020					
DATE ANALYZED			09-27-91	09-27-91	
DILUTION FACTOR*			1	1	
Chlorobenzene		0.4	ND	ND	ug/L
1,2-Dichlorobenzene		0.4	ND	ND	ug/L
1,3-Dichlorobenzene		0.4	ND	ND	ug/L
1,4-Dichlorobenzene		0.4	ND	ND	ug/L
Benzene		0.5	3.5	ND	ug/L
Ethylbenzene		0.6	1.3	ND	ug/L
Toluene		0.5	5.7	ND	ug/L
Xylenes, total		0.6	6.6	ND	ug/L

NET Pacific, Inc

Client No: 281 Date: 10-02-91
Client Name: Harding Lawson Associates
NET Log No: 9858 Page: 3

Ref: Carnation, Job: 20294.005.02

Parameter	Method	Reporting Limit	Descriptor, Lab No. and Results 91091603 09-16-91 1100 MW-28 97614	 91091605 09-16-91 1200 MW-26-D 97615	Units
METHOD 8020					
DATE ANALYZED			09-27-91	09-27-91	
DILUTION FACTOR*			1	1	
Chlorobenzene		0.4	ND	ND	ug/L
1,2-Dichlorobenzene		0.4	ND	ND	ug/L
1,3-Dichlorobenzene		0.4	ND	ND	ug/L
1,4-Dichlorobenzene		0.4	ND	ND	ug/L
Benzene		0.5	ND	3,300	ug/L
Ethylbenzene		0.6	ND	210	ug/L
Toluene		0.5	ND	2,200	ug/L
Xylenes, total		0.6	ND	1,700	ug/L

NET Pacific, Inc

Client No: 281 Date: 10-02-91
Client Name: Harding Lawson Associates
NET Log No: 9858 Page: 4

Ref: Carnation, Job: 20294.005.02

Parameter	Method	Reporting Limit	Descriptor, Lab No. and Results: 91091606 09-16-91 1300 MW-27 97616	91091607 09-16-91 1330 MW-30 97617	Units
METHOD 8020					
DATE ANALYZED			09-27-91	09-27-91	
DILUTION FACTOR*			1	1	
Chlorobenzene		0.4	ND	ND	ug/L
1,2-Dichlorobenzene		0.4	ND	ND	ug/L
1,3-Dichlorobenzene		0.4	ND	ND	ug/L
1,4-Dichlorobenzene		0.4	ND	ND	ug/L
Benzene		0.5	ND	ND	ug/L
Ethylbenzene		0.6	ND	ND	ug/L
Toluene		0.5	ND	ND	ug/L
Xylenes, total		0.6	ND	ND	ug/L

NET Pacific, Inc

Client No: 281 Date: 10-02-91
Client Name: Harding Lawson Associates
NET Log No: 9858 Page: 5

Ref: Carnation, Job: 20294.005.02

Parameter	Method	Reporting Limit	Descriptor, Lab No. and Results 91091608 09-16-91 1400 mw-3 97618	Units
METHOD 8020				
DATE ANALYZED			09-27-91	
DILUTION FACTOR*			1	
Chlorobenzene		0.4	ND	ug/L
1,2-Dichlorobenzene		0.4	ND	ug/L
1,3-Dichlorobenzene		0.4	ND	ug/L
1,4-Dichlorobenzene		0.4	ND	ug/L
Benzene		0.5	64	ug/L
Ethylbenzene		0.6	3.8	ug/L
Toluene		0.5	3.6	ug/L
Xylenes, total		0.6	2.8	ug/L

NET Pacific, Inc

Client No: 281 Date: 10-02-91
Client Name: Harding Lawson Associates
NET Log No: 9858 Page: 6

Ref: Carnation, Job: 20294.005.02

Parameter	Method	Reporting Limit	Descriptor, Lab No. and Results: 91091604 09-16-91 1130 MW-20 97619	91091609 09-16-91 1430 MW-32 97620	Units
METHOD 8010/8020					
DATE ANALYZED			09-27-91	09-27-91	
DILUTION FACTOR*			1	1	
Bromodichloromethane		0.4	ND	ND	ug/L
Bromoform		0.4	ND	ND	ug/L
Bromomethane		0.4	ND	ND	ug/L
Carbon tetrachloride		0.4	ND	ND	ug/L
Chlorobenzene		0.4	ND	0.60	ug/L
Chloroethane		0.4	ND	ND	ug/L
2-Chloroethylvinyl ether		1.0	ND	ND	ug/L
Chloroform		0.4	ND	ND	ug/L
Chloromethane		0.4	ND	ND	ug/L
Dibromochloromethane		0.4	ND	ND	ug/L
1,2-Dichlorobenzene		0.4	ND	ND	ug/L
1,3-Dichlorobenzene		0.4	ND	ND	ug/L
1,4-Dichlorobenzene		0.4	ND	ND	ug/L
Dichlorodifluoromethane		0.4	ND	ND	ug/L
1,1-Dichloroethane		0.4	ND	ND	ug/L
1,2-Dichloroethane		0.4	610	8.1	ug/L
1,1-Dichloroethene		0.4	ND	ND	ug/L
trans-1,2-Dichloroethene		0.4	ND	ND	ug/L
1,2-Dichloropropane		0.4	ND	ND	ug/L
cis-1,3-Dichloropropene		0.4	ND	ND	ug/L
trans-1,3-Dichloropropene		0.4	ND	ND	ug/L
Methylene Chloride		10	ND	ND	ug/L
1,1,2,2-Tetrachloroethane		0.4	ND	ND	ug/L
Tetrachloroethene		0.4	ND	ND	ug/L
1,1,1-Trichloroethane		0.4	ND	ND	ug/L
1,1,2-Trichloroethane		0.4	ND	ND	ug/L
Trichloroethene		0.4	ND	ND	ug/L
Trichlorofluoromethane		0.4	ND	ND	ug/L
Vinyl chloride		2.0	ND	ND	ug/L
Benzene		0.5	6,200	0.62	ug/L
Ethylbenzene		0.6	1.0	11	ug/L
Toluene		0.5	5,800	2.6	ug/L
Xylenes, total		0.6	3,900	4.6	ug/L

NET Pacific, Inc

Client No: 281
Client Name: Harding Lawson Associates
NET Log No: 9858

Date: 10-02-91
Page: 7

Ref: Carnation, Job: 20294.005.02

Parameter	Method	Reporting Limit	Descriptor, Lab No. and Results 91091610 09-16-91 1500 FB 97621	Units
METHOD 8010/8020				
DATE ANALYZED			09-27-91	
DILUTION FACTOR*			1	
Bromodichloromethane		0.4	ND	ug/L
Bromoform		0.4	ND	ug/L
Bromomethane		0.4	ND	ug/L
Carbon tetrachloride		0.4	ND	ug/L
Chlorobenzene		0.4	ND	ug/L
Chloroethane		0.4	ND	ug/L
2-Chloroethylvinyl ether		1.0	ND	ug/L
Chloroform		0.4	ND	ug/L
Chloromethane		0.4	ND	ug/L
Dibromochloromethane		0.4	ND	ug/L
1,2-Dichlorobenzene		0.4	ND	ug/L
1,3-Dichlorobenzene		0.4	ND	ug/L
1,4-Dichlorobenzene		0.4	ND	ug/L
Dichlorodifluoromethane		0.4	ND	ug/L
1,1-Dichloroethane		0.4	ND	ug/L
1,2-Dichloroethane		0.4	ND	ug/L
1,1-Dichloroethene		0.4	ND	ug/L
trans-1,2-Dichloroethene		0.4	ND	ug/L
1,2-Dichloropropane		0.4	ND	ug/L
cis-1,3-Dichloropropene		0.4	ND	ug/L
trans-1,3-Dichloropropene		0.4	ND	ug/L
Methylene Chloride		10	ND	ug/L
1,1,2,2-Tetrachloroethane		0.4	ND	ug/L
Tetrachloroethene		0.4	ND	ug/L
1,1,1-Trichloroethane		0.4	ND	ug/L
1,1,2-Trichloroethane		0.4	ND	ug/L
Trichloroethene		0.4	ND	ug/L
Trichlorofluoromethane		0.4	ND	ug/L
Vinyl chloride		2.0	ND	ug/L
Benzene		0.5	ND	ug/L
Ethylbenzene		0.6	ND	ug/L
Toluene		0.5	ND	ug/L
Xylenes, total		0.6	ND	ug/L

NET Pacific, Inc

Client Acct: 281
Client Name: Harding Lawson Associates
NET Log No: 9858

Date: 10-02-91
Page: 8

Ref: Carnation, Job: 20294.005.02

QUALITY CONTROL DATA

Parameter	Reporting Limits	Units	Cal Verf Stand % Recovery	Blank Data	Spike % Recovery	Duplicate Spike % Recovery	RPD
Chlorobenzene	0.4	ug/L	103	ND	103	110	6.1
1,1-DCE	0.4	ug/L	100	ND	88	100	14
TCE	0.4	ug/L	108	ND	97	100	12
Benzene	0.5	ug/L	100	ND	93	94	< 1
Toluene	0.5	ug/L	92	ND	93	88	4.6

COMMENT: Blank Results were ND on other analytes tested.

NET Pacific, Inc

KEY TO ABBREVIATIONS and METHOD REFERENCES

<	:	Less than; When appearing in results column indicates analyte not detected at the value following. This datum supercedes the listed Reporting Limit.
*	:	Reporting Limits are a function of the dilution factor for any given sample. To obtain the actual reporting limits for this sample, multiply the stated Reporting Limits by the dilution factor (but do not multiply reported values).
ICVS	:	Initial Calibration Verification Standard (External Standard).
mean	:	Average; sum of measurements divided by number of measurements.
mg/Kg (ppm)	:	Concentration in units of milligrams of analyte per kilogram of sample, (parts per million).
mg/L	:	Concentration in units of milligrams of analyte per liter of sample.
mL/L/hr	:	Milliliters per liter per hour.
MPN/100 mL	:	Most probable number of bacteria per one hundred milliliters of sample.
N/A	:	Not applicable.
NA	:	Not analyzed.
ND	:	Not detected; the analyte concentration is less than applicable listed reporting limit.
NTU	:	Nephelometric turbidity units.
RPD	:	Relative percent difference, 100 [Value 1 - Value 2]/mean value.
SNA	:	Standard not available.
ug/Kg (ppb)	:	Concentration in units of micrograms of analyte per kilogram of sample, (parts per billion).
ug/L	:	Concentration in units of micrograms of analyte per liter of sample.
umhos/cm	:	Micromhos per centimeter.

Method References

Methods 100 through 493: see "Methods for Chemical Analysis of Water & Wastes", U.S. EPA, 600/4-79-020, rev. 1983.

Methods 601 through 625: see "Guidelines Establishing Test Procedures for the Analysis of Pollutants" U.S. EPA, 40 CFR, Part 136, rev. 1988.

Methods 1000 through 9999: see "Test Methods for Evaluating Solid Waste", U.S. EPA SW-846, 3rd edition, 1986.

SM: see "Standard Methods for the Examination of Water & Wastewater, 17th Edition, APHA, 1989.

Harding Lawson Associates
200 Rush Landing Road
P.O. Box 6107
Novato, California 94948
415/892-0821
Telecopy: 415/892-1586

CHAIN OF CUSTODY FORM

Lab: NET 9858

Samplers: Rick Evelsizer

Job Number: 20294.005.02

Name/Location: Carnation

Project Manager: Dan Craig

Recorder: Rick Evelsizer (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	HCL	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	ANALYSIS REQUESTED: EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb.
2 3	x							3	9	10	9 1601	9	10	9	1000	MW-25		X					
											1602				1030	MW-29		X					
											1603				1100	MW-28							
					3						1604				1130	MW-26	X	X					
											1605				1200	MW-26 DUP		X					
											1606				1300	MW-27		X					
											1607				1330	MW-30		X					
											1608				1400	MW-3		X					
					3						1609				1430	MW-32	X	X					
+	+				3			1			1610		+		1500	F. BLANK	X	X					

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature) Rick Evelsizer	Angel Salcedo	9/17/91 16:00
RELINQUISHED BY: (Signature) Angel Salcedo	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME 9/17/91 1648
METHOD OF SHIPMENT		

Laboratory Copy White — Project Office Copy Yellow — Field or Office Copy Pink

6533

DISTRIBUTION

QUARTERLY MONITORING REPORT
SEPTEMBER THROUGH NOVEMBER 1991
CARNATION FACILITY
OAKLAND, CALIFORNIA
December 10, 1991

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QUALITY CONTROL REVIEWER

David F. Leland

David F. Leland, P.E.
Associate Engineer