ENVIRONMENTAL PROTECTION

99 APR 15 AM 11: 21

**Electro-Coatings Inc.**

SLIC 1682

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4/12/99

Susan L. Hugo
Alameda County Dept. of Environmental Health
Environmental Protection Division
1131 Harbor Bay Parkway, #250
Alameda, CA 94502-6577

RE: Quarterly Groundwater Monitoring Report, February 1999

Dear Susan:

Enclosed is the above referenced report for sampling done at 1401 & 1421 Park Avenue, Emeryville.

As you can see, the good news continues. Next event in May.

Yours very truly,

Judy Garvens
Administrative Manager

cc: Mr. Mark Johnson, RWQCB

enclosure

# Quarterly Groundwater Sampling Report

## February 1999

Former Electro-Coatings, Inc. Facility at 1401 Park Avenue,
1421 Associates Property at 1421 Park Avenue,
Emeryville, California

ARCADIS
GERAGHTY & MILLER

1050 Marina Way South
Richmond, CA 94804
510 233-3200

QUARTERLY REPORT

Prepared April 7, 1999

QUARTERLY GROUNDWATER SAMPLING RESULTS
February 1999

FORMER ELECTRO-COATINGS, INC. FACILITY
1401 PARK AVENUE
1421 ASSOCIATES PROPERTY, 1421 PARK AVENUE
EMERYVILLE, CALIFORNIA

Prepared by

ARCADIS Geraghty & Miller, Inc.

April 7, 1999


Steven J. Brussee
Project Manager/Staff Engineer

Kent O'Brien, R.G.
Project Geologist

Donald C. Trueblood
Regional Manager


REGISTERED GEOLOGIST
KENT O'BRIEN
No. 6846
STATE OF CALIFORNIA

# Quarterly Groundwater Sampling Results

Former Electro-Coatings, Inc. Facility
1401 Park Avenue;
1421 Associates Property,
1421 Park Avenue,
Emeryville, California

## Introduction

### Groundwater Monitoring

This report presents the results of the semi-annual groundwater sampling activities performed by ARCADIS Geraghty & Miller on February 2, 3, and 4, 1999. The sampling activities are conducted on behalf of Electro-Coatings, Inc. (ECI) at the former Electro-Coatings, Inc. facility at 1401 Park Avenue and at the 1421 Associates Property at 1421 Park Avenue (the sites) in Emeryville, California (Figure 1).

Groundwater monitoring wells at the sites are sampled each quarter, as proposed by ECI and ARCADIS Geraghty & Miller in our April 27, 1996 letter to the Alameda County Health Care Services Agency, Department of Environmental Health (ACDEH). MW-18, MW-18A, and MW-20 are monitored semi-annually.

### Remediation-in-Progress, Reductive Zone Technology

In 1995 and 1996, ARCADIS Geraghty & Miller conducted a six-month pilot study at the site to evaluate a patented ARCADIS Geraghty & Miller in-situ Reductive Zone Technology. Based on the successful results of this pilot study, a full scale, on-site implementation of this remediation technology was initiated in April 1997.

ARCADIS Geraghty & Miller has installed over 100 temporary injection points throughout the sites. A proprietary mixture has been injected into the temporary injection points during two discrete injection events. The proprietary mixture includes non-petroleum organic compounds, an engineered additive of bio-nutrients, and a microbial inoculant. Two injection events have been completed at the site to date. The first event was completed in April 1997 and the second was completed in February 1998.

Data from the groundwater monitoring program is being used to evaluate the progress of the on-site remediation in progress. These data are presented and discussed below.

## Field Activities and Laboratory Analyses

The groundwater monitoring wells sampled during this semi-annual groundwater monitoring event include MW-1, MW-3A, MW-3B, MW-4, MW-5, MW-6, MW-9, MW-10, MW-12 , MW-13, MW-14, MW-16, MW-17, MW-18, MW-18A, and MW-20.

Prior to sampling, depth-to-water measurements were obtained from each well.

The wells were then low-flow sampled using an above-ground peristaltic pump. The low-flow sampling procedure was conducted in according to the protocol described in the United States Environmental Protection Agency (EPA) publication entitled *Ground Water Issue, Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures* (EPA/540/S-95/504). A copy of this publication is attached in Appendix B. In this publication, the EPA presents theoretical and empirical bases for low-flow sampling.

During the low-flow sampling procedure, new polyethylene tubing was used for each well. The intake of the tubing was placed at approximately the middle of the screened interval for each well. During the sampling process, groundwater was extracted from each well at approximately ½ liter per minute; groundwater quality parameters (pH, specific conductance, temperature, redox, and dissolved oxygen) were monitored during the sampling process (Table 2). Upon stabilization of these groundwater quality parameters, groundwater samples were collected from the effluent port of the low-flow sampling apparatus. The samples were collected into USEPA-approved containers, placed on ice, and transported to Sequoia Analytical, a State-certified laboratory, under chain-of-custody documentation for analysis by the methods indicated in Tables 3 and 4.

## Results & Discussion

### Overview

The groundwater monitoring wells which are sampled as part of the quarterly groundwater monitoring events include both on-site and off-site wells. To date, remediation activities have been implemented only onsite at the 1401 and 1421 Park Avenue sites. The groundwater monitoring wells, as presented in Tables 3 and 4 (analytical results), are grouped by their location (onsite versus offsite).

- Sampled on-site wells include MW-1, MW-3A, MW-3B, MW-4, MW-5, MW-9, MW-10, MW-12, MW-13, MW-14, and MW-20. MW-3A and MW-20 are deeper wells and are screened below the uppermost aquifer.
- Sampled off-site wells (wells not within the on-site remediation area) include MW-6 (the furthest downgradient monitoring well), MW-16 (the nearest off-site well), MW-17, MW-18, and MW-18A. MW-18 and MW-18A are cross-gradient wells; MW-18A is a deeper well and is screened below the uppermost water-bearing zone.

### Groundwater Elevations

Groundwater elevations for the shallow-zone wells ranged from 10.87 feet above mean sea level (msl) (MW-3B) to 6.53 feet msl (MW-6). Historic and current depth-to-water measurements and calculated groundwater elevations are presented in Table 1.

There are three locations at the site where pairs of wells exist for which one of the wells is screened in the shallow, uppermost water-bearing zone. This zone extends from first encountered groundwater at approximately 10 feet bgs to approximately 25 feet bgs. The other well of the pair is screened below the shallow, uppermost water-bearing zone from approximately 30 to 50 feet bgs. These pairs of wells include MW-3A and MW-3B, MW-10 and MW-20, and MW-18 and MW-18A. MW-3A and MW-3B are located near the upgradient edge of the site. MW-10 and MW-20 are located near the downgradient boundary of the site. The calculated groundwater elevation for MW-10 is 8.67 feet msl and for MW-20 is 12.70 feet msl. This indicates that a the lower water-bearing unit is (semi-) confined, with a piezometric head greater than the upper water-bearing zone (in this location, near the downgradient edge of the site). The calculated groundwater elevations for MW-3A and MW-3B are similar. MW-18 and MW-18A are ~~and~~ located crossgradient of the groundwater flow direction from the site. The calculated groundwater elevations for these wells do not indicate a significant difference in the piezometric head for the two water-bearing units in this location.

The groundwater elevations and groundwater contours upper water-bearing zone for the February 1999 sampling event are presented in Figure 2. Based on the depth-to-water data recorded on February 2, 1999, the direction of groundwater flow is toward the northwest, which is consistent with the previous sampling event (October 8, 1998).

#### Low-Flow Sampling

Low-flow sampling was first implemented at the site during the July 1998 sampling event. As described in the attached EPA document, low-flow sampling is likely to produce groundwater samples which more accurately reflect actual subsurface conditions. Low-flow sampling also generates far less purge water than do conventional purge-and-sample techniques. These considerations prompted ARCADIS Geraghty & Miller and ECI to implement the low-flow protocol for all wells sampled both on- and off-site.

Low-flow sampling techniques which use an above-ground peristaltic pump necessarily place a negative gauge pressure on the in-well sample tubing. This condition has the potential to volatilize HVOCs present in the water column within the in-well tubing, thereby producing analytical results which are not representative of actual subsurface conditions (i.e., falsely low).

To evaluate whether this sampling technique has had a deleterious effect on the groundwater samples which have been collected, ARCADIS Geraghty & Miller and ECI have compared the data sets for two groups of wells. The first group of wells includes those wells within the remediation area (on-site), in which marked decreases in the concentrations of HVOCs have been recorded. The second group of wells includes those wells on- and off-site which are not in the remediation area, specifically MW-1 (on-site), MW-6, MW-17, MW-18, and MW-18A (all off-site). Both groups of wells are sampled identically. However, none of the wells in the second group shows the HVOC-concentration trends apparent in the wells of the first group. Therefore, we conclude that the above-ground peristaltic pump low-flow sampling technique being used at the site has produced representative groundwater samples.

**Laboratory Analytical Results**

Chromium

Cumulative analytical results for hexavalent and total chromium are summarized in Table 3; the current results are presented in Figure 3. Trend analyses of concentrations of hexavalent chromium in on-site wells are presented in Chart 1.

Since the implementation of full-scale on-site remediation activities for the 1401 and 1421 Park Avenue sites in April 1997, the concentrations of total and hexavalent chromium detected in on-site groundwater monitoring wells (within the remediation area) have decreased dramatically.

- The average concentration of total chromium in these wells has decreased by approximately 99% from 65,670 micrograms per liter (µg/L) (March 1996) to 860 µg/L (February 1999).
- The average concentration of hexavalent chromium in these wells has decreased by greater than 99.9% from 74,350 µg/L (March 1996) to 20 µg/L (February 1999).
- Two on-site groundwater monitoring wells with historic concentrations of hexavalent chromium in excess of 100,000 µg/L (MW-13 and MW-14) are now non-detect for hexavalent chromium (less than 5.0 µg/L).

*Errata*

The analytical reported by the laboratory for hexavalent chromium for the sampling event conducted in September 1996 were unexpectedly low. The laboratory reported values which were, in most cases, one order of magnitude lower than might have been expected based on results obtained prior to and following the September 1996 event. The September 1996 data presented in Table 3 are presented as they were reported by the analytical laboratory. However, the data have been corrected by a factor of 10 for preparation of Chart 1, Concentrations of Hexavalent Chromium in On-Site Wells.

The reported concentrations of hexavalent chromium in off-site monitoring wells MW-6 and MW-17 were two orders of magnitude less for the October 1998 event, but have returned to historically-reported values for the February 1999 event. ARCADIS Geraghty & Miller believes the data reported for hexavalent chromium for these wells in October to be a laboratory error.

#### Halogenated Volatile Organic Compounds

The cumulative analytical results for halogenated volatile organic compounds (HVOCs) are summarized in Table 4; the current results for trichloroethylene (TCE) are presented in Figure 4. Trend analyses of concentrations of selected HVOCs in on-site wells are presented in Chart 2.

Since the implementation of full scale, on-site remediation for the 1401 and 1421 Park Avenue sites in April 1997, the reported concentrations of HVOCs in groundwater samples obtained from the on-site wells have changed significantly.

- The average concentration of TCE in the on-site groundwater monitoring wells within the remediation area has decreased by greater then 99.9% from 3,040 μg/L (April 1995) to 1 μg/L (February 1999).

The average concentrations of biodegradation daughter products (i.e., cis-1,2 DCE and vinyl chloride) initially increased following the initiation of the remediation program and have subsequently shown decreasing trends.

The concentration trends for TCE, as well as for PCE, cis-1,2-DCE, and vinyl chloride are graphically depicted in Chart 2.

MW-6, the furthest down-gradient groundwater monitoring well and MW-17 show detections consistent with previous groundwater analytical results (October 1998).

#### Continuing Remediation Activities

A comprehensive review of the remediation activities at the sites was presented in ARCADIS Geraghty & Miller's Remediation Status Report dated August 17, 1998.

ARCADIS Geraghty & Miller is continuing remediation activities at the sites. A third injection event is currently being implemented. This injection event focuses on the suspected former hexavalent chromium and TCE source areas at the south end of the 1401 and 1421 Park Avenue structures, respectively.

Upon completion of these on-site remediation activities, ECI and ARCADIS Geraghty & Miller will propose an off-site remediation program to the RWQCB. This is pursuant to a meeting between Mark Johnson and Derek Lee of the RWQCB, Judy Garvens of ECI, and Steven Brussee and Gary Keyes of ARCADIS Geraghty & Miller held at the site on February 3, 1999. We expect to submit a work plan for this proposed off-site remediation work plan the week of April 12, 1999.

Attachments

Tables:

| | |
|---|---|
| Table 1 | Summary of Groundwater Elevation Data |
| Table 2 | Summary of Field Sampling Data |
| Table 3 | Summary of Groundwater Analytical Data – Total and Hexavalent Chromium |
| Table 4 | Summary of Groundwater Analytical Data Halogenated Volatile Organic Compounds |

Figures:

| | |
|---|---|
| Figure 1 | Site Plan |
| Figure 2 | Groundwater Elevation Contours (February 1999) |
| Figure 3 | Hexavalent Chromium Concentrations in Groundwater (February 1999) |
| Figure 4 | TCE Concentrations in Groundwater (February 1999) |
| Figure 5 | Injection Point Locations |

Charts:

| | |
|---|---|
| Chart 1 | Concentrations of Hexavalent Chromium in On-Site Wells |
| Chart 2 | Concentrations of TCE in On-Site Wells |
| Appendix A | Copies of Laboratory Analytical Reports and Chain-of-Custody Documentation |
| Appendix B | Ground Water Issue, Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures (EPA/540/S-95/504) |

ARCADIS GERAGHTY&MILLER

## Table 1: Summary of Groundwater Elevation Data

Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | Screened Interval (feet, bgs) | Depth-to-Water (feet) | Top of Casing (feet - MSL) | Groundwater Elevation (feet - MSL) |
|---|---|---|---|---|---|
| **MW-1** | 19-Apr-95 | | Not Located | | -- |
| **(on-site)** | 12-Sep-96 | 21.0-29.0 | 6.15 | 15.19 | 9.04 |
| | 7-Apr-97 | | 5.87 | | 9.32 |
| | 29-Sep-97 | | 9.08 | | 6.11 |
| | 22-Apr-98 | | 5.76 | | 9.43 |
| | 27-Jul-98 | | 5.89 | | 9.30 |
| | 8-Oct-98 | | 5.91 | | 9.28 |
| | **2-Feb-99** | | **5.37** | | **9.82** |
| **MW-3A** | 19-Apr-95 | 57.0-61.0 | 4.87 | 16.1 | 11.23 |
| **(on-site)** | 19-Sep-95 | | 5.70 | | 10.40 |
| **(deep well)** | 14-Dec-95 | | 5.00 | | 11.10 |
| | 6-Mar-96 | | 4.73 | | 11.37 |
| | 11-Jun-96 | | 5.28 | | 10.82 |
| | 12-Sep-96 | | 5.47 | | 10.63 |
| | 9-Dec-96 | | 5.61 | | 10.49 |
| | 7-Apr-97 | | 5.05 | | 11.05 |
| | 30-Jun-97 | | 4.64 | | 11.46 |
| | 29-Sep-97 | | 5.50 | | 10.60 |
| | 4-Dec-97 | | 4.65 | | 11.45 |
| | 22-Apr-98 | | 4.65 | | 11.45 |
| | 27-Jul-98 | | 4.83 | | 11.27 |
| | 8-Oct-98 | | 5.74 | | 10.36 |
| | **2-Feb-99** | | **5.59** | | **10.51** |
| **MW-3B** | 19-Apr-95 | 16.0-18.0 | 6.76 | 16.3 | 9.54 |
| **(on-site)** | 22-Apr-98 | | 5.75 | | 10.55 |
| | 27-Jul-98 | | 6.08 | | 10.22 |
| | 8-Oct-98 | | 6.55 | | 9.75 |
| | **2-Feb-99** | | **5.43** | | **10.87** |
| **MW-3C** | 19-Apr-95 | 11.0-14.0 | 6.19 | 16.21 | 10.02 |
| **(on-site)** | | | | | |

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# Table 1: Summary of Groundwater Elevation Data

Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | Screened Interval (feet, bgs) | Depth-to-Water (feet) | Top of Casing (feet - MSL) | Groundwater Elevation (feet - MSL) |
|---|---|---|---|---|---|
| **MW-4** | 19-Apr-95 | 16.0-20.0 | 6.52 | 14.29 | 7.77 |
| **(on-site)** | 19-Sep-95 | | 6.50 | | 7.79 |
| | 14-Dec-95 | | 5.36 | | 8.93 |
| | 6-Mar-96 | | 5.90 | | 8.39 |
| | 11-Jun-96 | | 6.39 | | 7.90 |
| | 12-Sep-96 | | 6.40 | | 7.89 |
| | 9-Dec-96 | | 5.78 | | 8.51 |
| | 7-Apr-97 | | 6.49 | | 7.80 |
| | 30-Jun-97 | | 6.49 | | 7.80 |
| | 29-Sep-97 | | 6.59 | | 7.70 |
| | 1-Dec-97 | | 5.37 | | 8.92 |
| | 22-Apr-98 | | 6.47 | | 7.82 |
| | 27-Jul-98 | | 6.54 | | 7.75 |
| | 8-Oct-98 | | 6.55 | | 7.74 |
| | **2-Feb-99** | | **6.02** | | **8.27** |
| **MW-5** | 19-Apr-95 | 11.0-15.0 | 6.95 | 15.87 | 8.92 |
| **(on-site)** | 30-Jun-97 | | 6.84 | | 9.03 |
| | 29-Sep-97 | | 7.82 | | 8.05 |
| | 22-Apr-98 | | 6.50 | | 9.37 |
| | 27-Jul-98 | | 7.48 | | 8.39 |
| | 8-Oct-98 | | 7.72 | | 8.15 |
| | **2-Feb-99** | | **6.50** | | **9.37** |
| **MW-9** | 19-Apr-95 | 17.5-24.5 | 6.67 | 16.03 | 9.36 |
| **(on-site)** | 12-Sep-96 | | 6.71 | | 9.32 |
| | 7-Apr-97 | | 6.90 | | 9.13 |
| | 29-Sep-97 | | 6.55 | | 9.48 |
| | 1-Dec-97 | | 4.83 | | 11.20 |
| | 22-Apr-98 | | 5.92 | | 10.11 |
| | 27-Jul-98 | | 6.13 | | 9.90 |
| | 8-Oct-98 | | 6.50 | | 9.53 |
| | **2-Feb-99** | | **5.36** | | **10.67** |

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## Table 1: Summary of Groundwater Elevation Data

Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | Screened Interval (feet, bgs) | Depth-to-Water (feet) | Top of Casing (feet - MSL) | Groundwater Elevation (feet - MSL) |
|---|---|---|---|---|---|
| **MW-10** | 19-Apr-95 | 17.5-24.5 | 6.94 | 15.1 | 8.16 |
| **(on-site)** | 29-Sep-97 | | 7.10 | | 8.00 |
| | 1-Dec-97 | | 5.50 | | 9.60 |
| | 22-Apr-98 | | 6.62 | | 8.48 |
| | 27-Jul-98 | | 6.95 | | 8.15 |
| | 8-Oct-98 | | 7.10 | | 8.00 |
| | **2-Feb-99** | | **6.43** | | **8.67** |
| **MW-11** | 19-Apr-95 | 16.0-29.0 | 6.38 | 15.94 | 9.56 |
| **(on-site)** | 12-Sep-96 | | 6.40 | | 9.54 |
| | 7-Apr-97 | | 6.56 | | 9.38 |
| | 29-Sep-97 | | 5.80 | | 10.14 |
| **MW-12** | 19-Apr-95 | 17.5-28.5 | 6.52 | 16.04 | 9.52 |
| **(on-site)** | 19-Sep-95 | | 6.61 | | 9.43 |
| | 14-Dec-95 | | 5.12 | | 10.92 |
| | 6-Mar-96 | | 5.61 | | 10.43 |
| | 11-Jun-96 | | 6.46 | | 9.58 |
| | 12-Sep-96 | | 6.53 | | 9.51 |
| | 9-Dec-96 | | 5.76 | | 10.28 |
| | 7-Apr-97 | | 6.67 | | 9.37 |
| | 30-Jun-97 | | 6.19 | | 9.85 |
| | 29-Sep-97 | | 6.36 | | 9.68 |
| | 1-Dec-97 | | 4.66 | | 11.38 |
| | 22-Apr-98 | | 5.53 | | 10.51 |
| | 27-Jul-98 | | 5.94 | | 10.10 |
| | 8-Oct-98 | | 6.25 | | 9.79 |
| | **2-Feb-99** | | **5.30** | | **10.74** |

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## Table 1: Summary of Groundwater Elevation Data

Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | Screened Interval (feet, bgs) | Depth-to-Water (feet) | Top of Casing (feet - MSL) | Groundwater Elevation (feet - MSL) |
|---|---|---|---|---|---|
| **MW-13** | 19-Apr-95 | 10.5-15.5 | 6.75 | 15.37 | 8.62 |
| **(on-site)** | 19-Sep-95 | | 6.94 | | 8.43 |
| | 14-Dec-95 | | 5.45 | | 9.92 |
| | 6-Mar-96 | | 5.94 | | 9.43 |
| | 11-Jun-96 | | 6.75 | | 8.62 |
| | 12-Sep-96 | | 6.80 | | 8.57 |
| | 9-Dec-96 | | 6.02 | | 9.35 |
| | 7-Apr-97 | | 6.92 | | 8.45 |
| | 30-Jun-97 | | 6.66 | | 8.71 |
| | 29-Sep-97 | | 6.87 | | 8.50 |
| | 1-Dec-97 | | 5.15 | | 10.22 |
| | 22-Apr-98 | | 6.31 | | 9.06 |
| | 27-Jul-98 | | 6.58 | | 8.79 |
| | 8-Oct-98 | | 7.00 | | 8.37 |
| | **2-Feb-99** | | **6.03** | | **9.34** |
| **MW-14** | 19-Apr-95 | 15.0-25.0 | 6.71 | 15.49 | 8.78 |
| **(on-site)** | 12-Sep-96 | | 6.74 | | 8.75 |
| | 7-Apr-97 | | 6.85 | | 8.64 |
| | 29-Sep-97 | | 6.60 | | 8.89 |
| | 1-Dec-97 | | 4.78 | | 10.71 |
| | 27-Jul-98 | | 6.92 | | 8.57 |
| | 8-Oct-98 | | NM | | NM |
| | **2-Feb-99** | | **5.95** | | **9.54** |
| **MW-20** | 19-Apr-95 | 31.0-51.0 | 2.78 | 14.93 | 12.15 |
| **(on-site)** | 19-Sep-95 | | 2.47 | | 12.46 |
| **(deep well)** | 14-Dec-95 | | 2.95 | | 11.98 |
| **(semi annual)** | 6-Mar-96 | | 1.43 | | 13.50 |
| | 11-Jun-96 | | 2.29 | | 12.64 |
| | 12-Sep-96 | | 2.90 | | 12.03 |
| | 7-Apr-97 | | 2.63 | | 12.30 |
| | 29-Sep-97 | | 2.90 | | 12.03 |
| | 22-Apr-98 | | 1.77 | | 13.16 |
| | 27-Jul-98 | | 2.63 | | 12.30 |
| | **2-Feb-99** | | **2.23** | | **12.70** |

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## Table 1: Summary of Groundwater Elevation Data

Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | Screened Interval (feet, bgs) | Depth-to-Water (feet) | Top of Casing (feet - MSL) | Groundwater Elevation (feet - MSL) |
|---|---|---|---|---|---|
| **MW-6** | 19-Apr-95 | 13.0-17.0 | 3.55 | 9.24 | 5.69 |
| **(off-site)** | 19-Sep-95 | | 3.72 | | 5.52 |
| | 14-Dec-95 | | 3.01 | | 6.23 |
| | 6-Mar-96 | | 3.31 | | 5.93 |
| | 11-Jun-96 | | 5.34 | | 3.90 |
| | 12-Sep-96 | | 3.60 | | 5.64 |
| | 9-Dec-96 | | 3.19 | | 6.05 |
| | 7-Apr-97 | | 3.64 | | 5.60 |
| | 30-Jun-97 | | 3.57 | | 5.67 |
| | 29-Sep-97 | | 3.56 | | 5.68 |
| | 1-Dec-97 | | 3.14 | | 6.10 |
| | 22-Apr-98 | | 3.51 | | 5.73 |
| | 27-Jul-98 | | 3.01 | | 6.23 |
| | 8-Oct-98 | | 3.34 | | 5.90 |
| | **2-Feb-99** | | **2.71** | | **6.53** |
| **MW-8** | 19-Apr-95 | 16.0-22.0 | 5.50 | 16.42 | 10.92 |
| **(off-site)** | | | NL | | |
| **MW-15** | 19-Apr-95 | 15.0-25.0 | 7.94 | 17.26 | 9.32 |
| **(off-site)** | 19-Sep-95 | | NL | | -- |
| **MW-16** | 19-Apr-95 | 12.0-22.0 | 4.57 | 12.08 | 7.51 |
| **(off-site)** | 19-Sep-95 | | 4.64 | | 7.44 |
| | 14-Dec-95 | | 4.28 | | 7.80 |
| | 6-Mar-96 | | 4.01 | | 8.07 |
| | 11-Jun-96 | | 4.50 | | 7.58 |
| | 12-Sep-96 | | 4.55 | | 7.53 |
| | 9-Dec-96 | | 3.98 | | 8.10 |
| | 7-Apr-97 | | 4.57 | | 7.51 |
| | 30-Jun-97 | | 4.55 | | 7.53 |
| | 29-Sep-97 | | 4.63 | | 7.45 |
| | 1-Dec-97 | | 3.51 | | 8.57 |
| | 22-Apr-98 | | 4.40 | | 7.68 |
| | 27-Jul-98 | | 4.49 | | 7.59 |
| | 8-Oct-98 | | 4.62 | | 7.46 |
| | **2-Feb-99** | | **4.40** | | **7.68** |

ARCADIS GERAGHTY&MILLER

## Table 1: Summary of Groundwater Elevation Data

Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | Screened Interval (feet, bgs) | Depth-to-Water (feet) | Top of Casing (feet - MSL) | Groundwater Elevation (feet - MSL) |
|---|---|---|---|---|---|
| **MW-17** | 19-Apr-95 | 10.0-20.0 | 4.48 | 12.76 | 8.28 |
| **(off-site)** | 19-Sep-95 | | 4.78 | | 7.98 |
| | 14-Dec-95 | | 3.31 | | 9.45 |
| | 6-Mar-96 | | 3.75 | | 9.01 |
| | 11-Jun-96 | | 4.55 | | 8.21 |
| | 12-Sep-96 | | 4.61 | | 8.15 |
| | 9-Dec-96 | | 3.89 | | 8.87 |
| | 7-Apr-97 | | 4.71 | | 8.05 |
| | 30-Jun-97 | | 4.55 | | 8.21 |
| | 29-Sep-97 | | 4.66 | | 8.10 |
| | 1-Dec-97 | | 3.49 | | 9.27 |
| | 22-Apr-98 | | 4.10 | | 8.66 |
| | 27-Jul-98 | | 4.43 | | 8.33 |
| | 8-Oct-98 | | 4.69 | | 8.07 |
| | **2-Feb-99** | | **3.91** | | **8.85** |
| **MW-18** | 19-Apr-95 | 15.0-25.0 | 4.79 | 13.57 | 8.78 |
| **(off-site)** | 19-Sep-95 | | 5.00 | | 8.57 |
| **(semi-annual)** | 14-Dec-95 | | 3.48 | | 10.09 |
| | 6-Mar-96 | | 3.96 | | 9.61 |
| | 11-Jun-96 | | 4.86 | | 8.71 |
| | 30-Jun-97 | | 4.69 | | 8.88 |
| | 29-Sep-97 | | 5.01 | | 8.56 |
| | 22-Apr-98 | | 4.14 | | 9.43 |
| | 27-Jul-98 | | 4.54 | | 9.03 |
| | **2-Feb-99** | | **4.30** | | **9.27** |
| **MW-18A** | 19-Apr-95 | 35.0-50.0 | 4.67 | 13.36 | 8.69 |
| **(off-site)** | 19-Sep-95 | | 5.76 | | 7.60 |
| **(deep well)** | 14-Dec-95 | | 5.60 | | 7.76 |
| **(semi-annual)** | 6-Mar-96 | | 3.86 | | 9.50 |
| | 11-Jun-96 | | 4.85 | | 8.51 |
| | 30-Jun-97 | | 5.08 | | 8.28 |
| | 29-Sep-97 | | 5.26 | | 8.10 |
| | 22-Apr-98 | | 4.15 | | 9.21 |
| | 27-Jul-98 | | 4.86 | | 8.50 |
| | **2-Feb-99** | | **4.05** | | **9.31** |

ARCADIS GERAGHTY & MILLER

## Table 1: Summary of Groundwater Elevation Data

Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | Screened Interval (feet, bgs) | Depth-to-Water (feet) | Top of Casing (feet - MSL) | Groundwater Elevation (feet - MSL) |
|---|---|---|---|---|---|
| **MW-19 (off-site)** | 19-Apr-95 | 10.0-25.0 | NL | | NL |
| **MW-21 (off-site)** | 19-Apr-95 | 10.0-25.0 | NL | | NL |
| **MW-2** | 19-Apr-95 | 14.0-21.0 | NL | | NL |
| **MW-7** | 19-Apr-95 | 10.0-13.0 | NL | | NL |

NL = Monitoring well has not been located by ARCADIS Geraghty & Miller.

NM = Not measured

MSL = mean sea level

bgs = below ground surface

**ARCADIS** GERAGHTY & MILLER

**Table 2: Summary of Field Sampling Data**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | Purge Volume Calc. (a) (gallons) | Purge Volume Actual (gallons) | Field Measurements pH | SC (µmhos/cm) | Temp (°C) | Temp (°F) | DO (mg/L) | Redox (mV) |
|---|---|---|---|---|---|---|---|---|---|
| **MW-1** | 13-Sep-96 | 59 | 45 | 6.0 | 570 | 18.0 | 64.4 | | |
| **(on-site)** | 8-Apr-97 | 45 | 23 | 6 | 730 | 14.3 | 57.7 | | |
| | 30-Sep-97 | 39 | 11 | 8.0 | 590 | 19.4 | 67 | | |
| | 22-Apr-98 | 46 | 17 (b) | 7.6 | 660 | 26.2 | 79 | | |
| | 27-Jul-98 | NA | 7 | 7.0 | 580 | 21.6 | | 0.78 | -4 |
| | 8-Oct-98 | NA | 7 | 6.9 | 730 | 19.4 | 67 | 0.74 | 28 |
| | **2-Feb-99** | **NA** | **7** | **6.4** | **NM** | **16.8** | **62** | **1.10** | **35** |
| **MW-3A** | 19-Sep-95 | 15 | 6 (c) | 7.3 | 2,800 | 21.8 | 71.2 | | |
| **(on-site)** | 14-Dec-95 | 3 | 4 | 7.0 | 2,000 | 18.7 | 65.6 | | |
| | 6-Mar-96 | 17 | 8 | 6.0 | 1,190 | 24.7 | 76.5 | | |
| | 12-Jun-96 | 18 | 8 | 6.0 | 620 | 18.6 | 65.4 | | |
| | 12-Sep-96 | 17 | 13 | 7.1 | 430 | 19.9 | 67.9 | | |
| | 10-Dec-96 | 17 | 7 | 6.0 | 1,530 | 20.8 | 69.5 | | |
| | 7-Apr-97 | 13 | 8 | 6.0 | 600 | 17.4 | 63.4 | | |
| | 30-Jun-97 | 13 | 3 | 7.4 | 440 | 20.0 | 68.0 | | |
| | 30-Sep-97 | 13 | 5 | 7.1 | 500 | 22.2 | 72 | | |
| | 22-Apr-98 | NP | NP | NP | NP | NP | NP | | |
| | 27-Jul-98 | NA | 3 | 7.3 | 406 | 19.9 | | 0.96 | -17 |
| | 8-Oct-98 | NA | 3 | 6.7 | 220 | 24.9 | 77 | 0.83 | 12 |
| | **2-Feb-99** | **NA** | **3** | **7.7** | **510** | **18.6** | **66** | **1.30** | **41** |
| **MW-3B** | 22-Apr-98 | 3 | 3 | 6.9 | 1,500 | 19.6 | 67 | | |
| **(on-site)** | 27-Jul-98 | NA | 1 | 7.1 | 1,050 | 22.4 | | 1.17 | -5 |
| **(deep well)** | 8-Oct-98 | NA | 1 | 6.8 | 1,200 | 28.6 | 83 | 0.79 | -5 |
| | **2-Feb-99** | **NA** | **1** | **6.3** | **800** | **18.7** | **66** | **1.25** | **41** |

**ARCADIS** GERAGHTY&MILLER

**Table 2: Summary of Field Sampling Data**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | Purge Volume Calc. (a) (gallons) | Purge Volume Actual (gallons) | pH | SC (µmhos/cm) | Temp (°C) | Temp (°F) | DO (mg/L) | Redox (mV) |
|---|---|---|---|---|---|---|---|---|---|
| **MW-4** | 19-Sep-95 | 4 | 4 | 7.1 | 1,970 | 21.6 | 70.9 | | |
| **(on-site)** | 15-Dec-95 | 4 | 5 | 6.0 | 2,350 | 18.8 | 65.8 | | |
| | 6-Mar-96 | 4 | 5 | NM | 2,050 | 20.7 | 69.3 | | |
| | 11-Jun-96 | 4 | 5 | 6.0 | 1,030 | 21.5 | 70.7 | | |
| | 12-Sep-96 | 4 | 4.5 | 7.3 | 710 | 21.8 | 71.2 | | |
| | 10-Dec-96 | 4 | 5 | 6.5 | 2,110 | 16.1 | 60.9 | | |
| | 8-Apr-97 | 3 | 3 | 6.0 | 850 | 17.9 | 64.2 | | |
| | 30-Jun-97 | 3 | 3.1 | 6.3 | 1,700 | 21.0 | 69.8 | | |
| | 1-Oct-97 | 3 | 3 | 7.3 | 1,400 | 22.2 | 72 | | |
| | 22-Apr-98 | NM | NM | NM | NM | NM | NM | | |
| | 27-Jul-98 | NA | 1 | 6.1 | 1,300 | 17.5 | | 0.73 | 21 |
| | 8-Oct-98 | NA | 1 | 6.6 | 2,240 | 20.9 | 70 | 0.68 | -59 |
| | **2-Feb-99** | **NA** | **1** | **7.2** | **1,800** | **18.1** | **65** | **0.90** | **-18** |
| **MW-5** | 30-Jun-97 | 2 | 1.8 | 5.6 | 2,100 | 21.0 | 69.8 | | |
| **(on-site)** | 30-Sep-97 | 2 | 1.5 | 7.6 | 1,800 | 24.4 | 76 | | |
| | 23-Apr-98 | 2 | 1.0 (b) | 6.5 | 4,480 | 18.1 | 65 | | |
| | 27-Jul-98 | NA | 1 | 6.8 | 2,530 | 21.1 | | 0.75 | 12 |
| | 8-Oct-98 | NA | 1 | 6.3 | 2,600 | 25.7 | 78 | 0.52 | -137 |
| | **2-Feb-99** | **NA** | **1** | **9.2** | **390** | **15.5** | **60** | **0.62** | **125** |
| **MW-9** | 13-Sep-96 | 40 | 40 | 7.0 | 700 | 17.9 | 64.3 | | |
| **(on-site)** | 7-Apr-97 | 29 | 30 | 6.0 | 1,020 | 18.1 | 65 | | |
| | 30-Sep-97 | 34 | 32 | 7.0 | 790 | 21.1 | 70 | | |
| | 22-Apr-98 | 36 | 36 | 4.9 | 5,030 | 19.8 | 68 | | |
| | 27-Jul-98 | NA | 6 | 5.8 | 2,300 | 22.6 | | 0.80 | 73 |
| | 8-Oct-98 | NA | 6 | 6.3 | 2,600 | 26.6 | 80 | 0.76 | -12 |
| | **2-Feb-99** | **NA** | **6** | **9.6** | **80** | **16.8** | **62** | **1.88** | **264** |

ARCADIS GERAGHTY&MILLER

**Table 2: Summary of Field Sampling Data**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | Purge Volume Calc. (a) (gallons) | Purge Volume Actual (gallons) | Field Measurements pH | SC (µmhos/cm) | Temp (°C) | Temp (°F) | DO (mg/L) | Redox (mV) |
|---|---|---|---|---|---|---|---|---|---|
| **MW-10** | 30-Sep-97 | 32 | 7 | 6.4 | 2,700 | 23.3 | 74 | | |
| **(on-site)** | 22-Apr-98 | 33 | 19 (b) | 7.0 | 2,810 | 18.8 | 66 | | |
| | 27-Jul-98 | NA | 6 | 6.2 | 1,560 | 18.2 | 18 | 0.78 | 4 |
| | 8-Oct-98 | NA | 6 | 6.5 | 2,330 | 22.5 | 73 | 0.77 | -180 |
| | **2-Feb-99** | **NA** | **6** | **8.6** | **2,800** | **17.8** | **64** | **0.47** | **93** |
| **MW-11** | 12-Sep-96 | 122 | 125 | 6.3 | 650 | 18.4 | 65.2 | | |
| **(on-site)** | 7-Apr-97 | 91 | 90 | 6.0 | 810 | 16.8 | 62.2 | | |
| | 30-Sep-97 | 94 | 90 | 6.6 | 600 | 22.2 | 72 | | |
| | Well is being used for injections and is no longer monitored. | | | | | | | | |
| **MW-12** | 19-Sep-95 | 39 | 40 | 6.2 | 2,320 | 21.7 | 71.1 | | |
| **(on-site)** | 14-Dec-95 | 56 | 60 | 6.0 | 2,180 | 20.6 | 69.1 | | |
| | 6-Mar-96 | 55 | 55 | 6.0 | 2,570 | 22.2 | 71.9 | | |
| | 12-Jun-96 | 53 | 55 | 6.0 | 1,200 | 18.6 | 65.5 | | |
| | 12-Sep-96 | 52 | 55 | 6.4 | 980 | 18.7 | 65.7 | | |
| | 10-Dec-96 | 55 | 55 | 6.0 | 2,820 | 21.8 | 71.3 | | |
| | 7-Apr-97 | 39 | 40 | 6.0 | 1,160 | 16.5 | 61.7 | | |
| | 30-Jun-97 | 39 | 39 | 5.8 | 1,300 | 19.0 | 66.2 | | |
| | 30-Sep-97 | 39 | 35 | 6.4 | 1,150 | 21.7 | 71 | | |
| | 22-Apr-98 | 40 | 40 | 6.1 | 1,400 | 19.1 | 66 | | |
| | 27-Jul-98 | NA | 7 | 5.2 | 1,490 | 22.1 | | 0.82 | 105 |
| | 8-Oct-98 | NA | 7 | 6.6 | 820 | 30.8 | 87 | 0.91 | 31 |
| | **2-Feb-99** | **NA** | **7** | **13.0** | **3,430** | **18.2** | **65** | **0.60** | **-366** |

**ARCADIS** GERAGHTY&MILLER

**Table 2: Summary of Field Sampling Data**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | Purge Volume Calc. (a) (gallons) | Purge Volume Actual (gallons) | pH | SC (µmhos/cm) | Temp (°C) | Temp (°F) | DO (mg/L) | Redox (mV) |
|---|---|---|---|---|---|---|---|---|---|
| **MW-13** | 19-Sep-95 | 36 | 35 | 6.4 | 2,610 | 20.9 | 69.6 | | |
| **(on-site)** | 15-Dec-95 | 56 | 25 (b) | 6.0 | 2,990 | 20.3 | 68.6 | | |
| | 6-Mar-96 | 51 | 30 (b) | 6.0 | 2,120 | 21.9 | 71.4 | | |
| | 11-Jun-96 | 49 | 30 (b) | 6.0 | 1,500 | 23.3 | 74.0 | | |
| | 13-Sep-96 | 47 | 45 | 6.0 | 980 | 18.7 | 65.7 | | |
| | 10-Dec-96 | 53 | 55 | 6.0 | 2,570 | 20.6 | 69.1 | | |
| | 7-Apr-97 | 35 | 35 | 6.0 | 1,290 | 17.2 | 62.9 | | |
| | 30-Jun-97 | 36 | 24 (b) | 6.2 | 1,220 | 22.0 | 71.6 | | |
| | 30-Sep-97 | 35 | 25 | 7.1 | 1,120 | 21.1 | 70 | | |
| | 23-Apr-98 | 38 | 21 (b) | 5.4 | 3,530 | 17.6 | 64 | | |
| | 27-Jul-98 | NA | 7 | 7.0 | 1,920 | 20.4 | | 0.70 | 0 |
| | 8-Oct-98 | NA | 7 | 6.7 | 2,310 | 26.9 | 80 | 0.78 | -187 |
| | **2-Feb-99** | **NA** | **7** | **8.8** | **610** | **16.9** | **62** | **0.60** | **-109** |
| **MW-14** | 12-Sep-96 | 48 | 15 (b) | 6.0 | 820 | 18.8 | 65.8 | | |
| **(on-site)** | 8-Apr-97 | 36 | 16 | 6.0 | 540 | 17.9 | 64.2 | | |
| | 30-Sep-97 | 36 | 8 | 3.7 | 5,000 | 20.6 | 69 | | |
| | 23-Apr-98 | NM | NM | NM | NM | NM | NM | | |
| | 27-Jul-98 | NA | 7 | 5.0 | 2,360 | 21.3 | | 0.70 | 98 |
| | 8-Oct-98 | Not accessible | | | | | | | |
| | **2-Feb-99** | **NA** | **7** | **9.1** | **800** | **18.3** | **65** | **0.53** | **117** |
| **MW-20** | 19-Sep-95 | 89 | 90 | 6.9 | 2,530 | 20.2 | 68.4 | | |
| **(on-site)** | 15-Dec-95 | 117 | 120 | 7.0 | 2,560 | 21.4 | 70.6 | | |
| **(deep well)** | 6-Mar-96 | 121 | 125 | 6.0 | 950 | 21.1 | 69.9 | | |
| **(semi-annual)** | 11-Jun-96 | 119 | 120 | 6.0 | 780 | 20.3 | 68.5 | | |
| | 12-Sep-96 | 117 | 120 | 6.8 | 450 | 20.5 | 68.9 | | |
| | 7-Apr-97 | 188 | 90 | 6.0 | 750 | 18.3 | 64.9 | | |
| | 1-Oct-97 | 88 | 80 | 7.8 | 490 | 20.6 | 69 | | |
| | 22-Apr-98 | NP | NP | NP | NP | NP | NP | 0.72 | -2 |
| | 27-Jul-98 | NA | 15 | 6.1 | 480 | 19.3 | | | |
| | **2-Feb-99** | **NA** | **15** | **5.5** | **NM** | **18.7** | **66** | **NM** | **87** |

ARCADIS GERAGHTY&MILLER

**Table 2: Summary of Field Sampling Data**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | Purge Volume Calc. (a) (gallons) | Purge Volume Actual (gallons) | Field Measurements pH | SC (µmhos/cm) | Temp (°C) | Temp (°F) | DO (mg/L) | Redox (mV) |
|---|---|---|---|---|---|---|---|---|---|
| **MW-6 (off-site)** | 19-Sep-95 | 3 | 5 | 7.0 | 1,482 | 21.3 | 70.3 | | |
| | 14-Dec-95 | 2 | 3 | 6.5 | 3,650 | 19.8 | 67.6 | | |
| | 6-Mar-96 | 3 | 3 | 6.0 | 3,750 | 21.9 | 71.5 | | |
| | 11-Jun-96 | 2 | 2 | 6.5 | 1,900 | 22.6 | 72.7 | | |
| | 12-Sep-96 | 4 | 4 | 7.3 | 1,550 | 21.8 | 71.3 | | |
| | 10-Dec-96 | 4 | 6.5 | 6.5 | 3,780 | 19.4 | 66.9 | | |
| | 8-Apr-97 | 3 | 3 | 6.0 | 1,530 | 17.1 | 62.8 | | |
| | 30-Jun-97 | 3 | 2.9 | 6.7 | 1,700 | 22.0 | 71.6 | | |
| | 30-Sep-97 | 3 | 2.5 | 7.6 | 1,750 | 21.7 | 71 | | |
| | 22-Apr-98 | 3 | 3 | 7.0 | 1,890 | 22.3 | 72 | | |
| | 27-Jul-98 | NA | 1 | 6.7 | 1,330 | 21.9 | | 0.77 | -14 |
| | 8-Oct-98 | NA | 1 | 7.0 | 1,420 | 23.7 | 75 | 0.78 | 116 |
| | **2-Feb-99** | **NA** | **1** | **6.6** | **2,470** | **17.6** | **64** | **1.06** | **138** |
| **MW-16 (off-site)** | 19-Sep-95 | 40 | 40 | 6.7 | 1,710 | NM | NM | | |
| | 14-Dec-95 | 54 | 55 | 6.5 | 2,750 | 18.0 | 64.4 | | |
| | 6-Mar-96 | 55 | 55 | 6.0 | 1,800 | 15.4 | 59.8 | | |
| | 11-Jun-96 | 53 | 55 | 6.0 | 1,370 | 25.3 | 77.5 | | |
| | 12-Sep-96 | 53 | 55 | 7.2 | 980 | 20.5 | 68.9 | | |
| | 10-Dec-96 | 54 | 55 | 6.5 | 2,730 | 19.5 | 67.1 | | |
| | 8-Apr-97 | 39 | 40 | 6.0 | 110 | 14.9 | 58.9 | | |
| | 30-Jun-97 | 40 | 30 (b) | 6.4 | 1,100 | 21.0 | 69.8 | | |
| | 1-Oct-97 | 39 | 35 | 7.4 | 1,050 | 20.0 | 68 | | |
| | 23-Apr-98 | 40 | 40 | 8.0 | 910 | 17.8 | 64 | | |
| | 27-Jul-98 | NA | 6 | 6.4 | 936 | 23.0 | | 0.75 | 6 |
| | 8-Oct-98 | NA | 6 | 6.6 | 970 | 17.9 | 64 | 0.72 | 34 |
| | **2-Feb-99** | **NA** | **6** | **6.6** | **290** | **17.2** | **63** | **0.63** | **193** |

**ARCADIS** GERAGHTY&MILLER

**Table 2: Summary of Field Sampling Data**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | Purge Volume Calc. (a) (gallons) | Purge Volume Actual (gallons) | pH | SC (µmhos/cm) | Temp (°C) | Temp (°F) | DO (mg/L) | Redox (mV) |
|---|---|---|---|---|---|---|---|---|---|
| **MW-17** | 19-Sep-95 | 39 | 40 | 6.8 | 2,410 | 22.3 | 72.1 | | |
| **(off-site)** | 14-Dec-95 | 55 | 20 (b) | 6.0 | 3,140 | 18.5 | 65.3 | | |
| | 6-Mar-96 | 54 | 26 (b) | 7.0 | 2,630 | 16.2 | 61.1 | | |
| | 11-Jun-96 | 52 | 30 (b) | 6.0 | 1,600 | 18.8 | 65.8 | | |
| | 12-Sep-96 | 51 | 40 | 7.1 | 1,270 | 21.2 | 70.1 | | |
| | 10-Dec-96 | 54 | 55 | 6.5 | 2,000 | 20.8 | 69.4 | | |
| | 8-Apr-97 | 38 | 25 | 6.0 | 1,370 | 15.9 | 60.6 | | |
| | 30-Jun-97 | 39 | 38 | 6.4 | 1,400 | 20.0 | 68.0 | | |
| | 1-Oct-97 | 39 | 35 | 7.2 | 1,300 | 22.2 | 72 | | |
| | 22-Apr-98 | 40 | 40 | 7.6 | 1,430 | 23.7 | 75 | | |
| | 27-Jul-98 | NA | 5 | 6.4 | 1,010 | 23.6 | | 0.76 | 11 |
| | 8-Oct-98 | NA | 5 | 6.7 | 1,030 | 22.6 | 73 | 0.76 | 252 |
| | **2-Feb-99** | **NA** | **5** | **6.5** | **2,500** | **17.6** | **64** | **1.16** | **184** |
| **MW-18** | 19-Sep-95 | 40 | 20 (b) | 4.1 | 1,920 | 23.1 | 73.6 | | |
| **(off-site)** | 14-Dec-95 | 57 | 57 | 5.0 | 3,140 | 20.7 | 69.2 | | |
| **(semi-annual)** | 6-Mar-96 | 56 | 55 | 5.0 | 2,480 | 20.6 | 69.0 | | |
| | 11-Jun-96 | 54 | 55 | 5.0 | 1,280 | 18.2 | 64.8 | | |
| | 30-Jun-97 | 40 | 35 (b) | 3.5 | 1,400 | 23.0 | 73.4 | | |
| | 1-Oct-97 | 40 | 15 (b) | 3.7 | 1,310 | 20.6 | 69 | | |
| | 22-Apr-98 | 41 | 41 | 4.0 | 1,340 | 22.7 | 73 | 0.78 | 182 |
| | 27-Jul-98 | NA | 7 | 4.2 | 1,110 | 18.8 | | | |
| | **2-Feb-99** | **NA** | **7** | **6.5** | **2,050** | **18.5** | **65** | **2.05** | **191** |
| **MW-18A** | 19-Sep-95 | 68 | 20 (c) | 6.0 | 920 | 22.3 | 72.1 | | |
| **(off-site)** | 15-Dec-95 | 91 | 40 (b) | 6.5 | 1,960 | 18.3 | 64.9 | | |
| **(deep well)** | 6-Mar-96 | 96 | 80 | 6.0 | 810 | 19.9 | 67.8 | | |
| **(semi-annual)** | 11-Jun-96 | 93 | 95 | 6.0 | 680 | 18.4 | 65.2 | | |
| | 30-Jun-97 | 70 | 69 | 7.6 | 500 | 21.0 | 69.8 | | |
| | 1-Oct-97 | 69 | 69 | 7.8 | 490 | 21.7 | 71 | | |
| | 22-Apr-98 | NP | NP | NP | NP | NP | NP | 0.70 | -39 |
| | 27-Jul-98 | NA | 15 | 6.6 | 430 | 19.6 | | | |
| | **2-Feb-99** | **NA** | **15** | **5.1** | **1,900** | **17.8** | **64** | **1.40** | **348** |

ARCADIS GERAGHTY&MILLER

## Table 2: Summary of Field Sampling Data

Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | Purge Volume Calc. (a) (gallons) | Purge Volume Actual (gallons) | pH | SC (µmhos/cm) | Temp (°C) | Temp (°F) | DO (mg/L) | Redox (mV) |
|---|---|---|---|---|---|---|---|---|---|
| **MW-20** | 19-Sep-95 | 89 | 90 | 6.9 | 2,530 | 20.2 | 68.4 | | |
| **(on-site)** | 15-Dec-95 | 117 | 120 | 7.0 | 2,560 | 21.4 | 70.6 | | |
| **(deep well)** | 6-Mar-96 | 121 | 125 | 6.0 | 950 | 21.1 | 69.9 | | |
| **(semi-annual)** | 11-Jun-96 | 119 | 120 | 6.0 | 780 | 20.3 | 68.5 | | |
| | 12-Sep-96 | 117 | 120 | 6.8 | 450 | 20.5 | 68.9 | | |
| | 7-Apr-97 | 188 | 90 | 6.0 | 750 | 18.3 | 64.9 | | |
| | 1-Oct-97 | 88 | 80 | 7.8 | 490 | 20.6 | 69 | | |
| | 22-Apr-98 | NP | NP | NP | NP | NO | NP | | |
| | 27-Jul-98 | NA | 15 | 6.1 | 480 | 19.3 | | 0.72 | -2 |
| | **2-Feb-99** | **NA** | **15** | **5.5** | **NM** | **18.7** | **66** | **NM** | **87** |

(a) Based on three casing volumes.
Beginning July 1998, low-flow sampling methods were employed.
(b) Purged dry.
(c) Represents approximately one casing volume. Equipment problems encountered during sampling.

NA Not Applicable
NM Not measured
NP Not purged
SC Specific Conductance

**ARCADIS** GERAGHTY&MILLER

**Table 3: Summary of Groundwater Analytical Data - Total and Hexavalent Chromium**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Screened Interval | Date Sampled | Total Chromium (µg/L) (a) | Hexavalent Chromium (µg/L) (b) |
|---|---|---|---|---|
| **MW-1 (on-site)** | 21.0-29.0 | 24-Aug-77 | 200 | NA |
| | | 15-Sep-81 | ND(<1) | NA |
| | | 11-Oct-81 | 1 | NA |
| | | 24-Nov-81 | 2.5 | NA |
| | | 21-Dec-81 | 32 | NA |
| | | 26-Feb-85 | ND(<20) | ND(<20) |
| | | 15-Nov-91 | ND(<50) | 50 |
| | | 20-Apr-95 | NL | NL |
| | | 13-Sep-96 | 330 | ND(<5.0) |
| | | 8-Apr-97 | 320 | ND(<5.0) |
| | | Apr-97 | On-Site Remediation Injection Event | |
| | | 1-Oct-97 | ND(<10) | ND(<5.0) |
| | | Feb-98 | On-Site Remediation Injection Event | |
| | | 23-Apr-98 | ND(<10) | ND(<5.0) |
| | | 28-Jul-98 | ND(<10) | ND(<5.0) |
| | | 8-Oct-98 | ND(<10) | ND(<5.0) |
| | | **3-Feb-99** | **ND(<10)** | **ND(<5.0)** |
| **MW-3A (on-site) (deep well)** | 57.0-61.0 | 24-Aug-77 | 50 | NA |
| | | 15-Sep-81 | ND (<1) | NA |
| | | 11-Oct-81 | ND (<1) | NA |
| | | 24-Nov-81 | 230 | NA |
| | | 21-Dec-81 | 14 | NA |
| | | 26-Feb-85 | 770 | 80 |
| | | 29-Oct-91 | 130 | ND (<500) |
| | | 20-Apr-95 | 36 | ND (<5.0) |
| | | 19-Sep-95 | 65 | ND (<5.0) |
| | | 14-Dec-95 | 110 | 7.5 |
| | | 8-Mar-96 | 92 | ND (<5.0) |
| | | 11-Jun-96 | 51 | ND (<5.0) |
| | | 13-Sep-96 | ND(<10) | ND (<5.0) |
| | | 11-Dec-96 | 13 (d) | ND (<5.0) |
| | | 7-Apr-97 | 14 | ND (<5.0) |
| | | Apr-97 | On-Site Remediation Injection Event | |
| | | 30-Jun-97 | 67 | 5.0 |
| | | 1-Oct-97 | 36 | ND(<5.0) |
| | | 4-Dec-97 | 94 | 29 |
| | | Feb-98 | On-Site Remediation Injection Event | |
| | | 23-Apr-98 | 43 | ND(<5.0) |
| | | 28-Jul-98 | 210 | 62 |
| | | 8-Oct-98 | 270 | ND(<5.0) |
| | | **2-Feb-99** | **120** | **ND(<5.0) (f)** |

**ARCADIS** GERAGHTY&MILLER

**Table 3: Summary of Groundwater Analytical Data - Total and Hexavalent Chromium**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Screened Interval | Date Sampled | Total Chromium (µg/L) (a) | Hexavalent Chromium (µg/L) (b) |
|---|---|---|---|---|
| **MW-3B** | 16.0-18.0 | 24-Aug-77 | 60 | NA |
| **(on-site)** (c) | | 15-Sep-81 | ND (<1) | NA |
| | | 11-Oct-81 | 480 | NA |
| | | 24-Nov-81 | 2,000 | NA |
| | | 21-Dec-81 | 190 | NA |
| | | 29-Oct-91 | 110,000 | 100,000 |
| | | 20-Apr-95 | 8,000 | 7,600 |
| | | 22-Aug-95 | 13,000 | 12,000 |
| | | 22-Aug-95 | Pilot test injection event into MW-11. | |
| | | 20-Oct-95 | 180 | ND(<5.0) |
| | | 22-Dec-95 | Pilot test injection event into MW-11. | |
| | | 4-Jan-96 | Pilot test injection event into MW-11. | |
| | | 19-Jan-96 | Pilot test injection event into MW-11. | |
| | | 1-Feb-96 | Pilot test injection event into MW-11. | |
| | | 16-Feb-96 | 3,300 | 1,100 |
| | | Apr-97 | On-Site Remediation Injection Event | |
| | | Feb-98 | On-Site Remediation Injection Event | |
| | | 23-Apr-98 | 340 | ND(<5.0) |
| | | 28-Jul-98 | 150 | ND(<5.0) |
| | | 8-Oct-98 | 45 | ND(<5.0) |
| | | **2-Feb-99** | **270** | **95 (f)** |
| **MW-3C** | 11.0-14.0 | 24-Aug-77 | 18,000 | NA |
| **(on-site)** | | 15-Sep-81 | 30,000 | NA |
| | | 11-Oct-81 | 28,000 | NA |
| | | 24-Nov-81 | 22,000 | NA |
| | | 21-Dec-81 | 17,000 | NA |
| | | 26-Feb-85 | 7,250 | 6,300 |
| | | 29-Oct-91 | 2,300 | 1,600 |
| | | 20-Apr-95 | 1,400 | ND (<5.0) |
| | | Apr-97 | On-Site Remediation Injection Event | |
| | | Feb-98 | On-Site Remediation Injection Event | |

**ARCADIS** GERAGHTY&MILLER

**Table 3: Summary of Groundwater Analytical Data - Total and Hexavalent Chromium**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Screened Interval | Date Sampled | Total Chromium (µg/L) (a) | Hexavalent Chromium (µg/L) (b) |
|---|---|---|---|---|
| **MW-4 (on-site)** | 16.0-20.0 | 24-Aug-77 | 90,000 | 67,000 |
| | | 15-Sep-81 | 57,000 | NA |
| | | 11-Oct-81 | 61,000 | NA |
| | | 24-Nov-81 | 56,000 | NA |
| | | 21-Dec-81 | 55,000 | NA |
| | | 26-Feb-85 | 59,000 | 59,000 |
| | | 1-Jun-91 | 17,000 | 17,800 |
| | | 11-Oct-91 | 22,000 | 22,000 |
| | | 28-Jul-94 | NA | 6,300 |
| | | 21-Apr-95 | 16,000 | 17,000 |
| | | 19-Sep-95 | 14,000 | 15,000 |
| | | 15-Dec-95 | 16,000 | 16,000 |
| | | 8-Mar-96 | 16,000 | 23,000 |
| | | 11-Jun-96 | 5,400 | 9,100 |
| | | 13-Sep-96 | 14,000 | 1,400 |
| | | 11-Dec-96 | 17,000 (d) | 47,000 |
| | | 8-Apr-97 | 13,000 | 16,000 |
| | | Apr-97 | On-Site Remediation Injection Event | |
| | | 30-Jun-97 | 200 | ND(<50) |
| | | 1-Oct-97 | 76 | ND(<5.0) |
| | | 2-Dec-97 | 170 | ND(<5.0) |
| | | Feb-98 | On-Site Remediation Injection Event | |
| | | 23-Apr-98 | Access blocked by construction activity at 1421 Park Avenue. | |
| | | 28-Jul-98 | 110 | ND(<5.0) |
| | | 9-Oct-98 | 190 | ND(<5.0) |
| | | **3-Feb-99** | **ND(10)** | **ND(<5.0) (f)** |
| **MW-5 (on-site)** | 11.0-15.0 | 24-Aug-77 | 360,000 | 295,000 |
| | | 11-Oct-81 | 880,000 | 2,240 |
| | | 24-Nov-81 | 610,000 | NA |
| | | 21-Dec-81 | 280,000 | NA |
| | | 26-Feb-85 | 480,000 | 480,000 |
| | | 1-Jun-91 | 390,000 | NA |
| | | 11-Oct-91 | 260,000 | 250,000 |
| | | 28-Jul-94 | NA | 454,000 |
| | | 21-Apr-95 | 140,000 | 160,000 |
| | | Apr-97 | On-Site Remediation Injection Event | |
| | | 30-Jun-97 | 16,000 | 5,800 |
| | | 1-Oct-97 | 4,400 | ND(<5.0) |
| | | Feb-98 | On-Site Remediation Injection Event | |
| | | 23-Apr-98 | Access blocked by construction activity at 1421 Park Avenue. | |
| | | 28-Jul-98 | 670 | ND(<500) |
| | | 9-Oct-98 | 540 | 38 |
| | | **2-Feb-99** | **260** | **ND(<5.0) (f)** |

ARCADIS GERAGHTY & MILLER

**Table 3:** **Summary of Groundwater Analytical Data - Total and Hexavalent Chromium**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Screened Interval | Date Sampled | Total Chromium (µg/L) (a) | Hexavalent Chromium (µg/L) (b) |
|---|---|---|---|---|
| **MW-9 (on-site)** | 17.5-24.5 | 15-Jan-81 | 258,000 | 185,000 |
| | | 26-Feb-85 | 892,000 | 877,000 |
| | | 11-Oct-91 | 140,000 | 130,000 |
| | | 21-Apr-95 | 66,000 | 70,000 |
| | | 13-Sep-96 | 56,000 | 5,800 |
| | | 7-Apr-97 | 74,000 | 76,000 |
| | | Apr-97 | On-Site Remediation Injection Event | |
| | | 1-Oct-97 | 67,000 | 44,000 |
| | | 2-Dec-97 | 5,900 | 6,800 |
| | | Feb-98 | On-Site Remediation Injection Event | |
| | | 23-Apr-98 | 11,000 | ND(<5.0) |
| | | 28-Jul-98 | 3,900 | ND(<500) |
| | | 8-Oct-98 | 3,100 | ND(<50) |
| | | **2-Feb-99** | **3,000** | **ND(<50) (e) (f)** |
| **MW-10 (on-site)** (c) | 17.5-24.5 | 15-Jan-81 | 17,000 | 14,000 |
| | | 26-Feb-85 | 746,000 | 740,000 |
| | | 11-Oct-91 | 490,000 | 450,000 |
| | | 21-Apr-95 | 160,000 | 170,000 |
| | | 21-Aug-95 | Pilot test injection event into MW-11. | |
| | | 22-Aug-95 | 150,000 | 150,000 |
| | | 20-Oct-95 | 78,000 | 86,000 |
| | | 22-Dec-95 | Pilot test injection event into MW-11. | |
| | | 16-Feb-96 | 16,000 | 23,000 |
| | | 14-Mar-96 | Pilot test injection event into MW-11. | |
| | | 9-May-96 | 11,000 | ND(<50) |
| | | 8-Apr-97 | 6,500 | ND(<5.0) |
| | | Apr-97 | On-Site Remediation Injection Event | |
| | | 1-Oct-97 | 640 | 14 |
| | | 2-Dec-97 | 510 | ND(<5.0) |
| | | Feb-98 | On-Site Remediation Injection Event | |
| | | 23-Apr-98 | 500 | 9 |
| | | 28-Jul-98 | 240 | ND(<500) |
| | | 9-Oct-98 | 250 | 12 |
| | | **2-Feb-99** | **77** | **ND(<5.0) (f)** |

**ARCADIS** GERAGHTY&MILLER

**Table 3:** **Summary of Groundwater Analytical Data - Total and Hexavalent Chromium**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Screened Interval | Date Sampled | Total Chromium (µg/L) (a) | Hexavalent Chromium (µg/L) (b) |
|---|---|---|---|---|
| **MW-11** **(on-site)** (c) | 16.0-29.0 | 14-Jan-81 | 129,000 | 115,000 |
| | | 21-Jul-81 | 340 | 34 |
| | | 26-Feb-85 | 2,440 | 2,410 |
| | | 11-Oct-91 | 470 | 410 |
| | | 20-Apr-95 | 420 | 950 |
| | | 22-Aug-95 | 360 | 220 |
| | | 22-Aug-95 | Pilot test injection event into MW-11. | |
| | | 20-Oct-95 | 90 | ND(<5.0) |
| | | 22-Dec-95 | Pilot test injection event into MW-11. | |
| | | 4-Jan-96 | Pilot test injection event into MW-11. | |
| | | 19-Jan-96 | Pilot test injection event into MW-11. | |
| | | 1-Feb-96 | Pilot test injection event into MW-11. | |
| | | 16-Feb-96 | 430 | ND(<5.0) |
| | | 13-Sep-96 | 170 | 6.0 |
| | | 7-Apr-97 | 630 | ND(<5.0) |
| | | Apr-97 | On-Site Remediation Injection Event | |
| | | 1-Oct-97 | 510 | ND(<50) |
| | | 2-Dec-97 | 720 | 400 |
| | | Feb-98 | On-Site Remediation Injection Event | |
| **MW-12** **(on-site)** (c) | 17.5-28.5 | 14-Jan-81 | 32,000 | 12,000 |
| | | 26-Feb-85 | 240,000 | 240,000 |
| | | 1-Jun-91 | 38,000 | 29,700 |
| | | 11-Oct-91 | 44,000 | 39,000 |
| | | 20-Apr-95 | 10,000 | 10,000 |
| | | 19-Sep-95 | 18,000 | 19,000 |
| | | 14-Dec-95 | 17,000 | 20,000 |
| | | 22-Dec-95 | Pilot Test: 330 gallons innoc.10:1 into OW-1. | |
| | | 16-Feb-96 | 16,000 | 1,300 |
| | | 11-Jun-96 | 130 | 16 |
| | | 13-Sep-96 | 260 | ND(<5.0) |
| | | 11-Dec-96 | 1,100 (d) | 1,400 |
| | | 7-Apr-97 | 2,000 | 690 |
| | | Apr-97 | On-Site Remediation Injection Event | |
| | | 30-Jun-97 | 440 | 26 |
| | | 1-Oct-97 | 170 | ND(<5.0) |
| | | 2-Dec-97 | 100 | ND(<5.0) |
| | | Feb-98 | On-Site Remediation Injection Event | |
| | | 23-Apr-98 | 150 | ND(<5.0) |
| | | 28-Jul-98 | 69 | ND(<500) |
| | | 8-Oct-98 | 91 | ND(<5.0) |
| | | **2-Feb-99** | **3,300** | **ND(<50) (e) (f)** |

**ARCADIS** GERAGHTY & MILLER

**Table 3: Summary of Groundwater Analytical Data - Total and Hexavalent Chromium**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Screened Interval | Date Sampled | Total Chromium (µg/L) (a) | Hexavalent Chromium (µg/L) (b) |
|---|---|---|---|---|
| **MW-13 (on-site)** | 10.5-15.5 | 14-Jan-81 | 381,000 | 325,000 |
| | | 26-Feb-85 | 676,000 | 676,000 |
| | | 11-Oct-91 | 510,000 | 430,000 |
| | | 28-Jul-94 | 230,000 | 130,000 |
| | | 20-Apr-95 | 210,000 | 220,000 |
| | | 19-Sep-95 | 200,000 | 210,000 |
| | | 15-Dec-95 | 170,000 | 210,000 |
| | | 8-Mar-96 | 170,000 | 200,000 |
| | | 11-Jun-96 | 170,000 | 160,000 |
| | | 13-Sep-96 | 160,000 | 13,000 |
| | | 11-Dec-96 | 160,000 (d) | 170,000 |
| | | 7-Apr-97 | 150,000 | 160,000 |
| | | Apr-97 | On-Site Remediation Injection Event | |
| | | 30-Jun-97 | 92,000 | 69,000 |
| | | 1-Oct-97 | 63,000 | 40,000 |
| | | 2-Dec-97 | 33,000 | 28,000 |
| | | Feb-98 | On-Site Remediation Injection Event | |
| | | 23-Apr-98 | 7,900 | 2,500 |
| | | 28-Jul-98 | 1,800 | ND(<500) |
| | | 9-Oct-98 | 1,800 | ND(<5.0) |
| | | **2-Feb-99** | **370** | **ND(<5.0) (f)** |
| **MW-14 (on-site)** | 15.0-25.0 | 26-Feb-85 | 654,000 | 632,000 |
| | | 11-Oct-91 | 320,000 | 310,000 |
| | | 21-Apr-95 | 130,000 | 140,000 |
| | | 13-Sep-96 | 100,000 | 9,700 |
| | | 8-Apr-97 | 93,000 | 100,000 |
| | | Apr-97 | On-Site Remediation Injection Event | |
| | | 1-Oct-97 | 9,100 | ND(<5.0) |
| | | 2-Dec-97 | 1,400 | ND(<5.0) |
| | | Feb-98 | On-Site Remediation Injection Event | |
| | | 28-Jul-98 | 1,600 | ND(<500) |
| | | 26-Oct-98 | 970 | 52 |
| | | **2-Feb-99** | **480** | **ND(<50) (e) (f)** |

**ARCADIS** GERAGHTY&MILLER

**Table 3: Summary of Groundwater Analytical Data - Total and Hexavalent Chromium**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Screened Interval | Date Sampled | Total Chromium (μg/L) (a) | Hexavalent Chromium (μg/L) (b) |
|---|---|---|---|---|
| **MW-20** | 31.0-51.0 | 21-Jun-83 | 1,300 | 1,200 |
| **(on-site)** | | 11-Aug-83 | 90 | 40 |
| **(deep well)** | | 26-Feb-85 | ND (<20) | ND (<20) |
| | | 11-Oct-91 | ND (<50) | 14 |
| | | 21-Apr-95 | ND (<10) | ND (<5.0) |
| | | 19-Sep-95 | ND (<10) | ND (<5.0) |
| | | 15-Dec-95 | 22 | ND (<5.0) |
| | | 8-Mar-96 | 22 | ND (<5.0) |
| | | 11-Jun-96 | 96 | ND (<0.0050) |
| | | 13-Sep-96 | 120 | ND(5.0) |
| | | 7-Apr-97 | 55 | ND(<5.0) |
| | | Apr-97 | On-Site Remediation Injection Event | |
| | | 1-Oct-97 | ND(<10) | ND(<5.0) |
| | | Feb-98 | On-Site Remediation Injection Event | |
| | | 23-Apr-98 | ND(<10) | ND(<5.0) |
| | | 28-Jul-98 | ND(<10) | ND(<5.0) |
| | | **3-Feb-99** | **ND(<10)** | **ND(<5.0)** |
| **MW-6** | 13.0-17.0 | 15-Sep-81 | 630 | NA |
| **(off-site)** | | 11-Oct-81 | 80 | NA |
| | | 24-Nov-81 | 790 | NA |
| | | 21-Dec-81 | 630 | NA |
| | | 26-Feb-85 | 3,330 | 3,300 |
| | | 11-Oct-91 | 31,000 | 25,000 |
| | | 28-Jul-94 | NA | 4,800 |
| | | 20-Apr-95 | 39,000 | 40,000 |
| | | 19-Sep-95 | 45,000 | 43,000 |
| | | 14-Dec-95 | 35,000 | 50,000 |
| | | 8-Mar-96 | 42,000 | 50,000 |
| | | 11-Jun-96 | 41,000 | 44,000 |
| | | 13-Sep-96 | 46,000 | 44,000 |
| | | 11-Dec-96 | 45,000 (d) | 54,000 |
| | | 8-Apr-97 | 45,000 | 48,000 |
| | | 30-Jun-97 | 44,000 | 43,000 |
| | | 1-Oct-97 | 52,000 | 21,000 |
| | | 2-Dec-97 | 50,000 | 46,000 |
| | | 23-Apr-98 | 47,000 | 48,000 |
| | | 28-Jul-98 | 47,000 | 55,000 |
| | | 9-Oct-98 | 36,000 | 330 |
| | | **4-Feb-99** | **15,000** | **31,000** |

**ARCADIS** GERAGHTY & MILLER

**Table 3: Summary of Groundwater Analytical Data - Total and Hexavalent Chromium**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Screened Interval | Date Sampled | Total Chromium (µg/L) (a) | Hexavalent Chromium (µg/L) (b) |
|---|---|---|---|---|
| **MW-8 (off-site)** | 16.0-22.0 | 15-Sep-81 | ND (<1) | NA |
| | | 11-Oct-81 | 2 | NA |
| | | 24-Nov-81 | 3 | NA |
| | | 21-Dec-81 | 70 | NA |
| | | 26-Feb-85 | ND (<20) | ND (<20) |
| | | 1-Jun-91 | NA | NA |
| | | 11-Oct-91 | ND (<50) | ND (<10) |
| | | 21-Apr-95 | 33 | ND (<5.0) |
| **MW-15 (off-site)** | 15.0-25.0 | 26-Feb-85 | ND (<20) | ND (<20) |
| | | 1-Jun-91 | 30 | NA |
| | | 11-Oct-91 | ND (<50) | ND (<10) |
| | | 28-Jul-94 | NA | ND (<10) |
| | | 21-Apr-95 | ND (<10) | ND (<5.0) |
| **MW-16 (off-site)** (c) | 12.0-22.0 | 26-Feb-85 | 460,000 | 460,000 |
| | | 11-Oct-91 | 240,000 | 290,000 |
| | | 28-Jul-94 | 120,000 | 320,000 |
| | | 20-Apr-95 | 100,000 | 100,000 |
| | | 19-Sep-95 | 83,000 | 87,000 |
| | | 14-Dec-95 | 57,000 | 74,000 |
| | | 8-Mar-96 | 73,000 | 83,000 |
| | | 11-Jun-96 | 67,000 | 20,000 |
| | | 13-Sep-96 | 60,000 | 6,400 |
| | | 11-Dec-96 | 65,000 (d) | 73,000 |
| | | 8-Apr-97 | 57,000 | 64,000 |
| | | 30-Jun-97 | 67,000 | 57,000 |
| | | 1-Oct-97 | 67,000 | 27,000 |
| | | 2-Dec-97 | 24,000 | 32,000 |
| | | 23-Apr-98 | 56,000 | 54,000 |
| | | 28-Jul-98 | 17,000 | 14,000 |
| | | 9-Oct-98 | 29,000 | 2,400 |
| | | **4-Feb-99** | **92,000** | **93,000** |
| **MW-17 (off-site)** | 10.0-20.0 | 26-Feb-85 | 90,000 | 38,200 |
| | | 11-Oct-91 | 250,000 | 300,000 |
| | | 28-Jul-94 | 190,000 | 200,000 |
| | | 20-Apr-95 | 150,000 | 160,000 |
| | | 19-Sep-95 | 170,000 | 180,000 |
| | | 14-Dec-95 | 160,000 | 200,000 |
| | | 8-Mar-96 | 140,000 | 150,000 |
| | | 11-Jun-96 | 130,000 | 150,000 |
| | | 13-Sep-96 | 130,000 | 12,000 |
| | | 11-Dec-96 | 170,000 (d) | 200,000 |
| | | 8-Apr-97 | 160,000 | 160,000 |
| | | 30-Jun-97 | 120,000 | 83,000 |
| | | 1-Oct-97 | 91,000 | 52,000 |
| | | 2-Dec-97 | 97,000 | 60,000 |
| | | 23-Apr-98 | 85,000 | 10,000 |
| | | 28-Jul-98 | 50,000 | 65,000 |
| | | 9-Oct-98 | 60,000 | 420 |
| | | **4-Feb-99** | **120,000** | **110,000** |

**ARCADIS** GERAGHTY & MILLER

**Table 3: Summary of Groundwater Analytical Data - Total and Hexavalent Chromium**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Screened Interval | Date Sampled | Total Chromium (µg/L) (a) | Hexavalent Chromium (µg/L) (b) |
|---|---|---|---|---|
| **MW-18 (off-site)** | 15.0-25.0 | 26-Feb-85 | 60,500 | 55,000 |
| | | 1-Jun-91 | NA | NA |
| | | 11-Oct-91 | 31,000 | 24,000 |
| | | 28-Jul-94 | NA | NA |
| | | 22-Apr-95 | 24,000 | 23,000 |
| | | 19-Sep-95 | 25,000 | 27,000 |
| | | 14-Dec-95 | 20,000 | 22,000 |
| | | 8-Mar-96 | 22,000 | 23,000 |
| | | 11-Jun-96 | 19,000 | 17,000 |
| | | 30-Jun-97 | 16,000 | 11,000 |
| | | 1-Oct-97 | 20,000 | 14,000 |
| | | 24-Apr-98 | 11,000 | 9,400 |
| | | 28-Jul-98 | 12,000 | 5,000 |
| | | **4-Feb-99** | **16,000** | **50** |
| **MW-18A (off-site)** | 35.0-50.0 | 22-Jun-83 | 20 | ND (<20) |
| | | 26-Feb-85 | ND (<20) | ND (<20) |
| | | 11-Oct-91 | ND (<50) | ND (<10) |
| | | 20-Apr-95 | ND (<10) | ND (<5.0) |
| | | 19-Sep-95 | ND (<10) | ND (<5.0) |
| | | 15-Dec-95 | 17 | ND (<5.0) |
| | | 8-Mar-96 | ND (<50) | ND (<5.0) |
| | | 11-Jun-96 | 38 | ND (<0.0050) |
| | | 30-Jun-97 | 1,100 | 840 |
| | | 1-Oct-97 | 490 | 430 |
| | | 23-Apr-98 | 64 | 52 |
| | | 28-Jul-98 | 59 | 55 |
| | | **4-Feb-99** | **ND (<10)** | **50** |
| **MW-2** | 14.0-21.0 | 24-Aug-77 | 60 | NA |
| | | 15-Sep-81 | ND(<1) | NA |
| | | 11-Oct-81 | 4 | NA |
| | | 24-Nov-81 | 1.1 | NA |
| | | 21-Dec-81 | 2 | NA |
| | | 19-Apr-95 | Not Located | |
| **MW-7** | 10.0-13.0 | 19-Apr-95 | Not Located | |
| **MW-19** | 10.0-25.0 | 22-Jun-83 | NA (<20) | NA (<20) |
| | | 26-Feb-85 | 20 | 20 |
| | | 19-Apr-95 | Not Located | |
| **MW-21** | 10.0-25.0 | 21-Jun-83 | 20 | ND (<20) |
| | | 26-Feb-85 | 40 | ND (<20) |
| | | 19-Apr-95 | Not Located | |

**ARCADIS** GERAGHTY&MILLER

**Table 3:** **Summary of Groundwater Analytical Data - Total and Hexavalent Chromium**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Screened Interval | Date Sampled | Total Chromium (μg/L) (a) | Hexavalent Chromium (μg/L) (b) |
|---|---|---|---|---|
| **OW-1** | 5.0-20.0 | 22-Aug-95 | 19,000 | 22,000 |
| | | 22-Aug-95 | Pilot test injection event into MW-11. | |
| | | 20-Oct-95 | 24,000 | 32,000 |
| | | 22-Dec-95 | Pilot test injection event into MW-11. | |
| | | 22-Dec-95 | Pilot test injection event into MW-11. | |
| | | 4-Jan-96 | Pilot test injection event into MW-11. | |
| | | 19-Jan-96 | Pilot test injection event into MW-11. | |
| | | 1-Feb-96 | Pilot test injection event into MW-11. | |
| | | 16-Feb-96 | 4,800 | ND(<5.0) |
| **OW-2** | 5.0-20.0 | 22-Aug-95 | 36,000 | 36,000 |
| | | 22-Aug-95 | Pilot test injection event into MW-11. | |
| | | 18-Sep-95 | 70,000 | 77,000 |
| | | 20-Oct-95 | 51,000 | 58,000 |
| | | 22-Dec-95 | Pilot test injection event into MW-11. | |
| | | 4-Jan-96 | Pilot test injection event into MW-11. | |
| | | 19-Jan-96 | Pilot test injection event into MW-11. | |
| | | 1-Feb-96 | Pilot test injection event into MW-11. | |
| | | 16-Feb-96 | 6,900 | 89 |
| **DP-1** | NA | 20-Oct-95 | 10,000 | 6.1 |
| | | 14-Mar-96 | Pilot test injection event into MW-11. | |

(a) Analysis by USEPA Method 200.7.
(b) Analysis by USEPA Method 7196.
(c) Denotes well that was part of the pilot study performed from August 1995 through February 1996.
(d) Laboratory indicates results are questionable due to samples being marked "preserved" which were not.
(e) Laboratory reports detection limits raised due to matrix interference.
(f) Laboratory reports samples were analyzed past EPA recommended holding time.

ND( ) Not detected; laboratory method detection limit in parentheses
μg/L Micrograms per liter
NA Not applicable

Data from August 1977 through July 1994 taken from groundwater monitoring reports by American Environmental Management Corporation (January 27, 1992, and October 28, 1994).
Beginning April 20, 1995, laboratory analyses performed by Sequoia Analytical (Walnut Creek and Redwood City, California).

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**Table 4: Summary of Groundwater Analytical Data - Halogenated Volatile Organic Compounds**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | PCE (µg/L) (a) | TCE (µg/L) (a) | cis-1,2-DCE (µg/L) (a) | trans-1,2-DCE (µg/L) (a) | 1,1-DCE (µg/L) (a) | Vinyl Chloride (µg/L) (a) | 1,1,1-TCA (µg/L) (a) | 1,1-DCA (µg/L) (a) | 1,2-DCA (µg/L) (a) | Other Analytes (µg/L) | Methane (µg/L) | Ethane (µg/L) | Ethylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-1 | 21-Mar-85 | 21 | 33 | --- | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | --- | --- | --- | --- | --- |
| (on-site) | 15-Nov-91 | 0.6 | 11 | --- | 4.8 | 0.5 | ND(<1) | ND(<0.5) | 1.6 | --- | --- | --- | --- | --- |
| (SI 21.0-29.0) | 13-Sep-96 | ND(<0.50) | 14 | 1.9 | ND(<0.50) | 0.63 | ND(<1.0) | ND(<0.50) | ND(<0.50) | 0.78 | --- | --- | --- | --- |
| | 8-Apr-97 | ND(<0.50) | 13 | 1.2 | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | Apr-97 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 1-Oct-97 | ND(<0.50) | 16 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | Feb-98 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 24-Apr-98 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 32.2 | 0.009 | <.005 |
| | 19-May-98 | ND(<0.50) | 33 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 28-Jul-98 | ND(<1.0) | 28 | 6.0 | ND(<1.0) | ND(<1.0) | ND(<2.0) | ND(<1.0) | ND(<1.0) | ND(<1.0) | --- | --- | --- | --- |
| | 29-Jul-98 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 20.5 | 0.054 | 16.5 |
| | 8-Oct-98 | ND(0.50) | 17 | 1.7 | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | 13.7 | 0.057 | 0.042 |
| | **3-Feb-99** | **ND(0.50)** | **38** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | **ND(<1.0)** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | --- | --- | --- | --- |
| MW-3A | 29-Oct-91 | ND(<0.5) | ND(<0.5) | --- | ND(<0.5) | ND(<0.5) | ND(<1) | ND(<0.5) | ND(<0.5) | --- | --- | --- | --- | --- |
| (on-site) | 20-Apr-95 | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<1.0) | ND(<0.5) | ND(<0.5) | ND(<0.5) | --- | --- | --- | --- |
| (deep well) | 19-Sep-95 | ND(<0.5) | 0.56 | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<1.0) | ND(<0.5) | ND(<0.5) | ND(<0.5) | --- | --- | --- | --- |
| (SI 57.0-61.0) | 14-Dec-95 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 11-Jun-96 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 13-Sep-96 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 11-Dec-96 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 7-Apr-97 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | Apr-97 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 30-Jun-97 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 1-Oct-97 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 4-Dec-97 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | Feb-98 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 19-May-98 | ND(<0.50) | 1.2 | 0.68 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 28-Jul-98 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 8-Oct-98 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | **2-Feb-99** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | --- | --- | --- | --- |

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**Table 4: Summary of Groundwater Analytical Data - Halogenated Volatile Organic Compounds**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | PCE (µg/L) (a) | TCE (µg/L) (a) | cis-1,2-DCE (µg/L) (a) | trans-1,2-DCE (µg/L) (a) | 1,1-DCE (µg/L) (a) | Vinyl Chloride (µg/L) (a) | 1,1,1-TCA (µg/L) (a) | 1,1-DCA (µg/L) (a) | 1,2-DCA (µg/L) (a) | Other Analytes (µg/L) | Methane (µg/L) | Ethane (µg/L) | Ethylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-3B | 29-Oct-91 | 6.8 | 650 | --- | 45 | 13 | 6.4 | ND(<0.5) | 1.2 | --- | --- | --- | --- | --- |
| (on-site) | 20-Apr-95 | ND(<10) | 260 | 17 | 23 | ND(<10) | ND(<20) | ND(<10) | ND(<10) | ND(<10) | --- | --- | --- | --- |
| (SI 16.0-18.0) | Apr-97 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | Feb-98 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 19-May-98 | ND(<0.5) | 2.1 | 13 | 1.5 | 1.5 | 2.9 | ND(<0.50) | 2.5 | ND(<0.50) | --- | --- | --- | --- |
| | 28-Jul-98 | ND(<1.0) | 8.2 | 58.0 | 5.8 | 16 | 4.8 | 1.0 | 8.4 | 1.2 | --- | --- | --- | --- |
| | 8-Oct-98 | ND(<2.5) | 13 | 8.0 | 9.6 | 23 | 16 | ND(<2.5) | 10 | ND(<2.5) | --- | --- | --- | --- |
| | **2-Feb-99** | **ND(<0.50)** | **56** | **52** | **7.2** | **2.6** | **8.4** | **2.0** | **2.9** | **1.2** | --- | --- | --- | --- |
| MW-3C | 11-Jun-85 | 1.7 | 150 | --- | 23 | ND(<0.5) | ND(<0.5) | 2.4 | ND(<0.5) | --- | --- | --- | --- | --- |
| (on-site) | 21-Oct-91 | 1.7 | 180 | --- | 26 | 61 | 18 | 34 | 5.4 | --- | --- | --- | --- | --- |
| (SI 11.0-14.0) | 20-Apr-95 | ND(<0.5) | 30 | 11 | ND(<0.5) | 1.6 | 2.2 | 0.66 | 2.0 | ND(<0.5) | --- | --- | --- | --- |
| | Apr-97 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | Feb-98 | On-site Remediation Injection Event | | | | | | | | | | | | |
| MW-4 | 4-Nov-91 | 31 | 2,100 | --- | 269 | ND(<5) | 10 | ND(<5) | ND(<5) | --- | --- | --- | --- | --- |
| (on-site) | 28-Jul-94 | --- | 6,500 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| (SI 16.0-20.0) | 21-Apr-95 | ND(<50) | 4,400 | 430 | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 19-Sep-95 | 65 | 3,500 | 590 | 92 | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 15-Dec-95 | 27 | 2,900 | 330 | 44 | ND(<10) | ND(<20) | ND(<10) | ND(<10) | ND(<10) | --- | --- | --- | --- |
| | 8-Mar-96 | 84 | 3,100 | 360 | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 11-Jun-96 | ND(<100) | 3,100 | 280 | ND(<100) | ND(<100) | ND(<200) | ND(<100) | ND(<100) | ND(<100) | --- | --- | --- | --- |
| | 13-Sep-96 | 63 | 1,800 | 410 | 58 | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 11-Dec-96 | ND(<50) | 1,600 | 260 | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 8-Apr-97 | ND(<50) | 4,000 | 410 | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | Apr-97 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 30-Jun-97 | ND(<50) | 4,000 | 2,800 | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 1-Oct-97 | ND(<25) | ND(<25) | 1,300 | 45 | ND(<25) | 1,100 | ND(<25) | ND(<25) | ND(<25) | --- | --- | --- | --- |
| | 2-Dec-97 | ND(<25) | 120 | 320 | 29 | ND(<25) | 1,300 | ND(<25) | ND(<25) | ND(<25) | --- | --- | --- | --- |
| | Feb-98 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 19-May-98 | Access blocked by construction activity at 1421 Park Avenue. | | | | | | | | | | | | |
| | 28-Jul-98 | ND(<1.0) | 1.2 | 17 | 13 | ND(<1.0) | 21 | ND(<1.0) | ND(<1.0) | ND(<1.0) | --- | --- | --- | --- |
| | 8-Oct-98 | ND(<0.50) | 1.6 | 7.4 | 16 | ND(<0.50) | 19 | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | **3-Feb-99** | **ND(<0.50)** | **0.59** | **1.5** | **34** | **ND(<0.50)** | **ND(<1.0)** | **ND(<0.50)** | **1.6** | **0.94** | --- | --- | --- | --- |

**Table 4: Summary of Groundwater Analytical Data - Halogenated Volatile Organic Compounds**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | PCE (µg/L) (a) | TCE (µg/L) (a) | cis-1,2-DCE (µg/L) (a) | trans-1,2-DCE (µg/L) (a) | 1,1-DCE (µg/L) (a) | Vinyl Chloride (µg/L) (a) | 1,1,1-TCA (µg/L) (a) | 1,1-DCA (µg/L) (a) | 1,2-DCA (µg/L) (a) | Other Analytes (µg/L) | Methane (µg/L) | Ethane (µg/L) | Ethylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-5 | 4-Nov-91 | 8.9 | 410 | --- | 120 | 4.2 | 54 | 1.3 | 42 | --- | --- | --- | --- | --- |
| (on-site) | 21-Apr-95 | 10 | 210 | 31 | 13 | ND(<5) | ND(<10) | ND(<5) | 13 | ND(<5) | --- | --- | --- | --- |
| (SI 11.0-15.0) | Apr-97 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 30-Jun-97 | 14 | 190 | 32 | 20 | ND(<5.0) | ND(<10) | ND(<5.0) | 8.2 | ND(<5.0) | --- | --- | --- | --- |
| | 1-Oct-97 | ND(<2.5) | 36 | 210 | 19 | ND(<2.5) | 13 | ND(<2.5) | 9.1 | 2.7 | --- | --- | --- | --- |
| | Feb-98 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 19-May-98 | ND(<2.5) | ND(<2.5) | 7.1 | 11 | ND(<2.5) | ND(<2.5) | ND(<2.5) | ND(<2.5) | ND(<2.5) | --- | --- | --- | --- |
| | 28-Jul-98 | ND(<0.50) | ND(<0.50) | 3.1 | 5.0 | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 9-Oct-98 | ND(<0.50) | 3.5 | 2.4 | 6.5 | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | **2-Feb-99** | **ND(<0.50)** | **0.52** | **3.1** | **7.4** | **ND(<0.50)** | **ND(<1.0)** | **ND(<0.50)** | **0.93** | **0.56** | --- | --- | --- | --- |
| MW-9 | 13-Jun-85 | 26 | 700 | --- | 31 | ND(<5) | ND(<5) | ND(<5) | ND(<5) | --- | --- | --- | --- | --- |
| (on-site) | 30-Oct-91 | 11 | 200 | --- | 13 | ND(<0.5) | ND(<1) | ND(<0.5) | 1.3 | --- | --- | --- | --- | --- |
| (SI 17.5-24.5) | 21-Apr-95 | 13 | 73 | 6.4 | ND(<2) | ND(<2) | ND(<4) | ND(<2) | ND(<2) | ND(<2) | --- | --- | --- | --- |
| | 13-Sep-96 | 75 | ND(<50) | ND(<50) | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 11-Dec-96 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 7-Apr-97 | 15 | 95 | 8.8 | 2.5 | ND(<2.5) | ND(<5.0 | 7.1 | ND(<2.5) | ND(<2.5) | --- | --- | --- | --- |
| | Apr-97 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 1-Oct-97 | 9.6 | 57 | 8.8 | 2.5 | ND(<1.2) | ND(<2.5) | 4.8 | 3.9 | 1.3 | --- | --- | --- | --- |
| | 2-Dec-97 | 3.2 | 11 | 4.5 | ND(<0.50) | ND(<0.50) | ND(<1.0) | 2.5 | 5.2 | ND(<0.50) | --- | --- | --- | --- |
| | Feb-98 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 24-Apr-98 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 13,103 | <0.005 | 2.7 |
| | 19-May-98 | 38 | 99 | ND(<25) | 680 | ND<25) | 1,700 | 150 | 190 | ND(<25) | --- | --- | --- | --- |
| | 28-Jul-98 | ND(<100) | ND(<100) | 4,100 | 100 | ND(<100) | 320 | ND(<100) | ND(<100) | ND(<100) | --- | --- | --- | --- |
| | 29-Jul-98 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 7,886 | 0.390 | 17.8 |
| | 8-Oct-98 | ND(<25) | ND(<25) | 1,400 | 74 | ND(<25) | 180 | ND(<25) | 34 | ND(<25) | --- | 10,800 | 0.561 | 11.5 |
| | **2-Feb-99** | **ND(<1.3)** | **ND(<1.3)** | **2.7** | **8.7** | **ND(<1.3)** | **17** | **ND(<1.3)** | **1.4** | **ND(<1.3)** | --- | --- | --- | --- |

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**Table 4: Summary of Groundwater Analytical Data - Halogenated Volatile Organic Compounds**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | PCE (µg/L) (a) | TCE (µg/L) (a) | cis-1,2-DCE (µg/L) (a) | trans-1,2-DCE (µg/L) (a) | 1,1-DCE (µg/L) (a) | Vinyl Chloride (µg/L) (a) | 1,1,1-TCA (µg/L) (a) | 1,1-DCA (µg/L) (a) | 1,2-DCA (µg/L) (a) | Other Analytes (µg/L) | Methane (µg/L) | Ethane (µg/L) | Ethylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-10 | 12-Jun-85 | 81 | 5,100 | --- | ND(<50) | ND(<50) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- | --- |
| (on-site) | 12-Jun-85 | ND(<50) | 12,000 | --- | 600 | ND(<50) | --- | ND(<50) | ND(<50) | --- | --- | --- | --- | --- |
| (SI 17.5-24.5) | 7-Nov-91 | ND(<50) | 14,000 | --- | 640 | 3,800 | ND(<100) | 6,500 | ND(<50) | --- | --- | --- | --- | --- |
| | 21-Apr-95 | ND(<100) | 10,000 | 900 | ND(<100) | 1,200 | ND(<200) | 1,000 | ND(<100) | ND(<100) | --- | --- | --- | --- |
| | | Pilot Test: Spring 1998 | | | | | | | | | | | | |
| | 8-Apr-97 | ND(<500) | 660 | 11,000 | ND(<500) | 680 | ND(<1000) | ND(<500) | ND(<500) | ND(<500) | --- | --- | --- | --- |
| | Apr-97 | On-site Remediation Injection Event | | | | | | | | | --- | | | |
| | 1-Oct-97 | ND(<120) | ND(<120) | 5,900 | ND(<120) | 260 | 500 | ND(<120) | ND(<120) | ND(<120) | --- | --- | --- | --- |
| | 2-Dec-97 | ND(<120) | ND(<120) | 6,600 | ND(<120) | 320 | 480 | ND(<120) | ND(<120) | ND(<120) | --- | --- | --- | --- |
| | Feb-98 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 24-Apr-98 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 2,363 | 1.70 | 238 |
| | 19-May-98 | Access blocked by construction activity at 1421 Park Avenue. | | | | | | | | | | | | |
| | 28-Jul-98 | ND(<10) | ND(<10) | 390 | 17 | ND(<10) | 54 | ND(<10) | ND(<10) | ND(<10) | --- | --- | --- | --- |
| | 29-Jul-98 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 6,805 | 51.5 | 82.1 |
| | 9-Oct-98 | ND(<1.2) | 11 | 53 | 5.8 | 2.5 | 14 | ND(1.2) | 3.4 | 1.3 | --- | 8,550 | 129 | 53.5 |
| | **2-Feb-99** | **ND(<0.50)** | **3.9** | **6.4** | **ND(<0.50)** | **0.60** | **1.1** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | --- | --- | --- | --- |
| MW-11 | 12-Jun-85 | 5.3 | 19 | --- | 3.4 | ND(<0.5) | ND(<0.5) | 1.3 | ND(<0.5) | --- | --- | --- | --- | --- |
| (on-site) | 15-Nov-91 | 1.5 | 10 | --- | 3.1 | ND(<0.5) | ND(<1) | ND(<0.5) | ND(<0.5) | --- | --- | --- | --- | --- |
| (SI 16.0-29.0) | 20-Apr-95 | 7.4 | 67 | 6.2 | ND(<5) | ND(<5) | ND(<10) | ND(<5) | ND(<5) | ND(<5) | --- | --- | --- | --- |
| | 13-Sep-96 | 0.73 | 6.0 | 3.6 | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | 0.6 | 1.0 | --- | --- | --- | --- |
| | 7-Apr-97 | ND(<0.50) | 1.1 | 9.7 | 4.1 | ND(<0.50) | 4.6 | ND(<0.50) | 0.73 | ND(<0.50) | --- | --- | --- | --- |
| | Apr-97 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 1-Oct-97 | ND(<0.50) | 8.4 | 25 | 8.3 | ND(<0.50) | 9.5 | 0.51 | 2.6 | 1.6 | --- | --- | --- | --- |
| | 2-Dec-97 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | Feb-98 | On-site Remediation Injection Event | | | | | | | | | | | | |

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**Table 4: Summary of Groundwater Analytical Data - Halogenated Volatile Organic Compounds**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | PCE (µg/L) (a) | TCE (µg/L) (a) | cis-1,2-DCE (µg/L) (a) | trans-1,2-DCE (µg/L) (a) | 1,1-DCE (µg/L) (a) | Vinyl Chloride (µg/L) (a) | 1,1,1-TCA (µg/L) (a) | 1,1-DCA (µg/L) (a) | 1,2-DCA (µg/L) (a) | Other Analytes (µg/L) | Methane (µg/L) | Ethane (µg/L) | Ethylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-12** | 11-Nov-91 | 10 | 130 | --- | 9 | 3.3 | ND(<2) | 4.6 | 1.3 | --- | --- | --- | --- | --- |
| **(on-site)** | 20-Apr-95 | 9.4 | 52 | 5.0 | ND(<2.5) | 9.0 | ND(<5) | 3.9 | ND(<2.5) | ND(<2.5) | --- | --- | --- | --- |
| **(SI 17.6-28.5)** | 19-Sep-95 | 14 | 67 | 9.1 | 3.8 | 15 | ND(<2.5) | 7.2 | 1.6 | 2.9 | --- | --- | --- | --- |
| | 15-Dec-95 | ND(<10) | 79 | ND(<10) | ND(<10) | ND(<10) | ND(<20) | ND(<10) | ND(<10) | ND(<10) | --- | --- | --- | --- |
| | 8-Mar-96 | 850 | ND(<50) | ND(<50) | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 11-Jun-96 | ND(<1.0) | 2.7 | 39 | 1.4 | 3.9 | 13 | 2.6 | 1.6 | 1.4 | --- | --- | --- | --- |
| | 13-Sep-96 | 2.3 | 23 | 15 | 1.5 | 12 | ND(<1.0) | 5.9 | 2.9 | 1.9 | --- | --- | --- | --- |
| | 11-Dec-96 | 5.0 | 55 | 11 | 0.83 | 6.2 | ND(<1.0) | 4.9 | 1.4 | 1.5 | --- | --- | --- | --- |
| | 7-Apr-97 | 6.2 | 65 | 17 | ND(<5.0) | 15 | ND(<10) | ND(<5.0) | 5.6 | ND(<5.0) | --- | --- | --- | --- |
| | Apr-97 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 30-Jun-97 | 8.5 | 47 | 7.6 | 1.5 | 4.6 | ND(<2.0) | 1.9 | 1.5 | 1.6 | --- | --- | --- | --- |
| | 1-Oct-97 | 8.1 | 20 | 6.7 | 1.8 | ND(<0.50) | 1.1 | 0.52 | 2.0 | 1.7 | --- | --- | --- | --- |
| | 2-Dec-97 | 2.9 | 5.6 | 0.97 | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | 0.57 | ND(<0.50) | --- | --- | --- | --- |
| | Feb-98 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 24-Apr-98 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1,904 | 2.30 | 1.20 |
| | 19-May-98 | ND(<0.50) | 6.0 | 4.5 | 2.0 | ND(<0.50) | 2.4 | ND(<0.50) | 0.83 | 0.83 | CA: 1.2 | --- | --- | --- |
| | 28-Jul-98 | ND(<0.50) | 5.3 | 7.9 | 1.0 | ND(<0.50) | 1.2 | ND(<0.50) | 0.65 | 0.83 | --- | --- | --- | --- |
| | 29-Jul-98 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1,867 | 3.71 | 1.83 |
| | 8-Oct-98 | 0.75 | 11 | 7.8 | 0.60 | ND(<0.50) | ND(<1.0) | --- | 0.64 | 0.90 | --- | 270 | 1.67 | 0.190 |
| | **2-Feb-99** | **ND(<1.3)** | **ND(<1.3)** | **2.5** | **2.2** | **ND(<1.3)** | **ND(<1.3)** | **ND(<1.3)** | **ND(<1.3)** | **ND(<1.3)** | **CA: 6.7** | --- | --- | --- |

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**Table 4: Summary of Groundwater Analytical Data - Halogenated Volatile Organic Compounds**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | PCE (µg/L) (a) | TCE (µg/L) (a) | cis-1,2-DCE (µg/L) (a) | trans-1,2-DCE (µg/L) (a) | 1,1-DCE (µg/L) (a) | Vinyl Chloride (µg/L) (a) | 1,1,1-TCA (µg/L) (a) | 1,1-DCA (µg/L) (a) | 1,2-DCA (µg/L) (a) | Other Analytes (µg/L) | Methane (µg/L) | Ethane (µg/L) | Ethylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-13** | 8-Nov-91 | 8.9 | 630 | --- | 89 | 6.8 | 20 | ND(<5) | 15 | --- | --- | --- | --- | --- |
| **(on-site)** | 28-Jul-94 | --- | 770 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **(SI 10.5-15.5)** | 20-Apr-95 | 8.9 | 360 | 70 | 16 | ND(<5) | 20 | ND(<5) | 14 | ND(<5) | --- | --- | --- | --- |
| | 19-Sep-95 | 12.0 | 240 | 72 | 25 | ND(<5) | 42 | ND(<5) | 18 | ND(<5) | --- | --- | --- | --- |
| | 15-Dec-95 | ND(<10) | 380 | 68 | 17 | ND(<10) | ND(<20) | ND(<10) | ND(<10) | ND(<10) | --- | --- | --- | --- |
| | 8-Mar-96 | ND(<50) | 270 | 68 | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 11-Jun-96 | ND(<50) | 250 | ND(<50) | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 13-Sep-96 | ND(<50) | 430 | 84 | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 11-Dec-96 | ND(<50) | 250 | 56 | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 7-Apr-97 | ND(<50) | 280 | 62 | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | Apr-97 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 30-Jun-97 | 12 | 300 | 61 | 25 | ND(<5.0) | 30 | ND(<5.0) | 15 | ND(<5.0) | --- | --- | --- | --- |
| | 1-Oct-97 | 15 | 250 | 100 | 24 | ND(<5.0) | 25 | ND(<5.0) | 13 | ND(<5.0) | --- | --- | --- | --- |
| | 2-Dec-97 | 5.5 | 140 | 150 | 22 | ND(<2.5) | 35 | ND(<2.5) | 11 | 2.9 | --- | --- | --- | --- |
| | Feb-98 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 19-May-98 | ND(<0.50) | 1.2 | 29 | 4.4 | ND(<0.5) | 3.4 | ND(<0.5) | 6.1 | 0.67 | --- | --- | --- | --- |
| | 28-Jul-98 | ND(<0.50) | 9.3 | 9 | 3.2 | ND(<0.5) | 4.4 | ND(<0.5) | 3.1 | 0.90 | CA: 2.2 | --- | --- | --- |
| | 29-Jul-98 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 7,935 | 0.214 | 2.70 |
| | 9-Oct-98 | ND(<0.50) | 4.4 | 2.7 | 3.9 | ND(<0.50) | 1.3 | ND(<0.50) | 0.96 | ND(<0.50) | --- | 10,700 | 1.87 | 2.98 |
| | **2-Feb-99** | **ND(<0.50)** | **ND(<0.50)** | **0.55** | **0.96** | **ND(<0.50)** | **ND(<1.0)** | **ND(<0.50)** | **2.5** | **ND(<0.50)** | --- | --- | --- | --- |

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**Table 4: Summary of Groundwater Analytical Data - Halogenated Volatile Organic Compounds**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | PCE (µg/L) (a) | TCE (µg/L) (a) | cis-1,2-DCE (µg/L) (a) | trans-1,2-DCE (µg/L) (a) | 1,1-DCE (µg/L) (a) | Vinyl Chloride (µg/L) (a) | 1,1,1-TCA (µg/L) (a) | 1,1-DCA (µg/L) (a) | 1,2-DCA (µg/L) (a) | Other Analytes (µg/L) | Methane (µg/L) | Ethane (µg/L) | Ethylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-14** | 21-Mar-85 | 26 | 580 | --- | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | --- | --- | --- | --- | --- |
| **(on-site)** | 11-Nov-91 | 13 | 4,300 | --- | 150 | 13 | 30 | 17 | 19 | --- | --- | --- | --- | --- |
| **(SI 15.0-25.0)** | 21-Apr-95 | ND(<10) | 8,100 | 36 | ND(<10) | ND(<10) | ND(<20) | ND(<10) | ND(<10) | ND(<10) | --- | --- | --- | --- |
| | 13-Sep-96 | ND(<1000) | 4,700 | ND(<1000) | ND(<1000) | ND(<1000) | ND(<2000) | ND(<1000) | ND(<1000) | ND(<1000) | --- | --- | --- | --- |
| | 8-Apr-97 | ND(<500) | 17,000 | ND(<500) | ND(<500) | ND(<500) | ND(<1000) | ND(<500) | ND(<500) | ND(<500) | --- | --- | --- | --- |
| | Apr-97 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 1-Oct-97 | ND(<25) | 2,200 | 2,100 | ND(<25) | ND(<25) | ND(<50) | ND(<25) | ND(<25) | ND(<25) | --- | --- | --- | --- |
| | 2-Dec-97 | ND(<25) | 680 | 1,200 | ND(<25) | ND(<25) | 110 | ND(<25) | ND(<25) | ND(<25) | --- | --- | --- | --- |
| | Feb-98 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 19-May-98 | ND(<13) | 1,800 | 4,600 | 39 | 13 | 860 | ND(<13) | ND(<13) | ND(<13) | --- | --- | --- | --- |
| | 28-Jul-98 | ND(<100) | 1,500 | 5,100 | ND(<100) | ND(<100) | 1,200 | ND(<100) | ND(<100) | ND(<100) | --- | --- | --- | --- |
| | 29-Jul-98 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 2,846 | 20.4 | 98.9 |
| | 26-Oct-98 | ND(<0.50) | ND(<0.50) | 350 | 13 | ND(<0.50) | ND(<50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | 10,700 | 1.87 | 2.98 |
| | **2-Feb-99** | **ND(<0.50)** | **0.81** | **6.0** | **7.2** | **ND(<0.50)** | **3.0** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | --- | --- | --- | --- |
| **MW-20** | 15-Nov-91 | ND(<0.5) | ND(<0.5) | --- | ND(<0.5) | ND(<0.5) | ND(<1) | ND(<0.5) | ND(<0.5) | --- | --- | --- | --- | --- |
| **(on-site)** | 21-Apr-95 | ND(<0.5) | 4 | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<1.0) | ND(<0.5) | ND(<0.5) | ND(<0.5) | --- | --- | --- | --- |
| **(deep well)** | 19-Sep-95 | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<1.0) | ND(<0.5) | ND(<0.5) | ND(<0.5) | --- | --- | --- | --- |
| **(SI 31.0-51.0)** | 15-Dec-95 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 11-Jun-96 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 13-Sep-96 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 7-Apr-97 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | Apr-97 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 1-Oct-97 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | Feb-98 | On-site Remediation Injection Event | | | | | | | | | | | | |
| | 19-May-98 | Access blocked by construction activity at 1421 Park Avenue. | | | | | | | | | | | | |
| | 28-Jul-98 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | **3-Feb-98** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | **ND(<1.0)** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | **MC: 6.8** | --- | --- | --- |

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**Table 4: Summary of Groundwater Analytical Data - Halogenated Volatile Organic Compounds**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | PCE (µg/L) (a) | TCE (µg/L) (a) | cis-1,2-DCE (µg/L) (a) | trans-1,2-DCE (µg/L) (a) | 1,1-DCE (µg/L) (a) | Vinyl Chloride (µg/L) (a) | 1,1,1-TCA (µg/L) (a) | 1,1-DCA (µg/L) (a) | 1,2-DCA (µg/L) (a) | Other Analytes (µg/L) | Methane (µg/L) | Ethane (µg/L) | Ethylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-6 | 11-Jun-85 | ND(<0.5) | 220 | --- | 54 | ND(<5) | ND(<5) | 3.9 | ND(<5) | --- | --- | --- | --- | --- |
| (off-site) | 5-Nov-91 | 5.9 | 420 | --- | 78 | 29 | 19 | 6.4 | ND(<0.5) | --- | --- | --- | --- | --- |
| (SI 13.0-17.0) | 28-Jul-94 | --- | 790 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 20-Apr-95 | ND(<10) | 320 | 55 | ND(<10) | 34 | ND(<20) | ND(<10) | ND(<10) | ND(<10) | --- | --- | --- | --- |
| | 19-Sep-95 | 6.4 | 210 | 48 | 12 | 46 | 13 | ND(<5) | ND(<5) | ND(<5) | CBz: 5.1 | --- | --- | --- |
| | 14-Dec-95 | ND(<10) | 400 | 53 | ND(<10) | 74 | ND(<20) | ND(<10) | ND(<10) | ND(<10) | --- | --- | --- | --- |
| | 8-Mar-96 | ND(<50) | 290 | ND(<50) | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 11-Jun-96 | ND(<50) | 300 | ND(<50) | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 13-Sep-96 | ND(<50) | 480 | ND(<50) | ND(<50) | 64 | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 11-Dec-96 | ND(<50) | 360 | ND(<50) | ND(<50) | 59 | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 8-Apr-97 | ND(<50) | 420 | 52 | ND(<50) | 73 | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 30-Jun-97 | 8.1 | 330 | 47 | 11 | 51 | 12 | ND(<5.0) | ND(<5.0) | ND(<5.0) | CBz: 8.9 | --- | --- | --- |
| | 1-Oct-97 | 6.2 | 220 | 49 | 9.7 | 37 | 13 | 2.6 | ND(<2.5) | ND(<2.5) | CBz: 6.6 | --- | --- | --- |
| | 2-Dec-97 | 6.4 | 260 | 44 | 7.6 | 43 | ND(<10) | ND(<5.0) | ND(<5.0) | ND(<5.0) | CBz: 6.7 | --- | --- | --- |
| | 19-May-98 | 4.3 | 330 | 45 | 12 | 50 | 13 | 4.6 | 1.3 | 1.4 | 2-DCBz: 0.56; CBz: 4.8; CFM: 1 | --- | --- | --- |
| | 28-Jul-98 | ND(<5.0) | 200 | 59 | 7.0 | 24 | ND(<10) | ND(<5.0) | ND(<5.0) | ND(<5.0) | --- | --- | --- | --- |
| | 9-Oct-98 | ND(<5.0) | 200 | 42 | 6.8 | 23 | ND(<10) | ND(<5.0) | ND(<5.0) | ND(<5.0) | --- | --- | --- | --- |
| | **4-Feb-99** | **10.0** | **230** | **5.7** | **5.3** | **21** | **ND(<10)** | **ND(<5.0)** | **ND(<5.0)** | **ND(<5.0)** | **CBz: 5.9** | --- | --- | --- |
| MW-8 | 10-Jun-85 | 18 | 46 | --- | 19 | ND(<1) | 3 | ND(<1) | 1 | --- | --- | --- | --- | --- |
| (off-site) | 11-Jun-85 | 35 | 93 | --- | 32 | 1 | --- | ND(<0.5) | 1 | --- | --- | --- | --- | --- |
| (SI 16.0-22.0) | 5-Nov-91 | 35 | 38 | --- | 23 | 0.8 | 4.9 | ND(<0.5) | 1.8 | --- | --- | --- | --- | --- |
| | 21-Apr-95 | 18 | 40 | 46 | 6.7 | ND(<1.0) | 16 | ND(<1.0) | 1.2 | 5.6 | --- | --- | --- | --- |
| | 19-Sep-95 | Not Located | | | | | | | | | | | | |
| MW-15 | 13-Jun-85 | ND(<50) | 1,200 | --- | 410 | ND(<50) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- | --- |
| (off-site) | 21-Nov-91 | ND(<5) | 650 | --- | 220 | ND(<5) | ND(<10) | ND(<5) | ND(<5) | --- | --- | --- | --- | --- |
| (SI 15.0-25.0) | 21-Apr-95 | ND(<10) | 300 | 88 | 130 | ND(<10) | ND(<20) | ND(<10) | ND(<10) | ND(<10) | --- | --- | --- | --- |
| | 19-Sep-95 | Not Located | | | | | | | | | | | | |

**Table 4: Summary of Groundwater Analytical Data - Halogenated Volatile Organic Compounds**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | PCE (µg/L) (a) | TCE (µg/L) (a) | cis-1,2-DCE (µg/L) (a) | trans-1,2-DCE (µg/L) (a) | 1,1-DCE (µg/L) (a) | Vinyl Chloride (µg/L) (a) | 1,1,1-TCA (µg/L) (a) | 1,1-DCA (µg/L) (a) | 1,2-DCA (µg/L) (a) | Other Analytes (µg/L) | Methane (µg/L) | Ethane (µg/L) | Ethylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-16** | 21-Mar-85 | 42 | 360 | --- | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | --- | --- | --- | --- | --- |
| **(off-site)** | 19-Nov-91 | ND(<5) | 19,000 | --- | 2299 | 1,200 | 420 | 1,300 | ND(<5) | --- | --- | --- | --- | --- |
| **(SI 12.0-22.0)** | 28-Jul-94 | --- | 22,000 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 20-Apr-95 | 13 | 10,000 | 2,400 | 67 | 390 | 300 | 180 | 28 | ND(<10) | CBz: 12 | --- | --- | --- |
| | 19-Sep-95 | ND(<125) | 7,800 | 2,500 | 190 | 590 | 730 | 190 | ND(<125) | ND(<125) | --- | --- | --- | --- |
| | 14-Dec-95 | ND(<0.50) | 11,000 | 2,300 | 100 | 620 | 460 | 140 | 26 | ND(<0.50) | --- | --- | --- | --- |
| | 8-Mar-96 | ND(<200) | 9,900 | 2,400 | ND(<200) | 460 | ND(<400) | ND(<200) | ND(<200) | ND(<200) | --- | --- | --- | --- |
| | 11-Jun-96 | ND(<200) | 9,700 | 2,100 | ND(<200) | ND(<200) | 440 | ND(<200) | ND(<200) | ND(<200) | --- | --- | --- | --- |
| | 13-Sep-96 | ND(<1000) | 11,000 | 2,200 | ND(<1000) | ND(<1000) | ND(<2000) | ND(<1000) | ND(<1000) | ND(<1000) | --- | --- | --- | --- |
| | 11-Dec-96 | ND(<1000) | 11,000 | 2,900 | ND(<1000) | ND(<1000) | ND(<2000) | ND(<1000) | ND(<1000) | ND(<1000) | --- | --- | --- | --- |
| | 8-Apr-97 | ND(<1000) | 15,000 | 2,900 | ND(<1000) | ND(<1000) | ND(<2000) | ND(<1000) | ND(<1000) | ND(<1000) | --- | --- | --- | --- |
| | 30-Jun-97 | ND(<500) | 24,000 | 4,100 | ND(<500) | 780 | ND(<1000) | ND(<500) | ND(<500) | ND(<500) | --- | --- | --- | --- |
| | 1-Oct-97 | ND(<120) | 11,000 | 2,200 | ND(<120) | 350 | 410 | ND(<120) | ND(<120) | ND(<120) | --- | --- | --- | --- |
| | 2-Dec-97 | ND(<100) | 5,300 | 1,100 | ND(<100) | 160 | ND(<200) | ND(<100) | ND(<100) | ND(<100) | --- | --- | --- | --- |
| | 22-Apr-98 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 92.7 | 0.830 | 5.3 |
| | 19-May-98 | 4.5 | 3,900 | 1,800 | 40 | 230 | 160 | 39 | 9.3 | 1.9 | --- | --- | --- | --- |
| | 28-Jul-98 | ND(<100) | 4,500 | 2,600 | ND(<100) | 270 | ND(<200) | ND(<100) | ND(<100) | ND(<100) | --- | --- | --- | --- |
| | 29-Jul-98 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 199 | 4.95 | 31.5 |
| | 9-Oct-98 | ND(<100) | 2,700 | 1,400 | ND(<100) | ND(<100) | ND(<200) | ND(<100) | ND(<100) | ND(<100) | --- | 410 | 6.06 | 30.4 |
| | **4-Feb-99** | ND(<25) | **7,500** | **2,200** | **80** | **660** | **ND(<50)** | **ND(<25)** | **ND(<25)** | **ND(<25)** | --- | --- | --- | --- |

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**Table 4: Summary of Groundwater Analytical Data - Halogenated Volatile Organic Compounds**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | PCE (µg/L) (a) | TCE (µg/L) (a) | cis-1,2-DCE (µg/L) (a) | trans-1,2-DCE (µg/L) (a) | 1,1-DCE (µg/L) (a) | Vinyl Chloride (µg/L) (a) | 1,1,1-TCA (µg/L) (a) | 1,1-DCA (µg/L) (a) | 1,2-DCA (µg/L) (a) | Other Analytes (µg/L) | Methane (µg/L) | Ethane (µg/L) | Ethylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-17** | 13-Jun-85 | 18 | 200 | --- | 23 | 46 | ND(<5) | 22 | ND(<5) | --- | --- | --- | --- | --- |
| **(off-site)** | 19-Nov-91 | 8.9 | 460 | --- | 54 | 54 | 420 | 30 | 7.8 | --- | --- | --- | --- | --- |
| **(SI 10.0-20.0)** | 28-Jul-95 | --- | 780 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 20-Apr-95 | ND(<10) | 410 | 42 | 11 | 37 | ND(<20) | ND(<10) | ND(<10) | ND(<10) | 1,2-DCBz: 17; CBz: 31 | --- | --- | --- |
| | 19-Sep-95 | 9.8 | 260 | 50 | 23 | 42 | ND(<10) | 11 | ND(<5) | ND(<5) | 1,2-DCBz: 28; CBz: 52 | --- | --- | --- |
| | 14-Dec-95 | 13 | 360 | 24 | ND(<10) | 38 | ND(<20) | ND(<10) | ND(<10) | ND(<10) | 1,2-DCBz: 15; CBz: 27 | --- | --- | --- |
| | 8-Mar-96 | ND(<0.50) | 310 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<100) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 11-Jun-96 | ND(<0.50) | 270 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<100) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 13-Sep-96 | ND(<200) | 1,900 | ND(<200) | ND(<200) | 410 | ND(<400) | ND(<200) | ND(<200) | ND(<200) | --- | --- | --- | --- |
| | 11-Dec-96 | ND(<200) | 450 | ND(<200) | ND(<200) | ND(<200) | ND(<400) | ND(<200) | ND(<200) | ND(<200) | --- | --- | --- | --- |
| | 8-Apr-97 | ND(<200) | 350 | ND(<200) | ND(<200) | ND(<200) | ND(<400) | ND(<200) | ND(<200) | ND(<200) | --- | --- | --- | --- |
| | 30-Jun-97 | 6.3 | 260 | 27 | 11 | 20 | ND(<10) | ND(<5.0) | ND(<5.0) | ND(<5.0) | 1,2-DCBz: 16; CBz: 28 | --- | --- | --- |
| | 1-Oct-97 | 11 | 250 | 29 | 11 | 15 | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | 1,2-DCBz: 14; CBz: 23 | --- | --- | --- |
| | 2-Dec-97 | 4.1 | 140 | 17 | 4.9 | 12 | ND(<5.0) | ND(<2.5) | ND(<2.5) | ND(<2.5) | 1,2-DCBz: 9.5; CBz: 14 | --- | --- | --- |
| (h) | 19-May-98 | 5.0 | 180 | 13 | 6.0 | 15 | 2.0 | 1.7 | 0.99 | 0.60 | 2-DCBz: 5.6; CBz: 7.7; CFM: 1 | --- | --- | --- |
| | 28-Jul-98 | ND(<5.0) | 170 | 17 | ND(<5.0) | 11 | ND(<10) | ND(<5.0) | ND(<5.0) | ND(<5.0) | 1,2-DCBz: 6.4; CBz: 9.3 | --- | --- | --- |
| | 29-Jul-98 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 93.2 | 4.19 | 0.996 |
| | 8-Oct-98 | ND(<2.5) | 110 | 13 | 3.3 | 7.1 | ND(<5.0) | ND(<2.5) | ND(<2.5) | ND(<2.5) | 1,2-DCBz: 4.8; CBz: 5.0 | 115 | 9.37 | 0.211 |
| | **4-Feb-99** | **ND(<2.5)** | **220** | **21** | **4.7** | **21** | **ND(<5.0)** | **ND(<2.5)** | **ND(<2.5)** | **ND(<2.5)** | **CBz: 11** | **---** | **---** | **---** |
| **MW-18** | 12-Jun-85 | 32 | 430 | --- | 140 | ND(<0.5) | ND(<0.5) | 52 | ND(<0.5) | --- | --- | --- | --- | --- |
| **(off-site)** | 12-Jun-85 | ND(<50) | 340 | --- | ND(<50) | ND(<50) | --- | 66 | ND(<50) | --- | --- | --- | --- | --- |
| **(SI 15.0-25.0)** | 19-Nov-91 | 11 | 560 | --- | 160 | ND(<5) | 30 | 23 | ND(<5) | --- | --- | --- | --- | --- |
| | 22-Apr-95 | ND(<10) | 330 | 35 | 13 | ND(<10) | ND(<20) | 16 | ND(<10) | ND(<10) | --- | --- | --- | --- |
| | 19-Sep-95 | 14 | 200 | 34 | 20 | ND(<5) | ND(<10) | 16 | ND(<5) | ND(<5) | --- | --- | --- | --- |
| | 14-Dec-95 | ND(<10) | 280 | 18 | ND(<10) | ND(<10) | ND(<20) | ND(<10) | ND(<10) | ND(<10) | --- | --- | --- | --- |
| | 8-Mar-96 | ND(<50) | 200 | ND(<50) | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 11-Jun-96 | ND(<50) | 200 | ND(<50) | ND(<50) | ND(<50) | ND(<100) | ND(<50) | ND(<50) | ND(<50) | --- | --- | --- | --- |
| | 30-Jun-97 | 9.0 | 210 | 21 | 12 | ND(<5.0) | ND(<10) | 8.6 | ND(<5.0) | ND(<5.0) | --- | --- | --- | --- |
| | 1-Oct-97 | 11 | 200 | 25 | 13 | ND(<2.5) | ND(<5.0) | 9.3 | ND(<2.5) | ND(<2.5) | --- | --- | --- | --- |
| | 19-May-98 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 28-Jul-98 | 6.7 | 190 | 13 | ND(5.0) | 23 | ND(<10) | 6.2 | ND(<5.0) | ND(<5.0) | --- | --- | --- | --- |
| | **4-Feb-99** | **7.5** | **180** | **24** | **13** | **3** | **3.7** | **6.8** | **ND(<2.5)** | **ND(<2.5)** | --- | **---** | **---** | **---** |

**Table 4: Summary of Groundwater Analytical Data - Halogenated Volatile Organic Compounds**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

| Monitoring Well | Date Sampled | PCE (µg/L) (a) | TCE (µg/L) (a) | cis-1,2-DCE (µg/L) (a) | trans-1,2-DCE (µg/L) (a) | 1,1-DCE (µg/L) (a) | Vinyl Chloride (µg/L) (a) | 1,1,1-TCA (µg/L) (a) | 1,1-DCA (µg/L) (a) | 1,2-DCA (µg/L) (a) | Other Analytes (µg/L) | Methane (µg/L) | Ethane (µg/L) | Ethylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MW-18A** | 13-Jun-85 | ND(<0.5) | 10 | --- | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | --- | --- | --- | --- | --- |
| **(off-site)** | 19-Nov-91 | ND(<0.5) | ND(<0.5) | --- | ND(<0.5) | ND(<0.5) | ND(<1) | ND(<0.5) | ND(<0.5) | --- | --- | --- | --- | --- |
| **(SI 35.0-50.0)** | 20-Apr-95 | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<1.0) | ND(<0.5) | ND(<0.5) | ND(<0.5) | --- | --- | --- | --- |
| | 19-Sep-95 | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<1.0) | ND(<0.5) | ND(<0.5) | ND(<0.5) | --- | --- | --- | --- |
| | 15-Dec-95 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 8-Mar-96 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 11-Jun-96 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 30-Jun-97 | ND(<0.50) | 4.5 | 0.54 | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | 1-Oct-97 | ND(<0.50) | 3.0 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | CFM: 1.5 | --- | --- | --- |
| | 28-Jul-98 | ND(<0.50) | 1.1 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | --- | --- | --- | --- |
| | **4-Feb-99** | **ND(<0.50)** | **18** | **2.7** | **ND(<0.50)** | **0.92** | **ND(<1.0)** | **ND(<0.50)** | **ND(<0.50)** | **ND(<0.50)** | --- | --- | --- | --- |
| **MW-2** | 15-Nov-91 | Not Located | | | | | | | | | | | | |
| **(SI 14.0-21.0)** | | | | | | | | | | | | | | |
| **MW-7** | 19-Apr-95 | Not Located | | | | | | | | | | | | |
| **(SI 10.0-13.0)** | | | | | | | | | | | | | | |
| **MW-19** | 21-Mar-85 | 23 | 91 | --- | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | ND(<0.5) | --- | | --- | --- | --- |
| **(SI 10.0-25.0)** | 19-Apr-95 | Not Located | | | | | | | | | | | | |
| **MW-21** | 13-Jun-85 | ND(<50) | 2,200 | --- | 800 | ND(<50) | ND(<50) | 110 | ND(<50) | --- | | --- | --- | --- |
| **(SI 10.0-25.0)** | 19-Apr-95 | Not Located | | | | | | | | | | | | |
| **TB-LB** | 2-Dec-97 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | | --- | --- | --- |
| | 19-May-98 | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<0.50) | ND(<1.0) | ND(<0.50) | ND(<0.50) | ND(<0.50) | | --- | --- | --- |

Notes appear on the following page.

ARCADIS GERAGHTY&MILLER



**Table 4: Summary of Groundwater Analytical Data - Halogenated Volatile Organic Compounds**
Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

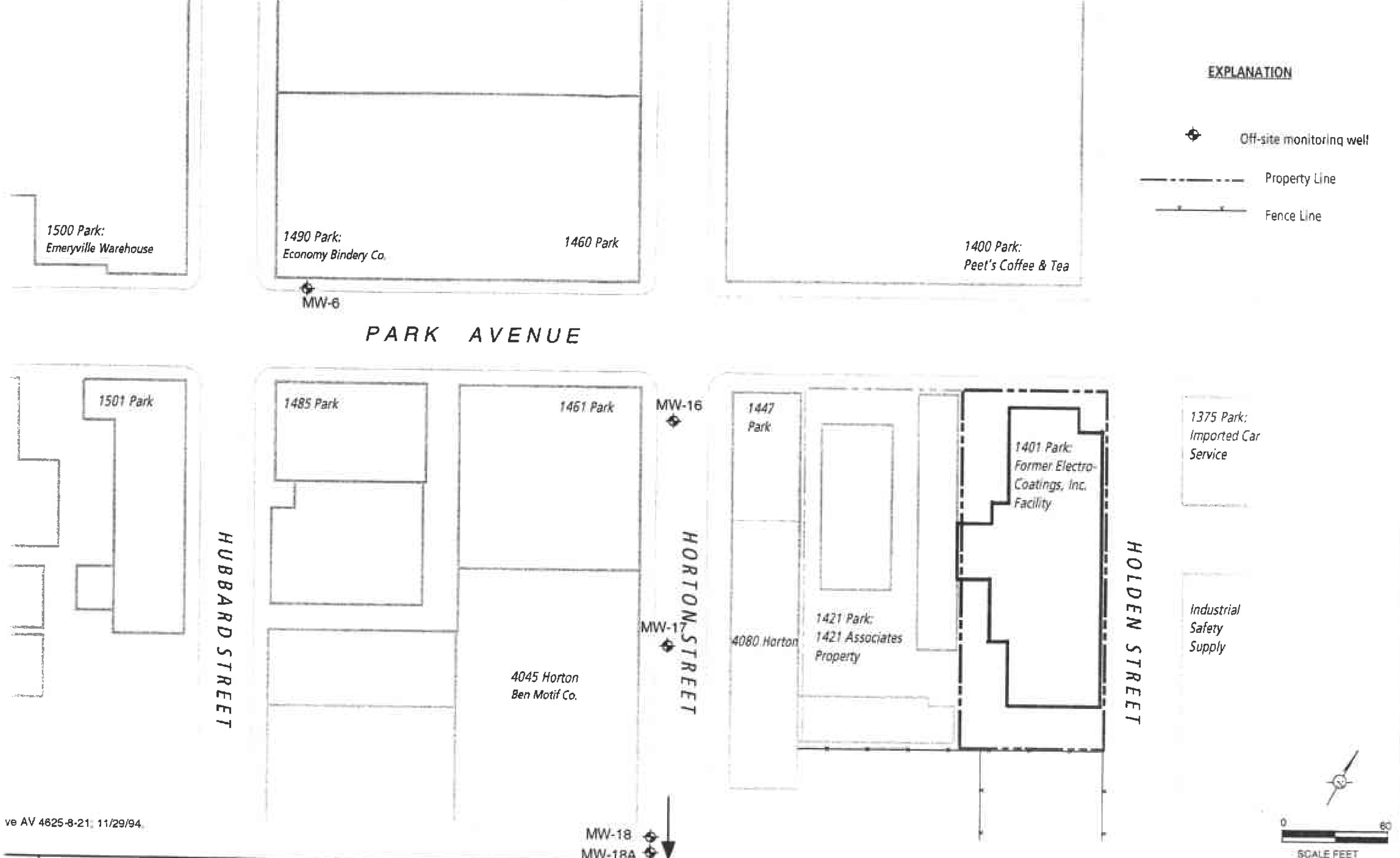
| Monitoring Well | Date Sampled | PCE (µg/L) (a) | TCE (µg/L) (a) | cis-1,2-DCE (µg/L) (a) | trans-1,2-DCE (µg/L) (a) | 1,1-DCE (µg/L) (a) | Vinyl Chloride (µg/L) (a) | 1,1,1-TCA (µg/L) (a) | 1,1-DCA (µg/L) (a) | 1,2-DCA (µg/L) (a) | Other Analytes (µg/L) | Methane (µg/L) | Ethane (µg/L) | Ethylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

(a) Analyzed by USEPA Method 8010.
(b) Denotes well that was part of the pilot study performed from August 1995 through February 1996.
PCE Tetrachloroethylene
TCE Trichloroethylene
cis-1,2-DCE cis-1,2-Dichloroethylene
trans-1,2-DCE trans-1,2-Dichloroethylene
1,1-DCE 1,1-Dichloroethylene
1,1,1-TCA 1,1,1-Trichloroethane
1,1-DCA 1,1-Dichloroethane
1,2-DCA 1,2-Dichloroethane
CBz Clorobenzene
1,2-DCBz 1,2-Dichlorobenzene
CFM Chloroform
CA Chloroethane
ND( ) Not detected; laboratory method detection limit in parentheses
TB-LB Trip blank-laboratory blank
µg/L Micrograms per liter
--- Not analyzed
SI Screened interval

Data from August 1977 through July 1994 taken from groundwater monitoring reports by American Environmental Management Corporation (January 27, 1992, and October 28, 1994).

Beginning April 20, 1995, laboratory analyses performed by Sequoia Analytical (Walnut Creek and Redwood City, California).

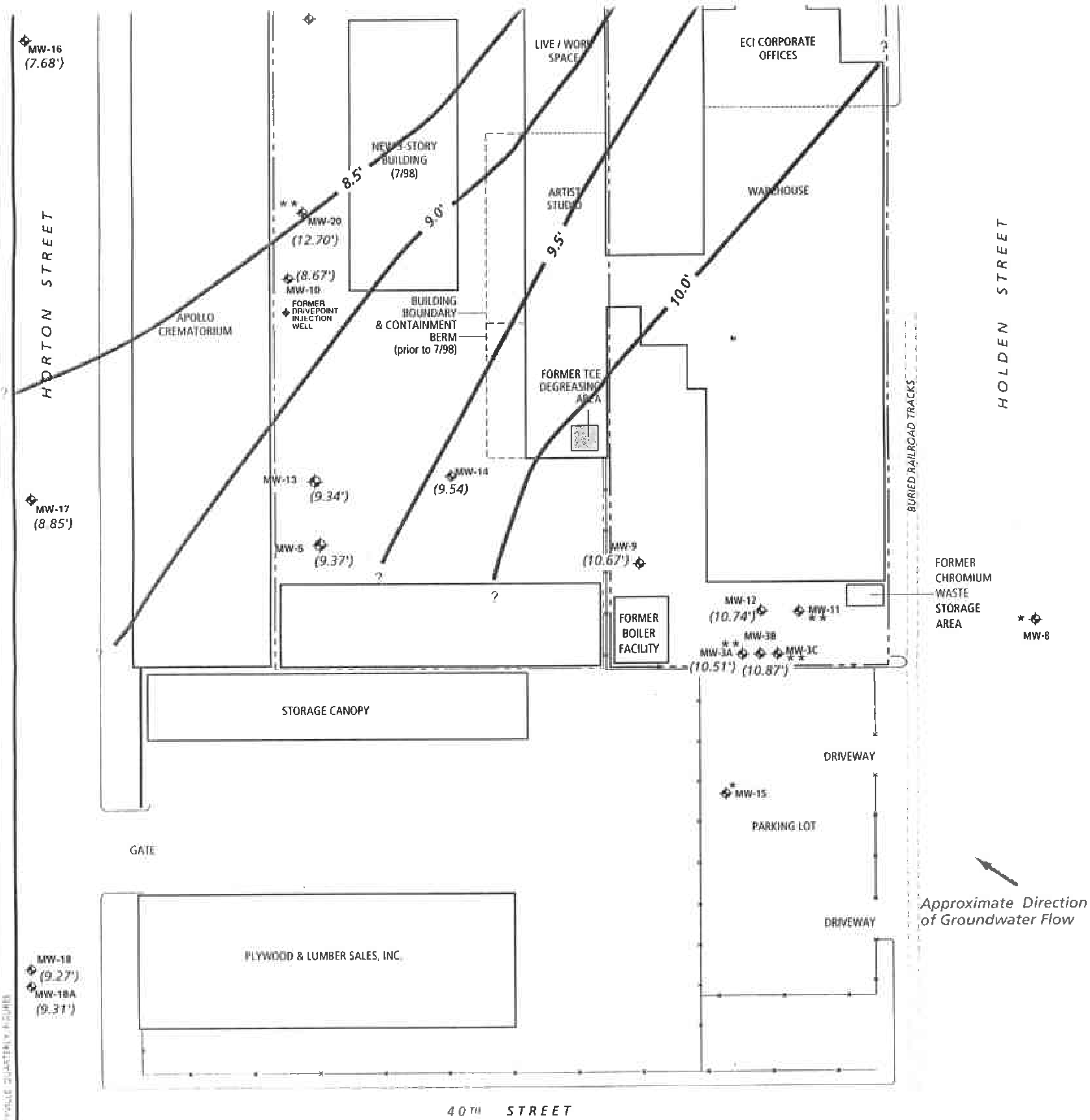
Methane, ethane, and ethylene analyses performed by Microseeps (Pittsburgh, Pennsylvania).




ER

**SITE VICINITY MAP**
Former Electro-Coatings, Inc. Facility
1401 Park Avenue
Emeryville, California

RC000304.0001
FIGURE
1




## EXPLANATION

| | |
|---|---|
| MW-12 | Monitoring Well |
| | Property Boundaries — 1421 Associates Property; Former Electro-Coatings, Inc. Facility |
| | Buried Railroad Tracks |
| | Fence Line |
| * | Reported location |
| ** | Deep wells, not used for groundwater contours |
| (10.36') | Groundwater Elevations, measured February 2, 1999, in feet above mean sea level. |
| ? 10.0 | Approximate location of groundwater contours on 0.5' intervals, dashed where uncertain, queried where unknown (measured in feet above mean sea level) |

N

0 20' 40'

1 inch = 40 feet

REFERENCE: DRAWING SCALED FROM ARCADIS GERAGHTY & MILLER FIELD MEASUREMENTS (APRIL 1998).

ARCADIS GERAGHTY & MILLER

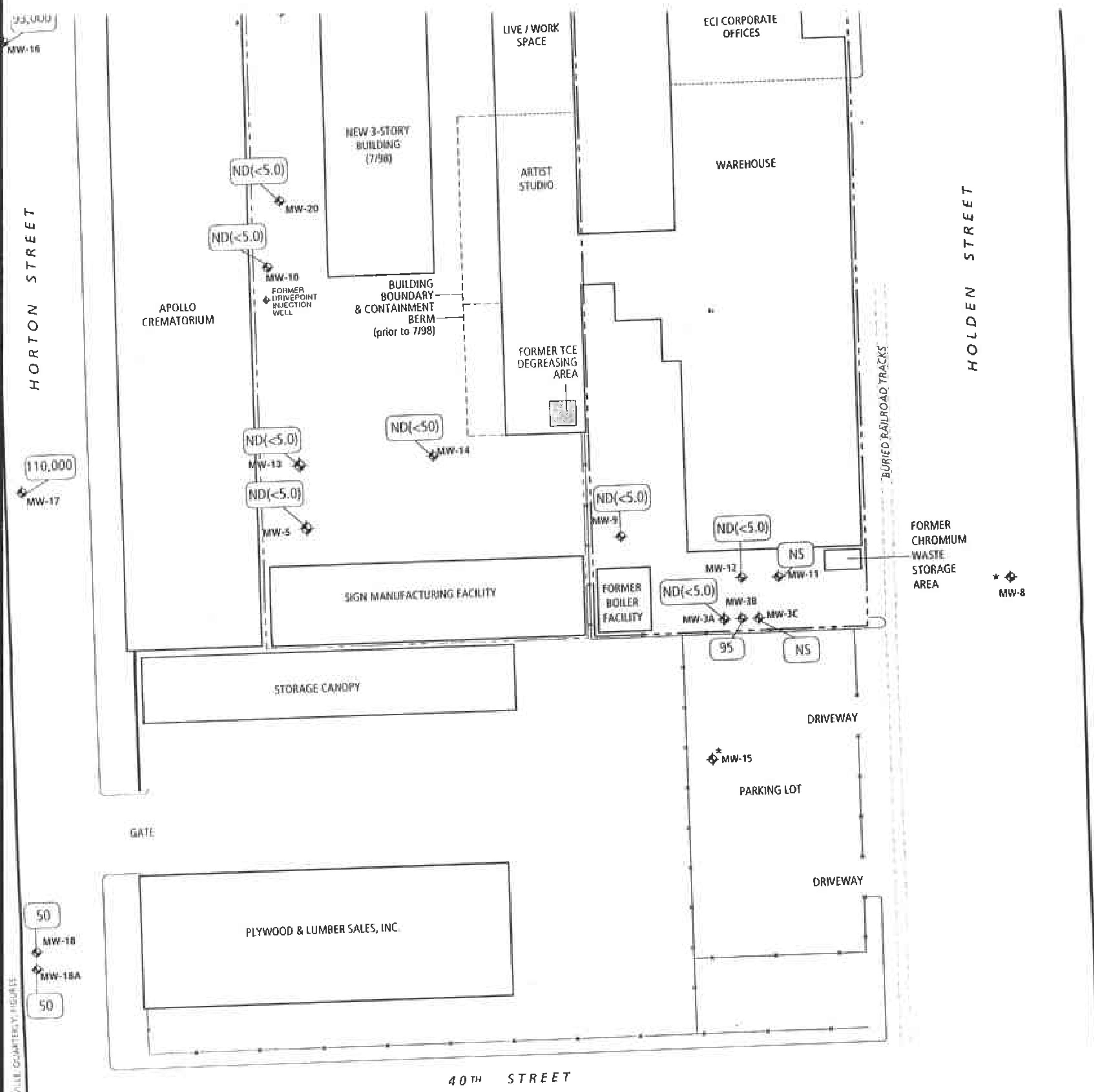
**GROUNDWATER ELEVATION CONTOURS**

Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

Revised 03/09/99
RC000304.0001

FIGURE

2




## EXPLANATION

| | | |
|---|---|---|
| MW-12 | Monitoring Well | ND(<5.0) — Hexavalent chromium, µg/L, February 1999. ND = Not Detected. Detection limit in ( ). |
| | Property Boundaries | 1421 Associates Property; Former Electro-Coatings, Inc. Facility |
| | Buried Railroad Tracks | NS — Not Sampled. |
| | Fence Line | |
| * | Reported location | |

N

0 20' 40'
1 inch = 40 feet

REFERENCE: DRAWING SCALED FROM ARCADIS GERAGHTY & MILLER FIELD MEASUREMENTS (APRIL 1998).

ARCADIS GERAGHTY & MILLER

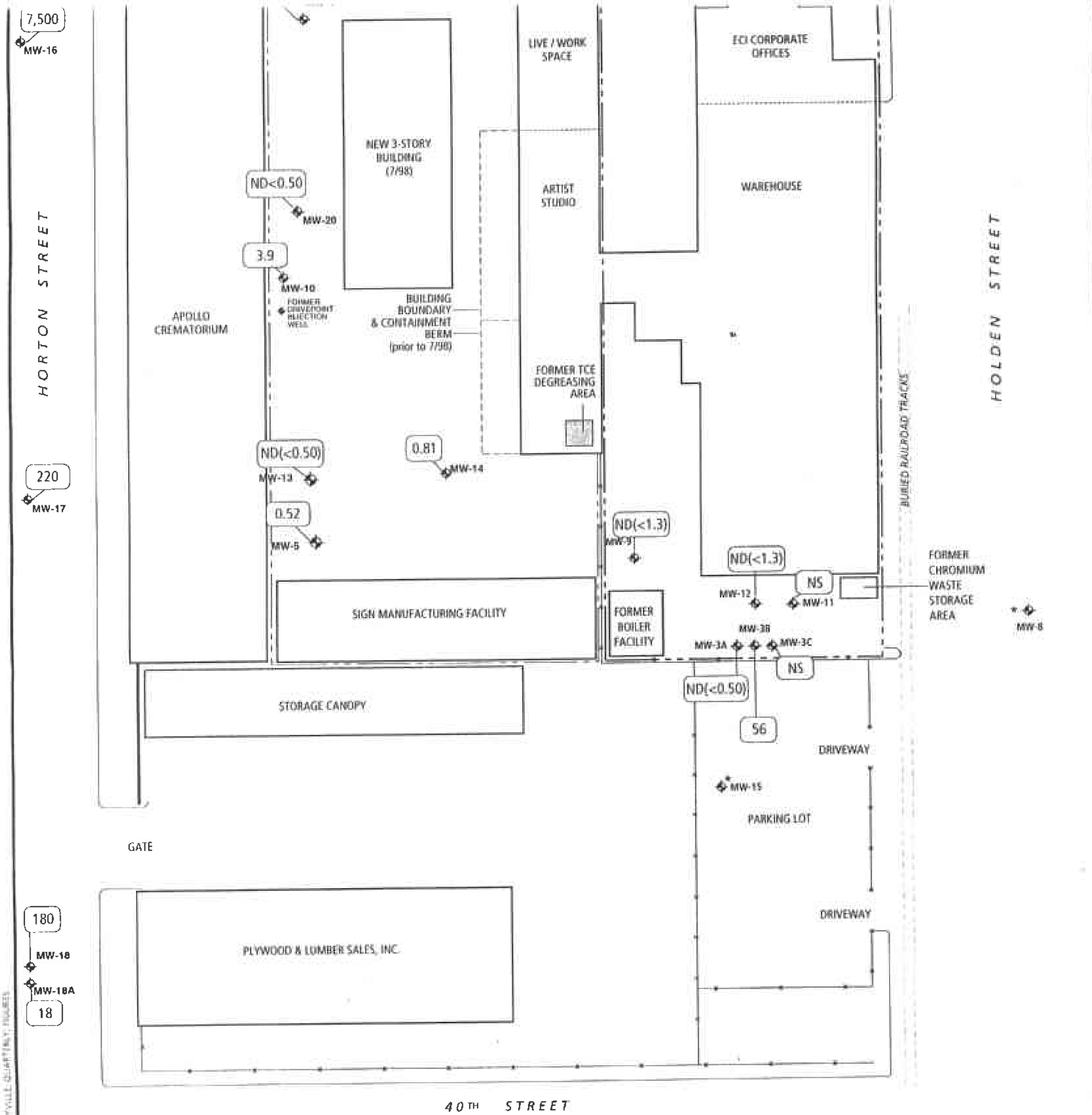
# HEXAVALENT CHROMIUM CONCENTRATIONS IN GROUNDWATER

Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

Revised 03/09/99
RC000304.0001

FIGURE 3

DRAWING DATE 2/3/98 | PATH: ELECTRO-COATINGS, INC. EMERYVILLE QUARTERLY FIGURES




**EXPLANATION**

| | | |
|---|---|---|
| MW-12 ◆ | *Monitoring Well* | |
| | *Property Boundaries* | *1421 Associates Property* / *Former Electro-Coatings, Inc. Facility* |
| | *Buried Railroad Tracks* | |
| | *Fence Line* | |
| * | *Reported location* | |

ND(<5.0) — TCE, µg/L, February 1999.
ND = Not Detected. Detection limit in ( ).

NS -- Not Sampled.

N

0 20' 40'
1 inch = 40 feet

REFERENCE: DRAWING SCALED FROM ARCADIS GERAGHTY & MILLER FIELD MEASUREMENTS (APRIL 1998).

ARCADIS GERAGHTY & MILLER

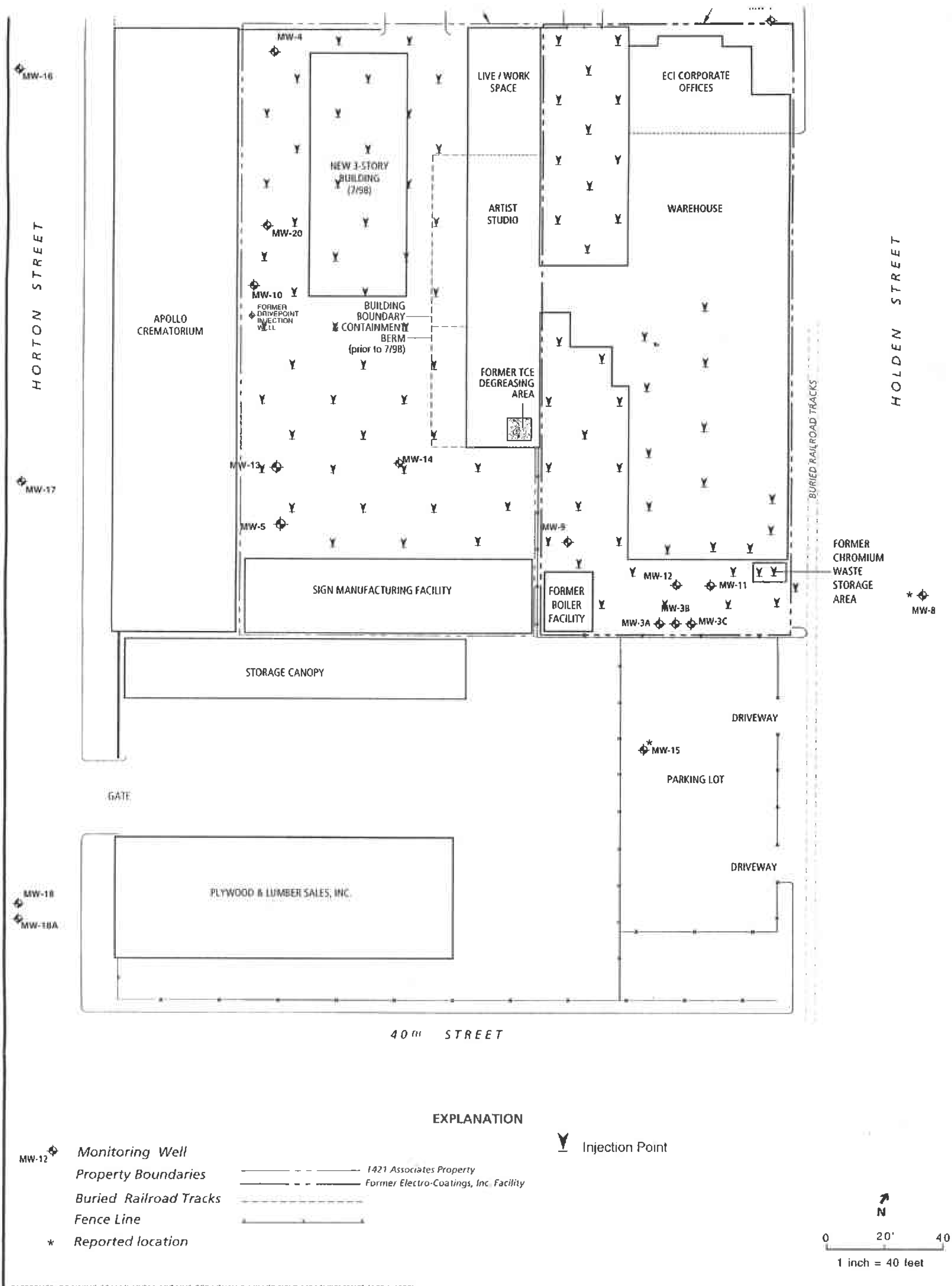
## TCE CONCENTRATIONS IN GROUNDWATER

Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

Revised 03/09/99
RC000304.0001

FIGURE

4




ARCADIS GERAGHTY & MILLER

**INJECTION POINT LOCATIONS**

Former Electro-Coatings, Inc. Facility, 1401 Park Avenue
1421 Associates Property, 1421 Park Avenue
Emeryville, California

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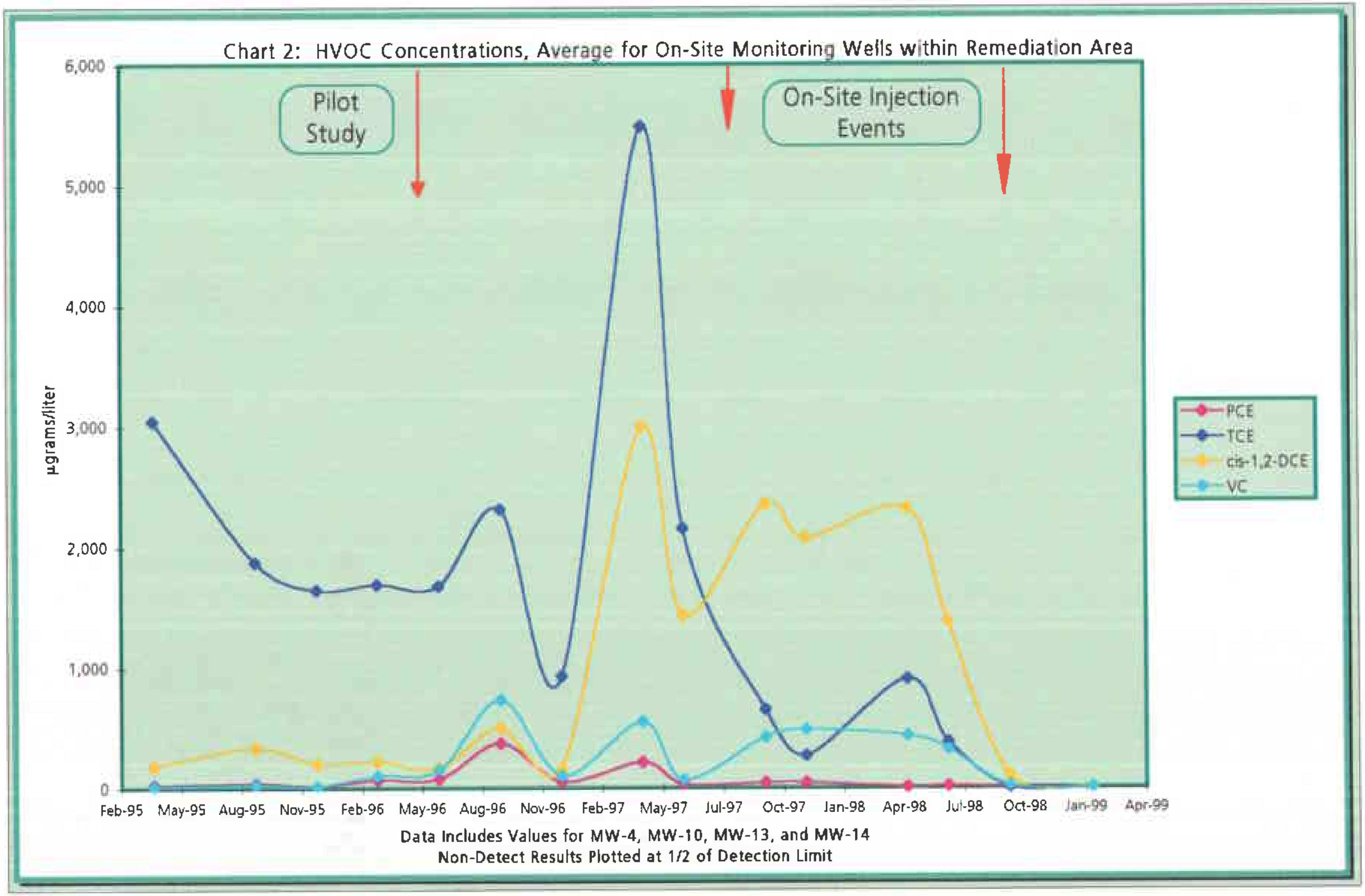
RC000304.0001

FIGURE
5




Our Ref:
Tables\Charts

Chart 1: Chromium Concentration, Average for On-Site Monitoring Wells within Remediation Area


Data Includes Values for MW-3B, MW-4, MW-5, MW-9, MW-10, MW-11MW-12, MW-13, MW-14
Non-Detect Results Plotted at 1/2 of Detection Limit

Our Ref:
Tables\Charts

# APPENDIX A

## COPIES OF LABORATORY ANALYTICAL REPORTS AND CHAIN-OF-CUSTODY DOCUMENTATION

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342

ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.8.4, ECI Emeryville
Sample Descript: Water, MW-3A
Analysis Method: EPA 5030/8010
Lab Number: 902-0294

Sampled: Feb 2, 1999
Received: Feb 2, 1999
Analyzed: Feb 9, 1999
Reported: Feb 16, 1999

QC Batch Number: GC020999801006A
Instrument ID: HP-6

# HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 0.50 | N.D. |
| Bromoform | 0.50 | N.D. |
| Bromomethane | 1.0 | N.D. |
| Carbon tetrachloride | 0.50 | N.D. |
| Chlorobenzene | 0.50 | N.D. |
| Chloroethane | 1.0 | N.D. |
| Chloroform | 0.50 | N.D. |
| Chloromethane | 1.0 | N.D. |
| Dibromochloromethane | 0.50 | N.D. |
| 1,3-Dichlorobenzene | 0.50 | N.D. |
| 1,4-Dichlorobenzene | 0.50 | N.D. |
| 1,2-Dichlorobenzene | 0.50 | N.D. |
| 1,1-Dichloroethane | 0.50 | N.D. |
| 1,2-Dichloroethane | 0.50 | N.D. |
| 1,1-Dichloroethene | 0.50 | N.D. |
| cis-1,2-Dichloroethene | 0.50 | N.D. |
| trans-1,2-Dichloroethene | 0.50 | N.D. |
| 1,2-Dichloropropane | 0.50 | N.D. |
| cis-1,3-Dichloropropene | 0.50 | N.D. |
| trans-1,3-Dichloropropene | 0.50 | N.D. |
| Methylene chloride | 5.0 | N.D. |
| 1,1,2,2-Tetrachloroethane | 0.50 | N.D. |
| Tetrachloroethene | 0.50 | N.D. |
| 1,1,1-Trichloroethane | 0.50 | N.D. |
| 1,1,2-Trichloroethane | 0.50 | N.D. |
| Trichloroethene | 0.50 | N.D. |
| Trichlorofluoromethane | 0.50 | N.D. |
| Vinyl chloride | 1.0 | N.D. |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 88 |
| 4-Bromofluorobenzene | 50 | 150 | 81 |

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Dimple Sharma
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342

| | | | | |
|---|---|---|---|---|
| ARCADIS Geraghty & Miller, Inc. | Client Project ID: | RC000304.8.4, ECI Emeryville | Sampled: | Feb 2, 1999 |
| 1050 Marina Way South | Sample Descript: | Water, MW-3B | Received: | Feb 2, 1999 |
| Richmond, CA 94804 | Analysis Method: | EPA 5030/8010 | Analyzed: | Feb 9, 1999 |
| Attention: S. Brussee | Lab Number: | 902-0295 | Reported: | Feb 16, 1999 |

QC Batch Number: GC020999801006A

Instrument ID: HP-6

# HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 0.50 | N.D. |
| Bromoform | 0.50 | N.D. |
| Bromomethane | 1.0 | N.D. |
| Carbon tetrachloride | 0.50 | N.D. |
| Chlorobenzene | 0.50 | N.D. |
| Chloroethane | 1.0 | N.D. |
| Chloroform | 0.50 | N.D. |
| Chloromethane | 1.0 | N.D. |
| Dibromochloromethane | 0.50 | N.D. |
| 1,3-Dichlorobenzene | 0.50 | N.D. |
| 1,4-Dichlorobenzene | 0.50 | N.D. |
| 1,2-Dichlorobenzene | 0.50 | N.D. |
| 1,1-Dichloroethane | 0.50 | 2.9 |
| 1,2-Dichloroethane | 0.50 | 1.2 |
| 1,1-Dichloroethene | 0.50 | 2.6 |
| cis-1,2-Dichloroethene | 0.50 | 52 |
| trans-1,2-Dichloroethene | 0.50 | 7.2 |
| 1,2-Dichloropropane | 0.50 | N.D. |
| cis-1,3-Dichloropropene | 0.50 | N.D. |
| trans-1,3-Dichloropropene | 0.50 | N.D. |
| Methylene chloride | 5.0 | N.D. |
| 1,1,2,2-Tetrachloroethane | 0.50 | N.D. |
| Tetrachloroethene | 0.50 | 3.1 |
| 1,1,1-Trichloroethane | 0.50 | 2.0 |
| 1,1,2-Trichloroethane | 0.50 | N.D. |
| Trichloroethene | 0.50 | 56 |
| Trichlorofluoromethane | 0.50 | N.D. |
| Vinyl chloride | 1.0 | 8.4 |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 113 |
| 4-Bromofluorobenzene | 50 | 150 | 88 |

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL, #1271**

DSharma

Dimple Sharma
Project Manager

Sequoia Analytical

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1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342

| | | | |
|---|---|---|---|
| RCADIS Geraghty & Miller, Inc. | Client Project ID: RC000304.8.4, ECI Emeryville | Sampled: | Feb 2, 1999 |
| 050 Marina Way South | Sample Descript: Water, MW-5 | Received: | Feb 2, 1999 |
| Richmond, CA 94804 | Analysis Method: EPA 5030/8010 | Analyzed: | Feb 9, 1999 |
| Attention: S. Brussee | Lab Number: 902-0296 | Reported: | Feb 16, 1999 |

C Batch Number: GC020999801006A

Instrument ID: HP-6

## HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 0.50 | N.D. |
| romoform | 0.50 | N.D. |
| romomethane | 1.0 | N.D. |
| Carbon tetrachloride | 0.50 | N.D. |
| hlorobenzene | 0.50 | N.D. |
| hloroethane | 1.0 | N.D. |
| Chloroform | 0.50 | N.D. |
| Chloromethane | 1.0 | N.D. |
| ibromochloromethane | 0.50 | N.D. |
| 3-Dichlorobenzene | 0.50 | N.D. |
| 1,4-Dichlorobenzene | 0.50 | N.D. |
| ,2-Dichlorobenzene | 0.50 | N.D. |
| 1-Dichloroethane | 0.50 | 0.93 |
| ,2-Dichloroethane | 0.50 | 0.56 |
| 1,1-Dichloroethene | 0.50 | N.D. |
| s-1,2-Dichloroethene | 0.50 | 3.1 |
| ans-1,2-Dichloroethene | 0.50 | 7.4 |
| 1,2-Dichloropropane | 0.50 | N.D. |
| is-1,3-Dichloropropene | 0.50 | N.D. |
| ans-1,3-Dichloropropene | 0.50 | N.D. |
| Methylene chloride | 5.0 | N.D. |
| 1,1,2,2-Tetrachloroethane | 0.50 | N.D. |
| etrachloroethene | 0.50 | N.D. |
| 1,1-Trichloroethane | 0.50 | N.D. |
| 1,1,2-Trichloroethane | 0.50 | N.D. |
| richloroethene | 0.50 | 0.52 |
| richlorofluoromethane | 0.50 | N.D. |
| Vinyl chloride | 1.0 | N.D. |

| urrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| ibromodifluoromethane | 50 | 150 | 115 |
| 4-Bromofluorobenzene | 50 | 150 | 101 |

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

DSharma

Dimple Sharma
Project Manager

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ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.8.4, ECI Emeryville
Sample Descript: Water, MW-9
Analysis Method: EPA 5030/8010
Lab Number: 902-0297

Sampled: Feb 2, 1999
Received: Feb 2, 1999
Analyzed: Feb 9, 1999
Reported: Feb 16, 1999

QC Batch Number: GC020999801006A
Instrument ID: HP-6

# HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 1.3 | N.D. |
| Bromoform | 1.3 | N.D. |
| Bromomethane | 2.5 | N.D. |
| Carbon tetrachloride | 1.3 | N.D. |
| Chlorobenzene | 1.3 | N.D. |
| Chloroethane | 2.5 | N.D. |
| Chloroform | 1.3 | N.D. |
| Chloromethane | 2.5 | N.D. |
| Dibromochloromethane | 1.3 | N.D. |
| 1,3-Dichlorobenzene | 1.3 | N.D. |
| 1,4-Dichlorobenzene | 1.3 | N.D. |
| 1,2-Dichlorobenzene | 1.3 | N.D. |
| 1,1-Dichloroethane | 1.3 | 1.4 |
| 1,2-Dichloroethane | 1.3 | N.D. |
| 1,1-Dichloroethene | 1.3 | N.D. |
| cis-1,2-Dichloroethene | 1.3 | 2.7 |
| trans-1,2-Dichloroethene | 1.3 | 8.7 |
| 1,2-Dichloropropane | 1.3 | N.D. |
| cis-1,3-Dichloropropene | 1.3 | N.D. |
| trans-1,3-Dichloropropene | 1.3 | N.D. |
| Methylene chloride | 13 | N.D. |
| 1,1,2,2-Tetrachloroethane | 1.3 | N.D. |
| Tetrachloroethene | 1.3 | N.D. |
| 1,1,1-Trichloroethane | 1.3 | N.D. |
| 1,1,2-Trichloroethane | 1.3 | N.D. |
| Trichloroethene | 1.3 | N.D. |
| Trichlorofluoromethane | 1.3 | N.D. |
| Vinyl chloride | 2.5 | 17 |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 76 |
| 4-Bromofluorobenzene | 50 | 150 | 82 |

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

**SEQUOIA ANALYTICAL, #1271**

DSharma

Dimple Sharma
Project Manager

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| | | | |
|---|---|---|---|
| ARCADIS Geraghty & Miller, Inc. | Client Project ID: RC000304.8.4, ECI Emeryville | Sampled: | Feb 2, 1999 |
| 1050 Marina Way South | Sample Descript: Water, MW-10 | Received: | Feb 2, 1999 |
| Richmond, CA 94804 | Analysis Method: EPA 5030/8010 | Analyzed: | Feb 9, 1999 |
| Attention: S. Brussee | Lab Number: 902-0298 | Reported: | Feb 16, 1999 |

QC Batch Number: GC020999801006A

Instrument ID: HP-6

# HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 0.50 | N.D. |
| Bromoform | 0.50 | N.D. |
| Bromomethane | 1.0 | N.D. |
| Carbon tetrachloride | 0.50 | N.D. |
| Chlorobenzene | 0.50 | N.D. |
| **Chloroethane** | **1.0** | **2.2** |
| Chloroform | 0.50 | N.D. |
| Chloromethane | 1.0 | N.D. |
| Dibromochloromethane | 0.50 | N.D. |
| 1,3-Dichlorobenzene | 0.50 | N.D. |
| 1,4-Dichlorobenzene | 0.50 | N.D. |
| 1,2-Dichlorobenzene | 0.50 | N.D. |
| **1,1-Dichloroethane** | **0.50** | **2.2** |
| 1,2-Dichloroethane | 0.50 | N.D. |
| **1,1-Dichloroethene** | **0.50** | **0.60** |
| **cis-1,2-Dichloroethene** | **0.50** | **6.4** |
| trans-1,2-Dichloroethene | 0.50 | N.D. |
| 1,2-Dichloropropane | 0.50 | N.D. |
| cis-1,3-Dichloropropene | 0.50 | N.D. |
| trans-1,3-Dichloropropene | 0.50 | N.D. |
| Methylene chloride | 5.0 | N.D. |
| 1,1,2,2-Tetrachloroethane | 0.50 | N.D. |
| Tetrachloroethene | 0.50 | N.D. |
| 1,1,1-Trichloroethane | 0.50 | N.D. |
| 1,1,2-Trichloroethane | 0.50 | N.D. |
| **Trichloroethene** | **0.50** | **3.9** |
| Trichlorofluoromethane | 0.50 | N.D. |
| **Vinyl chloride** | **1.0** | **1.1** |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 108 |
| 4-Bromofluorobenzene | 50 | 150 | 95 |

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL, #1271**

DSharma

Dimple Sharma
Project Manager

Sequoia Analytical

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ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.8.4, ECI Emeryville
Sample Descript: Water, MW-12
Analysis Method: EPA 5030/8010
Lab Number: 902-0299

Sampled: Feb 2, 1999
Received: Feb 2, 1999
Analyzed: Feb 9, 1999
Reported: Feb 16, 1999

QC Batch Number: GC020999801006A

Instrument ID: HP-6

# HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit μg/L | Sample Results μg/L |
|---|---|---|
| Bromodichloromethane | 1.3 | N.D. |
| Bromoform | 1.3 | N.D. |
| Bromomethane | 2.5 | N.D. |
| Carbon tetrachloride | 1.3 | N.D. |
| Chlorobenzene | 1.3 | N.D. |
| Chloroethane | 2.5 | 6.7 |
| Chloroform | 1.3 | N.D. |
| Chloromethane | 2.5 | N.D. |
| Dibromochloromethane | 1.3 | N.D. |
| 1,3-Dichlorobenzene | 1.3 | N.D. |
| 1,4-Dichlorobenzene | 1.3 | N.D. |
| 1,2-Dichlorobenzene | 1.3 | N.D. |
| 1,1-Dichloroethane | 1.3 | N.D. |
| 1,2-Dichloroethane | 1.3 | N.D. |
| 1,1-Dichloroethene | 1.3 | N.D. |
| cis-1,2-Dichloroethene | 1.3 | 2.5 |
| trans-1,2-Dichloroethene | 1.3 | 2.2 |
| 1,2-Dichloropropane | 1.3 | N.D. |
| cis-1,3-Dichloropropene | 1.3 | N.D. |
| trans-1,3-Dichloropropene | 1.3 | N.D. |
| Methylene chloride | 13 | N.D. |
| 1,1,2,2-Tetrachloroethane | 1.3 | N.D. |
| Tetrachloroethene | 1.3 | N.D. |
| 1,1,1-Trichloroethane | 1.3 | N.D. |
| 1,1,2-Trichloroethane | 1.3 | N.D. |
| Trichloroethene | 1.3 | N.D. |
| Trichlorofluoromethane | 1.3 | N.D. |
| Vinyl chloride | 2.5 | N.D. |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 86 |
| 4-Bromofluorobenzene | 50 | 150 | 88 |

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

**SEQUOIA ANALYTICAL, #1271**

Dimple Sharma
Project Manager

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1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342

| | | | |
|---|---|---|---|
| ARCADIS Geraghty & Miller, Inc. | Client Project ID: RC000304.8.4, ECI Emeryville | Sampled: | Feb 2, 1999 |
| 1050 Marina Way South | Sample Descript: Water, MW-13 | Received: | Feb 2, 1999 |
| Richmond, CA 94804 | Analysis Method: EPA 5030/8010 | Analyzed: | Feb 9, 1999 |
| Attention: S. Brussee | Lab Number: 902-0300 | Reported: | Feb 16, 1999 |

QC Batch Number: GC020999801006A

Instrument ID: HP-6

# HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 0.50 | N.D. |
| Bromoform | 0.50 | N.D. |
| Bromomethane | 1.0 | N.D. |
| Carbon tetrachloride | 0.50 | N.D. |
| Chlorobenzene | 0.50 | N.D. |
| Chloroethane | 1.0 | N.D. |
| Chloroform | 0.50 | N.D. |
| Chloromethane | 1.0 | N.D. |
| Dibromochloromethane | 0.50 | N.D. |
| 1,3-Dichlorobenzene | 0.50 | N.D. |
| 1,4-Dichlorobenzene | 0.50 | N.D. |
| 1,2-Dichlorobenzene | 0.50 | N.D. |
| 1,1-Dichloroethane | 0.50 | 2.5 |
| 1,2-Dichloroethane | 0.50 | N.D. |
| 1,1-Dichloroethene | 0.50 | N.D. |
| cis-1,2-Dichloroethene | 0.50 | 0.55 |
| trans-1,2-Dichloroethene | 0.50 | 0.96 |
| 1,2-Dichloropropane | 0.50 | N.D. |
| cis-1,3-Dichloropropene | 0.50 | N.D. |
| trans-1,3-Dichloropropene | 0.50 | N.D. |
| Methylene chloride | 5.0 | N.D. |
| 1,1,2,2-Tetrachloroethane | 0.50 | N.D. |
| Tetrachloroethene | 0.50 | N.D. |
| 1,1,1-Trichloroethane | 0.50 | 1.3 |
| 1,1,2-Trichloroethane | 0.50 | N.D. |
| Trichloroethene | 0.50 | N.D. |
| Trichlorofluoromethane | 0.50 | N.D. |
| Vinyl chloride | 1.0 | N.D. |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 108 |
| 4-Bromofluorobenzene | 50 | 150 | 95 |

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL, #1271**

DSharma

Dimple Sharma
Project Manager

Sequoia Analytical

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| | | | | | |
|---|---|---|---|---|---|
| ARCADIS Geraghty & Miller, Inc. | Client Project ID: | RC000304.8.4, ECI Emeryville | Sampled: | Feb 2, 1999 |
| 1050 Marina Way South | Sample Descript: | Water, MW-14 | Received: | Feb 2, 1999 |
| Richmond, CA 94804 | Analysis Method: | EPA 5030/8010 | Analyzed: | Feb 9, 1999 |
| Attention: S. Brussee | Lab Number: | 902-0301 | Reported: | Feb 16, 1999 |

QC Batch Number: GC020999801006A

Instrument ID: HP-6

## HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 0.50 | N.D. |
| Bromoform | 0.50 | N.D. |
| Bromomethane | 1.0 | N.D. |
| Carbon tetrachloride | 0.50 | N.D. |
| Chlorobenzene | 0.50 | N.D. |
| Chloroethane | 1.0 | N.D. |
| Chloroform | 0.50 | N.D. |
| Chloromethane | 1.0 | N.D. |
| Dibromochloromethane | 0.50 | N.D. |
| 1,3-Dichlorobenzene | 0.50 | N.D. |
| 1,4-Dichlorobenzene | 0.50 | N.D. |
| 1,2-Dichlorobenzene | 0.50 | N.D. |
| 1,1-Dichloroethane | 0.50 | N.D. |
| 1,2-Dichloroethane | 0.50 | N.D. |
| 1,1-Dichloroethene | 0.50 | N.D. |
| cis-1,2-Dichloroethene | 0.50 | 6.0 |
| trans-1,2-Dichloroethene | 0.50 | 7.2 |
| 1,2-Dichloropropane | 0.50 | N.D. |
| cis-1,3-Dichloropropene | 0.50 | N.D. |
| trans-1,3-Dichloropropene | 0.50 | N.D. |
| Methylene chloride | 5.0 | N.D. |
| 1,1,2,2-Tetrachloroethane | 0.50 | N.D. |
| Tetrachloroethene | 0.50 | N.D. |
| 1,1,1-Trichloroethane | 0.50 | N.D. |
| 1,1,2-Trichloroethane | 0.50 | N.D. |
| Trichloroethene | 0.50 | 0.81 |
| Trichlorofluoromethane | 0.50 | N.D. |
| Vinyl chloride | 1.0 | 3.0 |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 111 |
| 4-Bromofluorobenzene | 50 | 150 | 87 |

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL, #1271**

DSharma

Dimple Sharma
Pro

Sequoia Analytical

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ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.8.4, ECI Emeryville
Sample Descript: Water
Analysis for: Hexavalent Chromium **
First Sample #: 902-0294

Sampled: Feb 2, 1999
Received: Feb 2, 1999
Analyzed: Feb 3-4, 1999
Reported: Feb 16, 1999

## LABORATORY ANALYSIS FOR: Hexavalent Chromium **

| Sample Number | Sample Description | Detection Limit mg/L | Sample Result mg/L | QC Batch Number | Instrument ID |
|---|---|---|---|---|---|
| 902-0294 | MW-3A | 0.0050 | N.D. | IN0203997196I3A | INSPC-1 |
| 902-0295 | MW-3B | 0.0050 | 0.095 | IN0203997196I3A | INSPC-1 |
| 902-0296 | MW-5 | 0.0050 | N.D. | IN0204997196I3A | INSPC-1 |
| 902-0297 | MW-9* | 0.050 | N.D. | IN0204997196I3A | INSPC-1 |
| 902-0298 | MW-10 | 0.0050 | N.D. | IN0203997196I3A | INSPC-1 |
| 902-0299 | MW-12* | 0.050 | N.D. | IN0204997196I3A | INSPC-1 |
| 902-0300 | MW-13 | 0.0050 | N.D. | IN0204997196I3A | INSPC-1 |
| 902-0301 | MW-14* | 0.050 | N.D. | IN0204997196I3A | INSPC-1 |

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL, #1271**

Dimple Sharma
Project Manager

Please Note:
* Detection limit was raised due to matrix interference.
** Samples were analyzed past EPA recommended holding time.

Sequoia Analytical

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ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.8.4, ECI Emeryville
Sample Descript: Water
Analysis for: Chromium
First Sample #: 902-0294

Sampled: Feb 2, 1999
Received: Feb 2, 1999
Digested: Feb 3, 1999
Analyzed: Feb 14, 1999
Reported: Feb 16, 1999

## LABORATORY ANALYSIS FOR: Chromium

| Sample Number | Sample Description | Detection Limit mg/L | Sample Result mg/L | QC Batch Number | Instrument ID |
|---|---|---|---|---|---|
| 902-0294 | MW-3A | 0.010 | 0.12 | ME0203992007MDA | MV-3 |
| 902-0295 | MW-3B | 0.010 | 0.27 | ME0203992007MDA | MV-3 |
| 902-0296 | MW-5 | 0.010 | 0.26 | ME0203992007MDA | MV-3 |
| 902-0297 | MW-9 | 0.010 | 3.0 | ME0203992007MDA | MV-3 |
| 902-0298 | MW-10 | 0.010 | 0.077 | ME0203992007MDA | MV-3 |
| 902-0299 | MW-12 | 0.010 | 3.3 | ME0203992007MDA | MV-3 |
| 902-0300 | MW-13 | 0.010 | 0.37 | ME0203992007MDA | MV-3 |
| 902-0301 | MW-14 | 0.010 | 0.48 | ME0203992007MDA | MV-3 |

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL, #1271**

Dimple Sharma
Project Manager

Sequoia Analytical

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ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.8.4, ECI Emeryville
Matrix: Liquid
QC Sample Group: 9020294-301

Reported: Feb 16, 1999

# QUALITY CONTROL DATA REPORT

| Analyte: | 1,1-Dichloro-ethene | Trichloro-ethene | Chloro-benzene | Hexavalent Chromium | Hexavalent Chromium | Chromium |
|---|---|---|---|---|---|---|
| QC Batch#: | GC020999 801006A | GC020999 801006A | GC020999 801006A | IN020399 7196I3A | IN020499 7196I3A | ME020399 2007MDA |
| Analy. Method: | EPA 8010 | EPA 8010 | EPA 8010 | EPA 7196 | EPA 7196 | EPA 200.7 |
| Prep. Method: | EPA 5030 | EPA 5030 | EPA 5030 | EPA 7196 | EPA 7196 | EPA 200.7 |
| Analyst: | P. Kosovskaya | P. Kosovskaya | P. Kosovskaya | K. Anderson | K. Anderson | J. Kelly |
| MS/MSD #: | 9020294 | 9020294 | 9020294 | 9020289 | 9020445 | 9020301 |
| Sample Conc.: | N.D. | N.D. | N.D. | N.D. | N.D. | 0.48 mg/L |
| Prepared Date: | 2/9/99 | 2/9/99 | 2/9/99 | 2/3/99 | 2/4/99 | 2/3/99 |
| Analyzed Date: | 2/9/99 | 2/9/99 | 2/9/99 | 2/3/99 | 2/4/99 | 2/14/99 |
| Instrument I.D.#: | HP-6 | HP-6 | HP-6 | INSPC-1 | INSPC-1 | MV-3 |
| Conc. Spiked: | 20 µg/L | 20 µg/L | 20 µg/L | 0.050 mg/L | 0.050 mg/L | 1.0 mg/L |
| Result: | 18 | 22 | 21 | 0.051 | 0.041 | 1.5 |
| MS % Recovery: | 90 | 110 | 105 | 102 | 82 | 102 |
| Dup. Result: | 17 | 21 | 20 | 0.054 | 0.041 | 1.5 |
| MSD % Recov.: | 85 | 105 | 100 | 108 | 82 | 102 |
| RPD: | 5.7 | 4.7 | 4.9 | 5.7 | 0.0 | 0.0 |
| RPD Limit: | 0-25 | 0-25 | 0-25 | 0-20 | 0-20 | 0-20 |
| LCS #: | LCS020999 | LCS020999 | LCS020999 | LCS020399 | LCS020499 | LCS020399 |
| Prepared Date: | 2/9/99 | 2/9/99 | 2/9/99 | 2/3/99 | 2/4/99 | 2/3/99 |
| Analyzed Date: | 2/9/99 | 2/9/99 | 2/9/99 | 2/3/99 | 2/4/99 | 2/14/99 |
| Instrument I.D.#: | HP-6 | HP-6 | HP-6 | INSPC-1 | INSPC-1 | MV-3 |
| Conc. Spiked: | 20 µg/L | 20 µg/L | 20 µg/L | 0.050 mg/L | 0.050 mg/L | 1.0 mg/L |
| LCS Result: | 16 | 21 | 21 | 0.050 | 0.050 | 1.0 |
| LCS % Recov.: | 80 | 105 | 105 | 100 | 100 | 100 |
| MS/MSD LCS Control Limits | 65-135 | 70-130 | 70-130 | 80-120 | 80-120 | 80-120 |

SEQUOIA ANALYTICAL, #1271

D Sharma

Dimple Sharma
Project Manager

Please Note:
The LCS is a control sample of known, interferent-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

** MS = Matrix Spike, MSD = MS Duplicate, RPD = Relative % Difference

ARCADIS GERAGHTY&MILLER

Laboratory Task Order No./P.O. No. ____

# CHAIN-OF-CUSTODY RECORD



Project Number/Name RC000304.8.4
Project Location ECI Emeryville
Laboratory Sequoia
Project Manager S. Bussee
Sampler(s)/Affiliation DCG/NG

9902066

STD TAT

ANALYSIS / METHOD / SIZE

| Sample ID/Location | Matrix | Date/Time Sampled | Lab ID | 8010 | HEXAVALENT Chrome (7196) | TOTAL CHROME (200.7) | | | | Remarks | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-3A | L | 2/2/99 | | X | X | X | 9020294 A-E | | | | 5 |
| MW-3B | ↓ | ↓ | | X | X | X | 9020295 | | ↓ | | 5 |
| ~~MW-4~~ MW-5 | | | | X | X | X | 9020296 | | | | 5 |
| MW-9 | | | | X | X | X | 9020297 | | | | 5 |
| MW-10 | | | | X | X | X | 9020298 | | | | 5 |
| MW-12 | | | | X | X | X | 9020299 | | | | 5 |
| MW-13 | | | | X | X | X | 9020300 | | | | 5 |
| MW-14 | ↓ | ↓ | | X | X | X | 9020301 | | ↓ | | 5 |

Total No. of Bottles/Containers 40

Sample Matrix: L = Liquid; S = Solid; A = Air

| | | | | |
|---|---|---|---|---|
| Relinquished by: [signature] | Organization: ARCADIS | Date 2/2/99 | Time 1818 | Seal Intact? Yes No N/A |
| Received by: Ronald C. Jensen | Organization: SEQ/WC | Date 2/2/99 | Time 18:18 | |
| Relinquished by: | Organization: | Date / / | Time | Seal Intact? Yes No N/A |
| Received by: | Organization: | Date / / | Time | |

Special Instructions/Remarks:

Delivery Method: ☐ In Person ☐ Common Carrier ____ SPECIFY ☐ Lab Courier ☐ Other ____ SPECIFY

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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342

| | | | |
|---|---|---|---|
| ARCADIS Geraghty & Miller, Inc. | Client Project ID: RC000304.0003, ECI Emeryville | Sampled: | Feb 4, 1999 |
| 050 Marina Way South | Sample Descript: Water, MW-6 | Received: | Feb 4, 1999 |
| Richmond, CA 94804 | Analysis Method: EPA 5030/8010 | Analyzed: | Feb 11, 1999 |
| Attention: S. Brussee | Lab Number: 902-0499 | Reported: | Feb 19, 1999 |

QC Batch Number: GC021199801007A

Instrument ID: HP-7

## HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 5.0 | N.D. |
| Bromoform | 5.0 | N.D. |
| Bromomethane | 10 | N.D. |
| Carbon tetrachloride | 5.0 | N.D. |
| Chlorobenzene | 5.0 | 5.9 |
| Chloroethane | 10 | N.D. |
| Chloroform | 5.0 | N.D. |
| Chloromethane | 10 | N.D. |
| Dibromochloromethane | 5.0 | N.D. |
| 1,3-Dichlorobenzene | 5.0 | N.D. |
| 1,4-Dichlorobenzene | 5.0 | N.D. |
| 1,2-Dichlorobenzene | 5.0 | N.D. |
| 1,1-Dichloroethane | 5.0 | N.D. |
| 1,2-Dichloroethane | 5.0 | N.D. |
| 1,1-Dichloroethene | 5.0 | 21 |
| cis-1,2-Dichloroethene | 5.0 | 5.7 |
| trans-1,2-Dichloroethene | 5.0 | 5.3 |
| 1,2-Dichloropropane | 5.0 | N.D. |
| cis-1,3-Dichloropropene | 5.0 | N.D. |
| trans-1,3-Dichloropropene | 5.0 | N.D. |
| Methylene chloride | 50 | N.D. |
| 1,1,2,2-Tetrachloroethane | 5.0 | N.D. |
| Tetrachloroethene | 5.0 | 10 |
| 1,1,1-Trichloroethane | 5.0 | N.D. |
| 1,1,2-Trichloroethane | 5.0 | N.D. |
| Trichloroethene | 5.0 | 230 |
| Trichlorofluoromethane | 5.0 | N.D. |
| Vinyl chloride | 10 | N.D. |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 79 |
| 4-Bromofluorobenzene | 50 | 150 | 98 |

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

**SEQUOIA ANALYTICAL, #1271**

DSharma

Dimple Sharma
Project Manager

Sequoia Analytical

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ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.0003, ECI Emeryville
Sample Descript: Water, MW-16
Analysis Method: EPA 5030/8010
Lab Number: 902-0500

Sampled: Feb 4, 1999
Received: Feb 4, 1999
Analyzed: Feb 11, 1999
Reported: Feb 19, 1999

QC Batch Number: GC021199801007A
Instrument ID: HP-7

# HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 25 | N.D. |
| Bromoform | 25 | N.D. |
| Bromomethane | 50 | N.D. |
| Carbon tetrachloride | 25 | N.D. |
| Chlorobenzene | 25 | N.D. |
| Chloroethane | 50 | N.D. |
| Chloroform | 25 | N.D. |
| Chloromethane | 50 | N.D. |
| Dibromochloromethane | 25 | N.D. |
| 1,3-Dichlorobenzene | 25 | N.D. |
| 1,4-Dichlorobenzene | 25 | N.D. |
| 1,2-Dichlorobenzene | 25 | N.D. |
| 1,1-Dichloroethane | 25 | N.D. |
| 1,2-Dichloroethane | 25 | N.D. |
| 1,1-Dichloroethene | 25 | 660 |
| cis-1,2-Dichloroethene | 25 | 2,200 |
| trans-1,2-Dichloroethene | 25 | 80 |
| 1,2-Dichloropropane | 25 | N.D. |
| cis-1,3-Dichloropropene | 25 | N.D. |
| trans-1,3-Dichloropropene | 25 | N.D. |
| Methylene chloride | 250 | N.D. |
| 1,1,2,2-Tetrachloroethane | 25 | N.D. |
| Tetrachloroethene | 25 | N.D. |
| 1,1,1-Trichloroethane | 25 | N.D. |
| 1,1,2-Trichloroethane | 25 | N.D. |
| Trichloroethene | 25 | 7,500 |
| Trichlorofluoromethane | 25 | N.D. |
| Vinyl chloride | 50 | 280 |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 43* |
| 4-Bromofluorobenzene | 50 | 150 | 73 |

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

**SEQUOIA ANALYTICAL, #1271**

Please Note:
*Surrogate recovery for Dibromodifluoromethane is below control limit, however the tertiary surrogate, Chloro-2-Fluorobenzene, was with in the control limit at 85%.

DSharma
Dimple Sharma
Project Manager

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ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.0003, ECI Emeryville
Sample Descript: Water, MW-17
Analysis Method: EPA 5030/8010
Lab Number: 902-0501

Sampled: Feb 4, 1999
Received: Feb 4, 1999
Analyzed: Feb 11, 1999
Reported: Feb 19, 1999

QC Batch Number: GC021199801007A
Instrument ID: HP-7

# HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 2.5 | N.D. |
| Bromoform | 2.5 | N.D. |
| Bromomethane | 5.0 | N.D. |
| Carbon tetrachloride | 2.5 | N.D. |
| Chlorobenzene | 2.5 | 11 |
| Chloroethane | 5.0 | N.D. |
| Chloroform | 2.5 | N.D. |
| Chloromethane | 5.0 | N.D. |
| Dibromochloromethane | 2.5 | N.D. |
| 1,3-Dichlorobenzene | 2.5 | N.D. |
| 1,4-Dichlorobenzene | 2.5 | N.D. |
| 1,2-Dichlorobenzene | 2.5 | N.D. |
| 1,1-Dichloroethane | 2.5 | N.D. |
| 1,2-Dichloroethane | 2.5 | N.D. |
| 1,1-Dichloroethene | 2.5 | 21 |
| cis-1,2-Dichloroethene | 2.5 | 21 |
| trans-1,2-Dichloroethene | 2.5 | 4.7 |
| 1,2-Dichloropropane | 2.5 | N.D. |
| cis-1,3-Dichloropropene | 2.5 | N.D. |
| trans-1,3-Dichloropropene | 2.5 | N.D. |
| Methylene chloride | 25 | N.D. |
| 1,1,2,2-Tetrachloroethane | 2.5 | N.D. |
| Tetrachloroethene | 2.5 | 5.2 |
| 1,1,1-Trichloroethane | 2.5 | N.D. |
| 1,1,2-Trichloroethane | 2.5 | N.D. |
| Trichloroethene | 2.5 | 220 |
| Trichlorofluoromethane | 2.5 | N.D. |
| Vinyl chloride | 5.0 | N.D. |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 69 |
| 4-Bromofluorobenzene | 50 | 150 | 113 |

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL, #1271

DSharma
Dimple Sharma
Project Manager

Sequoia Analytical

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| | | | |
|---|---|---|---|
| ARCADIS Geraghty & Miller, Inc. | Client Project ID: RC000304.0003, ECI Emeryville | Sampled: | Feb 4, 1999 |
| 1050 Marina Way South | Sample Descript: Water, MW-18 | Received: | Feb 4, 1999 |
| Richmond, CA 94804 | Analysis Method: EPA 5030/8010 | Analyzed: | Feb 11, 1999 |
| Attention: S. Brussee | Lab Number: 902-0502 | Reported: | Feb 19, 1999 |

QC Batch Number: GC021199801007A
Instrument ID: HP-7

# HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 0.50 | N.D. |
| Bromoform | 0.50 | N.D. |
| Bromomethane | 1.0 | N.D. |
| Carbon tetrachloride | 0.50 | N.D. |
| Chlorobenzene | 0.50 | N.D. |
| Chloroethane | 1.0 | N.D. |
| Chloroform | 0.50 | N.D. |
| Chloromethane | 1.0 | N.D. |
| Dibromochloromethane | 0.50 | N.D. |
| 1,3-Dichlorobenzene | 0.50 | N.D. |
| 1,4-Dichlorobenzene | 0.50 | N.D. |
| 1,2-Dichlorobenzene | 0.50 | N.D. |
| 1,1-Dichloroethane | 0.50 | N.D. |
| 1,2-Dichloroethane | 0.50 | N.D. |
| 1,1-Dichloroethene | 0.50 | 0.92 |
| cis-1,2-Dichloroethene | 0.50 | 2.7 |
| trans-1,2-Dichloroethene | 0.50 | N.D. |
| 1,2-Dichloropropane | 0.50 | N.D. |
| cis-1,3-Dichloropropene | 0.50 | N.D. |
| trans-1,3-Dichloropropene | 0.50 | N.D. |
| Methylene chloride | 5.0 | N.D. |
| 1,1,2,2-Tetrachloroethane | 0.50 | N.D. |
| Tetrachloroethene | 0.50 | N.D. |
| 1,1,1-Trichloroethane | 0.50 | N.D. |
| 1,1,2-Trichloroethane | 0.50 | N.D. |
| Trichloroethene | 0.50 | 18 |
| Trichlorofluoromethane | 0.50 | N.D. |
| Vinyl chloride | 1.0 | N.D. |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 58 |
| 4-Bromofluorobenzene | 50 | 150 | 59 |

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL, #1271

Dimple Sharma
Project Manager

Sequoia Analytical

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ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.0003, ECI Emeryville
Sample Descript: Water, MW-18A
Analysis Method: EPA 5030/8010
Lab Number: 902-0503

Sampled: Feb 4, 1999
Received: Feb 4, 1999
Analyzed: Feb 11, 1999
Reported: Feb 19, 1999

QC Batch Number: GC021199801007A
Instrument ID: HP-7

## HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 2.5 | N.D. |
| Bromoform | 2.5 | N.D. |
| Bromomethane | 5.0 | N.D. |
| Carbon tetrachloride | 2.5 | N.D. |
| Chlorobenzene | 2.5 | N.D. |
| Chloroethane | 5.0 | N.D. |
| Chloroform | 2.5 | N.D. |
| Chloromethane | 5.0 | N.D. |
| Dibromochloromethane | 2.5 | N.D. |
| 1,3-Dichlorobenzene | 2.5 | N.D. |
| 1,4-Dichlorobenzene | 2.5 | N.D. |
| 1,2-Dichlorobenzene | 2.5 | N.D. |
| 1,1-Dichloroethane | 2.5 | N.D. |
| 1,2-Dichloroethane | 2.5 | N.D. |
| 1,1-Dichloroethene | 2.5 | 3.0 |
| cis-1,2-Dichloroethene | 2.5 | 24 |
| trans-1,2-Dichloroethene | 2.5 | 13 |
| 1,2-Dichloropropane | 2.5 | N.D. |
| cis-1,3-Dichloropropene | 2.5 | N.D. |
| trans-1,3-Dichloropropene | 2.5 | N.D. |
| Methylene chloride | 25 | N.D. |
| 1,1,2,2-Tetrachloroethane | 2.5 | N.D. |
| Tetrachloroethene | 2.5 | 7.5 |
| 1,1,1-Trichloroethane | 2.5 | 6.8 |
| 1,1,2-Trichloroethane | 2.5 | N.D. |
| Trichloroethene | 2.5 | 180 |
| Trichlorofluoromethane | 2.5 | N.D. |
| Vinyl chloride | 5.0 | 3.7 |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 69 |
| 4-Bromofluorobenzene | 50 | 150 | 114 |

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

**SEQUOIA ANALYTICAL, #1271**

Dimple Sharma
Project Manager

Sequoia Analytical

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ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.0003, ECI Emeryville
Sample Descript: Water
Analysis for: Chromium
First Sample #: 902-0499

Sampled: Feb 4, 1999
Received: Feb 4, 1999
Digested: Feb 5, 1999
Analyzed: Feb 17, 1999
Reported: Feb 19, 1999

## LABORATORY ANALYSIS FOR: Chromium

| Sample Number | Sample Description | Detection Limit mg/L | Sample Result mg/L | QC Batch Number | Instrument ID |
|---|---|---|---|---|---|
| 902-0499 | MW-6 | 0.010 | 15 | ME0205992007MDA | MV-4 |
| 902-0500 | MW-16 | 0.10 | 92 | ME0205992007MDA | MV-4 |
| 902-0501 | MW-17 | 0.10 | 120 | ME0205992007MDA | MV-4 |
| 902-0502 | MW-18 | 0.010 | N.D. | ME0205992007MDA | MV-4 |
| 902-0503 | MW-18A | 0.020 | 16 | ME0205992007MDA | MV-4 |

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL, #1271**

DSharma
Dimple Sharma
Project Manager

Sequoia Analytical
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ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.0003, ECI Emeryville
Sample Descript: Water
Analysis for: Hexavalent Chromium
First Sample #: 902-0499

Sampled: Feb 4, 1999
Received: Feb 4, 1999
Analyzed: Feb 5, 1999
Reported: Feb 19, 1999

## LABORATORY ANALYSIS FOR: Hexavalent Chromium

| Sample Number | Sample Description | Detection Limit mg/L | Sample Result mg/L | QC Batch Number | Instrument ID |
|---|---|---|---|---|---|
| 902-0499 | MW-6 | 0.0050 | 31 | IN020599719613A | INSPC-1 |
| 902-0500 | MW-16 | 0.0050 | 93 | IN020599719613A | INSPC-1 |
| 902-0501 | MW-17 | 0.0050 | 110 | IN020599719613A | INSPC-1 |
| 902-0502 | MW-18 | 0.0050 | 0.050 | IN020599719613A | INSPC-1 |
| 902-0503 | MW-18A | 0.0050 | 16 | IN020599719613A | INSPC-1 |

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL, #1271**

D Sharma

Dimple Sharma
Project Manager

Sequoia Analytical

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ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.0003, ECI Emeryville
Matrix: Liquid

QC Sample Group: 9020499-503

Reported: Feb 19, 1999

# QUALITY CONTROL DATA REPORT

| Analyte: | 1,1-Dichloro-ethene | Trichloro-ethene | Chloro-benzene | Chromium | Hexavalent Chromium |
|---|---|---|---|---|---|
| QC Batch#: | GC021199 801007A | GC021199 801007A | GC021199 801007A | ME020599 2007MDA | IN020599 719613A |
| Analy. Method: | EPA 8010 | EPA 8010 | EPA 8010 | EPA 200.7 | EPA 7196 |
| Prep. Method: | EPA 5030 | EPA 5030 | EPA 5030 | EPA 200.7 | EPA 7196 |
| Analyst: | P. Kosovskaya | P. Kosovskaya | P. Kosovskaya | J. Kelly | K. Anderson |
| MS/MSD #: | 9020502 | 9020502 | 9020502 | 9020499 | 9020502 |
| Sample Conc.: | N.D. | 18 µg/L | N.D. | 15 mg/L | 0.050 mg/L |
| Prepared Date: | 2/11/99 | 2/11/99 | 2/11/99 | 2/5/99 | 2/5/99 |
| Analyzed Date: | 2/11/99 | 2/11/99 | 2/11/99 | 2/10/99 | 2/5/99 |
| Instrument I.D.#: | HP-7 | HP-7 | HP-7 | MV-4 | INSPC-1 |
| Conc. Spiked: | 20 µg/L | 20 µg/L | 20 µg/L | 0.50 mg/L | 0.10 mg/L |
| Result: | 18 | 44 | 17 | 17 | 0.16 |
| MS % Recovery: | 90 | 130 | 85 | - | 110 |
| Dup. Result: | 17 | 47 | 18 | 18 | 0.15 |
| MSD % Recov.: | 85 | 145 | 90 | - | 100 |
| RPD: | 5.7 | 6.6 | 5.7 | 5.7 | 6.5 |
| RPD Limit: | 0-25 | 0-25 | 0-25 | 0-20 | 0-20 |

| LCS #: | LCS021199 | LCS021199 | LCS021199 | LCS020599 | LCS020599 |
|---|---|---|---|---|---|
| Prepared Date: | 2/11/99 | 2/11/99 | 2/11/99 | 2/5/99 | 2/5/99 |
| Analyzed Date: | 2/11/99 | 2/11/99 | 2/11/99 | 2/17/99 | 2/5/99 |
| Instrument I.D.#: | HP-7 | HP-7 | HP-7 | MV-4 | INSPC-1 |
| Conc. Spiked: | 20 µg/L | 20 µg/L | 20 µg/L | 1.0 mg/L | 0.050 mg/L |
| LCS Result: | 20 | 21 | 18 | 1.2 | 0.051 |
| LCS % Recov.: | 100 | 105 | 90 | 120 | 102 |

| | | | | | |
|---|---|---|---|---|---|
| MS/MSD LCS Control Limits | 65-135 | 70-130 | 70-130 | 80-120 | 80-120 |

SEQUOIA ANALYTICAL, #1271

DSharma
Dimple Sharma
Project Manager

Please Note:
The LCS is a control sample of known, interferent-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

** MS=Matrix Spike, MSD=MS Duplicate, RPD=Relative % Difference

# SEQUOIA ANALYTICAL CHAIN OF CUSTODY


☐ 680 Chesapeake Drive • Redwood City, C... 063... ...0) 3... 600 ... (65... 4-9...
☐ 819 Striker Ave., Suite 8 • Sacramento, CA 95834 • (916) 921-9600 FAX (916) 921-0100
☐ 404 N. Wiget Lane • Walnut Creek, CA 94598 • (925) 988-9600 FAX (925) 988-9673
☐ 1455 McDowell Blvd. North, Suite D • Petaluma, CA 94954 • (707) 792-1865 FAX (707) 792-0342


Company Name: ARCADIS Geraghty + Miller
Mailing Address: 1050 Marina Way South
City: Richmond State: CA Zip Code: 94804
Telephone: FAX #:
Report To: S. Brussee Sampler: DCG

Project Name: RC000304.0003 ECI Emeryville
Billing Address (if different):
P.O. #: 9902118
QC Data: ☐ Level D (Standard) ☐ Level C ☐ Level B ☐ Level A

Turnaround Time: ☑ 10 Working Days ☐ 7 Working Days ☐ 5 Working Days ☐ 3 Working Days ☐ 2 Working Days ☐ 24 Hours ☐ 2 - 8 Hours

☐ Drinking Water ☐ Waste Water ☐ Other

Analyses Requested

| Client Sample I.D. | Date/Time Sampled | Matrix Desc. | # of Cont. | Cont. Type | Sequoia's Sample # | 8010 | HEX Chrome | TOTAL CHROME | | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. MW-6 | 2/4/99 | L | 5 | | 9020499A-E | X | X | X | | | | | | | |
| 2. MW-16 | ↓ | ↓ | ↓ | | 9020500 | X | X | X | | | | | | | |
| 3. MW-17 | ↓ | ↓ | ↓ | | 9020501 | X | X | X | | | | | | | |
| 4. MW-18 | ↓ | ↓ | ↓ | | 9020502 | X | X | X | | | | | | | |
| 5. MW-18A | ↓ | ↓ | ↓ | | 9020503 | X | X | X | | | | | | | |
| 6. | | | | | | | | | | | | | | | |
| 7. | | | | | | | | | | | | | | | |
| 8. | | | | | | | | | | | | | | | |
| 9. | | | | | | | | | | | | | | | |
| 10. | | | | | | | | | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Relinquished By: [signature] | Date: 2/4/99 | Time: 1537 | Received By: | Date: | Time: |
| Relinquished By: | Date: | Time: | Received By: | Date: | Time: |
| Relinquished By: | Date: | Time: | Received By Lab: Ronald C. Jensen | Date: 2/4/99 | Time: 15:37 |

Were Samples Received in Good Condition? ☐ Yes ☐ No Samples on Ice? ☐ Yes ☐ No Method of Shipment______ Page ___ of ___

Pink - Client Yellow - Sequoia White - Sequoia

Sequoia Analytical

680 Chesapeake Drive | Redwood City, CA 94063 | (650) 364-9600 | FAX (650) 364-9233
404 N. Wiget Lane | Walnut Creek, CA 94598 | (925) 988-9600 | FAX (925) 988-9673
819 Striker Avenue, Suite 8 | Sacramento, CA 95834 | (916) 921-9600 | FAX (916) 921-0100
1455 McDowell Blvd. North, Ste. D | Petaluma, CA 94954 | (707) 792-1865 | FAX (707) 792-0342

ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.0008 T5, ECI Emeryville
Sample Descript: Water, MW-1
Analysis Method: EPA 5030/8010
Lab Number: 902-0444

Sampled: Feb 3, 1999
Received: Feb 3, 1999
Analyzed: Feb 11, 1999
Reported: Feb 17, 1999

QC Batch Number: GC021199801006A
Instrument ID: HP-6

# HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 0.50 | N.D. |
| Bromoform | 0.50 | N.D. |
| Bromomethane | 1.0 | N.D. |
| Carbon tetrachloride | 0.50 | N.D. |
| Chlorobenzene | 0.50 | N.D. |
| Chloroethane | 1.0 | N.D. |
| Chloroform | 0.50 | N.D. |
| Chloromethane | 1.0 | N.D. |
| Dibromochloromethane | 0.50 | N.D. |
| 1,3-Dichlorobenzene | 0.50 | N.D. |
| 1,4-Dichlorobenzene | 0.50 | N.D. |
| 1,2-Dichlorobenzene | 0.50 | N.D. |
| 1,1-Dichloroethane | 0.50 | N.D. |
| 1,2-Dichloroethane | 0.50 | N.D. |
| 1,1-Dichloroethene | 0.50 | N.D. |
| cis-1,2-Dichloroethene | 0.50 | N.D. |
| trans-1,2-Dichloroethene | 0.50 | N.D. |
| 1,2-Dichloropropane | 0.50 | N.D. |
| cis-1,3-Dichloropropene | 0.50 | N.D. |
| trans-1,3-Dichloropropene | 0.50 | N.D. |
| Methylene chloride | 5.0 | N.D. |
| 1,1,2,2-Tetrachloroethane | 0.50 | N.D. |
| Tetrachloroethene | 0.50 | N.D. |
| 1,1,1-Trichloroethane | 0.50 | N.D. |
| 1,1,2-Trichloroethane | 0.50 | N.D. |
| Trichloroethene | 0.50 | 38 |
| Trichlorofluoromethane | 0.50 | N.D. |
| Vinyl chloride | 1.0 | N.D. |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 112 |
| 4-Bromofluorobenzene | 50 | 150 | 105 |

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL, #1271**

DSharma
Dimple Sharma
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342

| | | | |
|---|---|---|---|
| ARCADIS Geraghty & Miller, Inc. | Client Project ID: RC000304.0008 T5, ECI Emeryville | Sampled: | Feb 3, 1999 |
| 1050 Marina Way South | Sample Descript: Water, MW-4 | Received: | Feb 3, 1999 |
| Richmond, CA 94804 | Analysis Method: EPA 5030/8010 | Analyzed: | Feb 11, 1999 |
| Attention: S. Brussee | Lab Number: 902-0445 | Reported: | Feb 17, 1999 |

QC Batch Number: GC021199801006A
Instrument ID: HP-6

# HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 0.50 | N.D. |
| Bromoform | 0.50 | N.D. |
| Bromomethane | 1.0 | N.D. |
| Carbon tetrachloride | 0.50 | N.D. |
| Chlorobenzene | 0.50 | N.D. |
| Chloroethane | 1.0 | N.D. |
| Chloroform | 0.50 | N.D. |
| Chloromethane | 1.0 | N.D. |
| Dibromochloromethane | 0.50 | N.D. |
| 1,3-Dichlorobenzene | 0.50 | N.D. |
| 1,4-Dichlorobenzene | 0.50 | 0.54 |
| 1,2-Dichlorobenzene | 0.50 | 3.8 |
| 1,1-Dichloroethane | 0.50 | 1.6 |
| 1,2-Dichloroethane | 0.50 | 0.94 |
| 1,1-Dichloroethene | 0.50 | N.D. |
| cis-1,2-Dichloroethene | 0.50 | 1.5 |
| trans-1,2-Dichloroethene | 0.50 | 34 |
| 1,2-Dichloropropane | 0.50 | N.D. |
| cis-1,3-Dichloropropene | 0.50 | N.D. |
| trans-1,3-Dichloropropene | 0.50 | N.D. |
| Methylene chloride | 5.0 | N.D. |
| 1,1,2,2-Tetrachloroethane | 0.50 | N.D. |
| Tetrachloroethene | 0.50 | N.D. |
| 1,1,1-Trichloroethane | 0.50 | N.D. |
| 1,1,2-Trichloroethane | 0.50 | N.D. |
| Trichloroethene | 0.50 | 0.59 |
| Trichlorofluoromethane | 0.50 | N.D. |
| Vinyl chloride | 1.0 | N.D. |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 120 |
| 4-Bromofluorobenzene | 50 | 150 | 101 |

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL, #1271**

DSharma
Dimple Sharma
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
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1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342

| | | | | |
|---|---|---|---|---|
| ARCADIS Geraghty & Miller, Inc. | Client Project ID: | RC000304.0008 T5, ECI Emeryville | Sampled: | Feb 3, 1999 |
| 1050 Marina Way South | Sample Descript: | Water, MW-20 | Received: | Feb 3, 1999 |
| Richmond, CA 94804 | Analysis Method: | EPA 5030/8010 | Analyzed: | Feb 11, 1999 |
| Attention: S. Brussee | Lab Number: | 902-0446 | Reported: | Feb 17, 1999 |

QC Batch Number: GC021199801006A

Instrument ID: HP-6

# HALOGENATED VOLATILE ORGANICS (EPA 8010)

| Analyte | Detection Limit µg/L | Sample Results µg/L |
|---|---|---|
| Bromodichloromethane | 0.50 | N.D. |
| Bromoform | 0.50 | N.D. |
| Bromomethane | 1.0 | N.D. |
| Carbon tetrachloride | 0.50 | N.D. |
| Chlorobenzene | 0.50 | N.D. |
| Chloroethane | 1.0 | N.D. |
| Chloroform | 0.50 | N.D. |
| Chloromethane | 1.0 | N.D. |
| Dibromochloromethane | 0.50 | N.D. |
| 1,3-Dichlorobenzene | 0.50 | N.D. |
| 1,4-Dichlorobenzene | 0.50 | N.D. |
| 1,2-Dichlorobenzene | 0.50 | N.D. |
| 1,1-Dichloroethane | 0.50 | N.D. |
| 1,2-Dichloroethane | 0.50 | N.D. |
| 1,1-Dichloroethene | 0.50 | N.D. |
| cis-1,2-Dichloroethene | 0.50 | N.D. |
| trans-1,2-Dichloroethene | 0.50 | N.D. |
| 1,2-Dichloropropane | 0.50 | N.D. |
| cis-1,3-Dichloropropene | 0.50 | N.D. |
| trans-1,3-Dichloropropene | 0.50 | N.D. |
| Methylene chloride | 5.0 | 6.8 |
| 1,1,2,2-Tetrachloroethane | 0.50 | N.D. |
| Tetrachloroethene | 0.50 | N.D. |
| 1,1,1-Trichloroethane | 0.50 | N.D. |
| 1,1,2-Trichloroethane | 0.50 | N.D. |
| Trichloroethene | 0.50 | N.D. |
| Trichlorofluoromethane | 0.50 | N.D. |
| Vinyl chloride | 1.0 | N.D. |

| Surrogates | Control Limit % | | % Recovery |
|---|---|---|---|
| Dibromodifluoromethane | 50 | 150 | 105 |
| 4-Bromofluorobenzene | 50 | 150 | 88 |

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL, #1271**

DSharma

Dimple Sharma
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
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1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342

ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.0008 T5, ECI Emeryville
Sample Descript: Water
Analysis for: Chromium
First Sample #: 902-0444

Sampled: Feb 3, 1999
Received: Feb 3, 1999
Digested: Feb 4, 1999
Analyzed: Feb 16, 1999
Reported: Feb 17, 1999

## LABORATORY ANALYSIS FOR: Chromium

| Sample Number | Sample Description | Detection Limit mg/L | Sample Result mg/L | QC Batch Number | Instrument ID |
|---|---|---|---|---|---|
| 902-0444 | MW-1 | 0.010 | N.D. | ME0204992007MDA | MV-4 |
| 902-0445 | MW-4 | 0.010 | N.D. | ME0204992007MDA | MV-4 |
| 902-0446 | MW-20 | 0.010 | N.D. | ME0204992007MDA | MV-4 |

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL, #1271**

DSharma
Dimple Sharma
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792-0342

ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.0008 T5, ECI Emeryville
Sample Descript: Water
Analysis for: Hexavalent Chromium
First Sample #: 902-0444

Sampled: Feb 3, 1999
Received: Feb 3, 1999
Analyzed: Feb 3-4, 1999
Reported: Feb 17, 1999

## LABORATORY ANALYSIS FOR: Hexavalent Chromium

| Sample Number | Sample Description | Detection Limit mg/L | Sample Result mg/L | QC Batch Number | Instrument ID |
|---|---|---|---|---|---|
| 902-0444 | MW-1 | 0.0050 | N.D. | IN0203997196I3A | INSPC-1 |
| 902-0445 | MW-4* | 0.0050 | N.D. | IN0204997196I3A | INSPC-1 |
| 902-0446 | MW-20 | 0.0050 | N.D. | IN0203997196I3A | INSPC-1 |

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL, #1271**

Please Note:
*Sample was analyzed past EPA recommended holding time.

DSharma
Dimple Sharma
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (925) 988-9600, FAX (925) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100
1455 McDowell Blvd. North, Ste. D, Petaluma, CA 94954, (707) 792-1865, FAX (707) 792 0342

ARCADIS Geraghty & Miller, Inc.
1050 Marina Way South
Richmond, CA 94804
Attention: S. Brussee

Client Project ID: RC000304.0008 T5, ECI Emeryville
Matrix: Liquid

QC Sample Group: 9020444-446

Reported: Feb 17, 1999

# QUALITY CONTROL DATA REPORT

| Analyte: | 1,1-Dichloro-ethene | Trichloro-ethene | Chloro-benzene | Hexavalent Chromium | Hexavalent Chromium | Chromium |
|---|---|---|---|---|---|---|
| QC Batch#: | GC021199 801006A | GC021199 801006A | GC021199 801006A | IN020399 7196I3A | IN020499 7196I3A | ME020499 2007MDA |
| Analy. Method: | EPA 8010 | EPA 8010 | EPA 8010 | EPA 7196 | EPA 7196 | EPA 200.7 |
| Prep. Method: | EPA 5030 | EPA 5030 | EPA 5030 | EPA 7196 | EPA 7196 | EPA 200.7 |
| Analyst: | P. Kosovskaya | P. Kosovskaya | P. Kosovskaya | K. Anderson | K. Anderson | J. Kelly |
| MS/MSD #: | 9020446 | 9020446 | 9020446 | 9020289 | 9020445 | 9020444 |
| Sample Conc.: | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. |
| Prepared Date: | 2/11/99 | 2/11/99 | 2/11/99 | 2/3/99 | 2/4/99 | 2/4/99 |
| Analyzed Date: | 2/11/99 | 2/11/99 | 2/11/99 | 2/3/99 | 2/4/99 | 2/16/99 |
| Instrument I.D.#: | HP-6 | HP-6 | HP-6 | INSPC-1 | INSPC-1 | MV-4 |
| Conc. Spiked: | 20 µg/L | 20 µg/L | 20 µg/L | 0.050 mg/L | 0.050 mg/L | 1.0 mg/L |
| Result: | 23 | 26 | 24 | 0.051 | 0.041 | 1.0 |
| MS % Recovery: | 115 | 130 | 120 | 102 | 82 | 100 |
| Dup. Result: | 22 | 25 | 23 | 0.054 | 0.041 | 1.0 |
| MSD % Recov.: | 110 | 125 | 115 | 108 | 82 | 100 |
| RPD: | 4.4 | 3.9 | 4.3 | 5.7 | 0.0 | 0.0 |
| RPD Limit: | 0-25 | 0-25 | 0-25 | 0-20 | 0-20 | 0-20 |
| LCS #: | LCS021199 | LCS021199 | LCS021199 | LCS020399 | LCS020499 | LCS020499 |
| Prepared Date: | 2/11/99 | 2/11/99 | 2/11/99 | 2/3/99 | 2/4/99 | 2/4/99 |
| Analyzed Date: | 2/11/99 | 2/11/99 | 2/11/99 | 2/3/99 | 2/4/99 | 2/16/99 |
| Instrument I.D.#: | HP-6 | HP-6 | HP-6 | INSPC-1 | INSPC-1 | MV-4 |
| Conc. Spiked: | 20 µg/L | 20 µg/L | 20 µg/L | 0.050 mg/L | 0.050 mg/L | 1.0 mg/L |
| LCS Result: | 16 | 21 | 21 | 0.050 | 0.050 | 1.0 |
| LCS % Recov.: | 80 | 105 | 105 | 100 | 100 | 100 |
| MS/MSD LCS Control Limits | 65-135 | 70-130 | 70-130 | 80-120 | 80-120 | 80-120 |

SEQUOIA ANALYTICAL, #1271

Dimple Sharma
Project Manager

Please Note:
The LCS is a control sample of known, interferent-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

** MS=Matrix Spike, MSD=MS Duplicate, RPD=Relative % Difference

ARCADIS GERAGHTY & MILLER

Laboratory Task Order No./P.O. No. ______

CHAIN-OF-CUSTODY RECORD Page 1 of 1

Project Number/Name RC000304.0008 TS

Project Location ECI Emeryville

Laboratory Sequoia

Project Manager S. Brussee

Sampler(s)/Affiliation NG -ARCADIS

9902099

STD TAT

ANALYSIS / METHOD / SIZE

| Sample ID/Location | Matrix | Date/Time Sampled | Lab ID | 8010 | Hexavalent Chrome | Total Chrome | | | | Remarks | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-1 | L | 2/3/99 | | X | X | X | | | | 9020444 AE | 5 |
| MW-4 | " | ↓ | | X | X | X | | | | 9020445 ↓ | 5 |
| MW-20 | ↓ | ↓ | | X | X | X | | | | 9020446 ↓ | 5 |

Total No. of Bottles/Containers 15

Sample Matrix: L = Liquid; S = Solid; A = Air

| | | | | |
|---|---|---|---|---|
| Relinquished by: [signature] | Organization: ARCADIS | Date 2/3/99 | Time 1705 | Seal Intact? Yes No N/A |
| Received by: | Organization: | Date / / | Time | |
| Relinquished by: | Organization: | Date / / | Time | Seal Intact? Yes No N/A |
| Received by: Ronald C. Jensen | Organization: SEQ/WC | Date 2/3/99 | Time 17:05 | |

Special Instructions/Remarks: ______

Delivery Method: ☐ In Person ☐ Common Carrier ______ SPECIFY ☐ Lab Courier ☐ Other ______ SPECIFY

AG 05-0597

United States Environmental Protection Agency | Office of Research and Development | Office of Solid Waste and Emergency Response | EPA/540/S-95/504 April 1996

# EPA Ground Water Issue

## LOW-FLOW (MINIMAL DRAWDOWN) GROUND-WATER SAMPLING PROCEDURES

by Robert W. Puls[1] and Michael J. Barcelona[2]

### Background

The Regional Superfund Ground Water Forum is a group of ground-water scientists, representing EPA's Regional Superfund Offices, organized to exchange information related to ground-water remediation at Superfund sites. One of the major concerns of the Forum is the sampling of ground water to support site assessment and remedial performance monitoring objectives. This paper is intended to provide background information on the development of low-flow sampling procedures and its application under a variety of hydrogeologic settings. It is hoped that the paper will support the production of standard operating procedures for use by EPA Regional personnel and other environmental professionals engaged in ground-water sampling.

For further information contact: Robert Puls, 405-436-8543, Subsurface Remediation and Protection Division, NRMRL, Ada, Oklahoma.

### I. Introduction

The methods and objectives of ground-water sampling to assess water quality have evolved over time. Initially the emphasis was on the assessment of water quality of aquifers as sources of drinking water. Large water-bearing units were identified and sampled in keeping with that objective. These were highly productive aquifers that supplied drinking water via private wells or through public water supply systems. Gradually, with the increasing awareness of subsurface pollution of these water resources, the understanding of complex hydrogeochemical processes which govern the fate and transport of contaminants in the subsurface increased. This increase in understanding was also due to advances in a number of scientific disciplines and improvements in tools used for site characterization and ground-water sampling. Ground-water quality investigations where pollution was detected initially borrowed ideas, methods, and materials for site characterization from the water supply field and water analysis from public health practices. This included the materials and manner in which monitoring wells were installed and the way in which water was brought to the surface, treated, preserved and analyzed. The prevailing conceptual ideas included convenient generalizations of ground-water resources in terms of large and relatively homogeneous hydrologic *units*. With time it became apparent that conventional water supply generalizations of *homogeneity* did not adequately represent field data regarding pollution of these subsurface resources. The important role of *heterogeneity* became increasingly clear not only in geologic terms, but also in terms of complex physical,

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chemical and biological subsurface processes. With greater appreciation of the role of heterogeneity, it became evident that subsurface pollution was ubiquitous and encompassed the unsaturated zone to the deep subsurface and included unconsolidated sediments, fractured rock, and *aquitards* or low-yielding or impermeable formations. Small-scale processes and heterogeneities were shown to be important in identifying contaminant distributions and in controlling water and contaminant flow paths.

It is beyond the scope of this paper to summarize all the advances in the field of ground-water quality investigations and remediation, but two particular issues have bearing on ground-water sampling today: aquifer heterogeneity and colloidal transport. Aquifer heterogeneities affect contaminant flow paths and include variations in geology, geochemistry, hydrology and microbiology. As methods and the tools available for subsurface investigations have become increasingly sophisticated and understanding of the subsurface environment has advanced, there is an awareness that in most cases a primary concern for site investigations is characterization of contaminant flow paths rather than entire aquifers. In fact, in many cases, plume thickness can be less than well screen lengths (e.g., 3-6 m) typically installed at hazardous waste sites to detect and monitor plume movement over time. Small-scale differences have increasingly been shown to be important and there is a general trend toward smaller diameter wells and shorter screens.

The hydrogeochemical significance of colloidal-size particles in subsurface systems has been realized during the past several years (Gschwend and Reynolds, 1987; McCarthy and Zachara, 1989; Puls, 1990; Ryan and Gschwend, 1990). This realization resulted from both field and laboratory studies that showed faster contaminant migration over greater distances and at higher concentrations than flow and transport model predictions would suggest (Buddemeier and Hunt, 1988; Enfield and Bengtsson, 1988; Penrose et al., 1990). Such models typically account for interaction between the mobile aqueous and immobile solid phases, but do not allow for a mobile, reactive solid phase. It is recognition of this third *phase* as a possible means of contaminant transport that has brought increasing attention to the manner in which samples are collected and processed for analysis (Puls et al., 1990; McCarthy and Degueldre, 1993; Backhus et al., 1993; U. S. EPA, 1995). If such a phase is present in sufficient mass, possesses high sorption reactivity, large surface area, and remains stable in suspension, it can serve as an important mechanism to facilitate contaminant transport in many types of subsurface systems.

Colloids are particles that are sufficiently small so that the surface free energy of the particle dominates the bulk free energy. Typically, in ground water, this includes particles with diameters between 1 and 1000 nm. The most commonly observed mobile particles include: secondary clay minerals; hydrous iron, aluminum, and manganese oxides; dissolved and particulate organic materials, and viruses and bacteria. These reactive particles have been shown to be mobile under a variety of conditions in both field studies and laboratory column experiments, and as such need to be included in monitoring programs where identification of the *total* mobile contaminant loading (dissolved + naturally suspended particles) at a site is an objective. To that end, sampling methodologies must be used which do not artificially bias *naturally* suspended particle concentrations.

Currently the most common ground-water purging and sampling methodology is to purge a well using bailers or high speed pumps to remove 3 to 5 casing volumes followed by sample collection. This method can cause adverse impacts on sample quality through collection of samples with high levels of turbidity. This results in the inclusion of otherwise immobile artifactual particles which produce an overestimation of certain analytes of interest (e.g., metals or hydrophobic organic compounds). Numerous documented problems associated with filtration (Danielsson, 1982; Laxen and Chandler, 1982; Horowitz et al., 1992) make this an undesirable method of rectifying the turbidity problem, and include the removal of potentially mobile (contaminant-associated) particles during filtration, thus artificially biasing contaminant concentrations low. Sampling-induced turbidity problems can often be mitigated by using low-flow purging and sampling techniques.

Current subsurface conceptual models have undergone considerable refinement due to the recent development and increased use of field screening tools. So-called hydraulic *push* technologies (e.g., cone penetrometer, Geoprobe®, QED HydroPunch®) enable relatively fast screening site characterization which can then be used to design and install a monitoring well network. Indeed, alternatives to conventional monitoring wells are now being considered for some hydrogeologic settings. The ultimate design of any monitoring system should however be based upon adequate site characterization and be consistent with established monitoring objectives.

If the sampling program objectives include accurate assessment of the magnitude and extent of subsurface contamination over time and/or accurate assessment of subsequent remedial performance, then some information regarding plume delineation in three-dimensional space is necessary prior to monitoring well network design and installation. This can be accomplished with a variety of different tools and equipment ranging from hand-operated augers to screening tools mentioned above and large drilling rigs. Detailed information on ground-water flow velocity, direction, and horizontal and vertical variability are essential baseline data requirements. Detailed soil and geologic data are required prior to and during the installation of sampling points. This includes historical as well as detailed soil and geologic logs which accumulate during the site investigation. The use of borehole geophysical techniques is also recommended. With this information (together with other site characterization data) and a clear understanding of sampling objectives, then appropriate location, screen length, well diameter, slot size, etc. for the monitoring well network can be decided. This is especially critical for new in situ remedial approaches or natural attenuation assessments at hazardous waste sites.

In general, the overall goal of any ground-water sampling program is to collect water samples with no alteration in water chemistry; analytical data thus obtained may be used for a variety of specific monitoring programs depending on the regulatory requirements. The sampling methodology described in this paper assumes that the monitoring goal is to sample monitoring wells for the presence of contaminants and it is applicable whether mobile colloids are a concern or not and whether the analytes of concern are metals (and metalloids) or organic compounds.

## II. Monitoring Objectives and Design Considerations

The following issues are important to consider prior to the design and implementation of any ground-water monitoring program, including those which anticipate using low-flow purging and sampling procedures.

### *A. Data Quality Objectives (DQOs)*

Monitoring objectives include four main types: detection, assessment, corrective-action evaluation and resource evaluation, along with *hybrid* variations such as site-assessments for property transfers and water availability investigations. Monitoring objectives may change as contamination or water quality problems are discovered. However, there are a number of common components of monitoring programs which should be recognized as important regardless of initial objectives. These components include:

1) Development of a conceptual model that incorporates elements of the regional geology to the local geologic framework. The conceptual model development also includes initial site characterization efforts to identify hydrostratigraphic units and likely flow-paths using a minimum number of borings and well completions;

2) Cost-effective and well documented collection of high quality data utilizing simple, accurate, and reproducible techniques; and

3) Refinement of the conceptual model based on supplementary data collection and analysis.

These fundamental components serve many types of monitoring programs and provide a basis for future efforts that evolve in complexity and level of spatial detail as purposes and objectives expand. High quality, reproducible data collection is a common goal regardless of program objectives.

High quality data collection implies data of sufficient accuracy, precision, and completeness (i.e., ratio of valid analytical results to the minimum sample number called for by the program design) to meet the program objectives. Accuracy depends on the correct choice of monitoring tools and procedures to minimize sample and subsurface disturbance from collection to analysis. Precision depends on the repeatability of sampling and analytical protocols. It can be assured or improved by replication of sample analyses including blanks, field/lab standards and reference standards.

### *B. Sample Representativeness*

An important goal of any monitoring program is collection of data that is truly representative of conditions at the site. The term *representativeness* applies to chemical and hydrogeologic data collected via wells, borings, piezometers, geophysical and soil gas measurements, lysimeters, and temporary sampling points. It involves a recognition of the statistical variability of individual subsurface physical properties, and contaminant or major ion concentration levels, while explaining extreme values. Subsurface temporal and spatial variability are facts. Good professional practice seeks to maximize representativeness by using proven accurate and reproducible techniques to define limits on the distribution of measurements collected at a site. However, measures of representativeness are dynamic and are controlled by evolving site characterization and monitoring objectives. An evolutionary site characterization model, as shown in Figure 1, provides a systematic approach to the goal of consistent data collection.

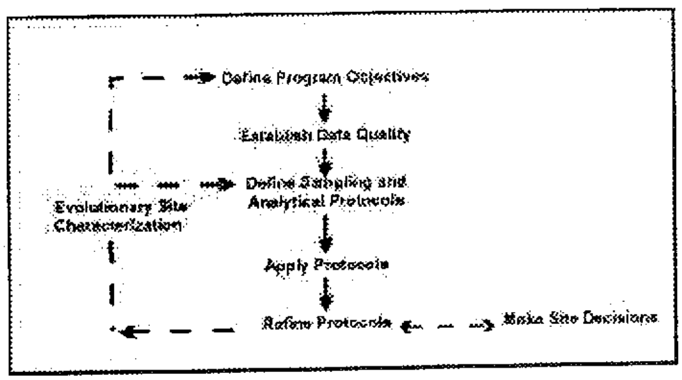


Figure 1. Evolutionary Site Characterization Model

The model emphasizes a recognition of the causes of the variability (e.g., use of inappropriate technology such as using bailers to purge wells; imprecise or operator-dependent methods) and the need to control avoidable errors.

1) Questions of Scale

A sampling plan designed to collect representative samples must take into account the potential scale of changes in site conditions through space and time as well as the chemical associations and behavior of the parameters that are targeted for investigation. In subsurface systems, physical (i.e., aquifer) and chemical properties over time or space are not statistically independent. In fact, samples taken in close proximity (i.e., within distances of a few meters) or within short time periods (i.e., more frequently than monthly) are highly auto-correlated. This means that designs employing high-sampling frequency (e.g., monthly) or dense spatial monitoring designs run the risk of redundant data collection and misleading inferences regarding trends in values that aren't statistically valid. In practice, contaminant detection and assessment monitoring programs rarely suffer these *over-sampling* concerns. In corrective-action evaluation programs, it is also possible that too little data may be collected over space or time. In these cases, false interpretation of the spatial extent of contamination or underestimation of temporal concentration variability may result.

2) Target Parameters

Parameter selection in monitoring program design is most often dictated by the regulatory status of the site. However, background water quality constituents, purging indicator parameters, and contaminants, all represent targets for data collection programs. The tools and procedures used in these programs should be equally rigorous and applicable to all categories of data, since all may be needed to determine or support regulatory action.

### *C. Sampling Point Design and Construction*

Detailed site characterization is central to all decision-making purposes and the basis for this characterization resides in identification of the geologic framework and major hydro-stratigraphic units. Fundamental data for sample point location include: subsurface lithology, head-differences and background geochemical conditions. Each sampling point has a proper use or uses which should be documented at a level which is appropriate for the program's data quality objectives. Individual sampling points may not always be able to fulfill multiple monitoring objectives (e.g., detection, assessment, corrective action).

1) Compatibility with Monitoring Program and Data Quality Objectives

Specifics of sampling point location and design will be dictated by the complexity of subsurface lithology and variability in contaminant and/or geochemical conditions. It should be noted that, regardless of the ground-water sampling approach, few sampling points (e.g., wells, drive-points, screened augers) have zones of influence in excess of a few feet. Therefore, the spatial frequency of sampling points should be carefully selected and designed.

2) Flexibility of Sampling Point Design

In most cases *well-point* diameters in excess of 1 7/8 inches will permit the use of most types of submersible pumping devices for low-flow (minimal drawdown) sampling. It is suggested that *short* (e.g., less than 1.6 m) screens be incorporated into the monitoring design where possible so that comparable results from one device to another might be expected. *Short*, of course, is relative to the degree of vertical water quality variability expected at a site.

3) Equilibration of Sampling Point

Time should be allowed for equilibration of the well or sampling point with the formation after installation. Placement of well or sampling points in the subsurface produces some disturbance of ambient conditions. Drilling techniques (e.g., auger, rotary, etc.) are generally considered to cause more disturbance than *direct-push* technologies. In either case, there may be a period (i.e., days to months) during which water quality near the point may be distinctly different from that in the formation. Proper development of the sampling point and adjacent formation to remove fines created during emplacement will shorten this water quality *recovery* period.

## III. Definition of Low-Flow Purging and Sampling

It is generally accepted that water in the well casing is non-representative of the formation water and needs to be purged prior to collection of ground-water samples. However, the water in the screened interval may indeed be representative of the formation, depending upon well construction and site hydrogeology. Wells are purged to some extent for the following reasons: the presence of the air interface at the top of the water column resulting in an oxygen concentration gradient with depth, loss of volatiles up the water column, leaching from or sorption to the casing or filter pack, chemical changes due to clay seals or backfill, and surface infiltration.

Low-flow purging, whether using portable or dedicated systems, should be done using pump-intake located in the middle or slightly above the middle of the screened interval. Placement of the pump too close to the bottom of the well will cause increased entrainment of solids which have collected in the well over time. These particles are present as a result of well development, prior purging and sampling events, and natural colloidal transport and deposition. Therefore, placement of the pump in the middle or toward the top of the screened interval is suggested. Placement of the pump at the top of the water column for sampling is only recommended in unconfined aquifers, screened across the water table, where this is the desired sampling point. Low-flow purging has the advantage of minimizing mixing between the overlying stagnant casing water and water within the screened interval.

### A. *Low-Flow Purging and Sampling*

Low-flow refers to the velocity with which water enters the pump intake and that is imparted to the formation pore water in the immediate vicinity of the well screen. It does not necessarily refer to the flow rate of water discharged at the surface which can be affected by flow regulators or restrictions. Water level drawdown provides the best indication of the stress imparted by a given flow-rate for a given hydrological situation. The objective is to pump in a manner that minimizes stress (drawdown) to the system to the extent practical taking into account established site sampling objectives. Typically, flow rates on the order of 0.1 - 0.5 L/min are used, however this is dependent on site-specific hydrogeology. Some extremely coarse-textured formations have been successfully sampled in this manner at flow rates to 1 L/min. The effectiveness of using low-flow purging is intimately linked with proper screen location, screen length, and well construction and development techniques. The reestablishment of natural flow paths in both the vertical and horizontal directions is important for correct interpretation of the data. For high resolution sampling needs, screens less than 1 m should be used. Most of the need for purging has been found to be due to passing the sampling device through the overlying casing water which causes mixing of these stagnant waters and the dynamic waters within the screened interval. Additionally, there is disturbance to suspended sediment collected in the bottom of the casing and the displacement of water out into the formation immediately adjacent to the well screen. These disturbances and impacts can be avoided using dedicated sampling equipment, which precludes the need to insert the sampling device prior to purging and sampling.

Isolation of the screened interval water from the overlying stagnant casing water may be accomplished using low-flow minimal drawdown techniques. If the pump intake is located within the screened interval, most of the water pumped will be drawn in directly from the formation with little mixing of casing water or disturbance to the sampling zone. However, if the wells are not constructed and developed properly, zones other than those intended may be sampled. At some sites where geologic heterogeneities are sufficiently different within the screened interval, higher conductivity zones may be preferentially sampled. This is another reason to use shorter screened intervals, especially where high spatial resolution is a sampling objective.

### B. *Water Quality Indicator Parameters*

It is recommended that water quality indicator parameters be used to determine purging needs prior to sample collection in each well. Stabilization of parameters such as pH, specific conductance, dissolved oxygen, oxidation-reduction potential, temperature and turbidity should be used to determine when formation water is accessed during purging. In general, the order of stabilization is pH, temperature, and specific conductance, followed by oxidation-reduction potential, dissolved oxygen and turbidity. Temperature and pH, while commonly used as purging indicators, are actually quite insensitive in distinguishing between formation water and stagnant casing water; nevertheless, these are important parameters for data interpretation purposes and should also be measured. Performance criteria for determination of stabilization should be based on water-level drawdown, pumping rate and equipment specifications for measuring indicator parameters. Instruments are available which utilize in-line flow cells to continuously measure the above parameters.

It is important to establish specific well stabilization criteria and then consistently follow the same methods thereafter, particularly with respect to drawdown, flow rate and sampling device. Generally, the time or purge volume required for parameter stabilization is independent of well depth or well volumes. Dependent variables are well diameter, sampling device, hydrogeochemistry, pump flow rate, and whether the devices are used in a portable or dedicated manner. If the sampling device is already in place (i.e., dedicated sampling systems), then the time and purge volume needed for stabilization is much shorter. Other advantages of dedicated equipment include less purge water for waste disposal, much less decontamination of equipment, less time spent in preparation of sampling as well as time in the field, and more consistency in the sampling approach which probably will translate into less variability in sampling results. The use of dedicated equipment is strongly recommended at wells which will undergo routine sampling over time.

If parameter stabilization criteria are too stringent, then minor oscillations in indicator parameters may cause purging operations to become unnecessarily protracted. It should also be noted that turbidity is a very conservative parameter in terms of stabilization. Turbidity is always the last parameter to stabilize. Excessive purge times are invariably related to the establishment of too stringent turbidity stabilization criteria. It should be noted that natural turbidity levels in ground water may exceed 10 nephelometric turbidity units (NTU).

### C. *Advantages and Disadvantages of Low-Flow (Minimum Drawdown) Purging*

In general, the advantages of low-flow purging include:

- samples which are representative of the *mobile* load of contaminants present (dissolved and colloid-associated);
- minimal disturbance of the sampling point thereby minimizing sampling artifacts;
- less operator variability, greater operator control;

- reduced stress on the formation (minimal drawdown);
- less mixing of stagnant casing water with formation water;
- reduced need for filtration and, therefore, less time required for sampling;
- smaller purging volume which decreases waste disposal costs and sampling time;
- better sample consistency; reduced artificial sample variability.

Some disadvantages of low-flow purging are:

- higher initial capital costs,
- greater set-up time in the field,
- need to transport additional equipment to and from the site,
- increased training needs,
- resistance to change on the part of sampling practitioners,
- concern that new data will indicate a *change in conditions* and trigger an *action.*

## IV. Low-Flow (Minimal Drawdown) Sampling Protocols

The following ground-water sampling procedure has evolved over many years of experience in ground-water sampling for organic and inorganic compound determinations and as such summarizes the authors' (and others) experiences to date (Barcelona et al., 1984, 1994; Barcelona and Helfrich, 1986; Puls and Barcelona, 1989; Puls et. al. 1990, 1992; Puls and Powell, 1992; Puls and Paul, 1995). High-quality chemical data collection is essential in ground-water monitoring and site characterization. The primary limitations to the collection of *representative* ground-water samples include: mixing of the stagnant casing and *fresh* screen waters during insertion of the sampling device or ground-water level measurement device; disturbance and resuspension of settled solids at the bottom of the well when using high pumping rates or raising and lowering a pump or bailer; introduction of atmospheric gases or degassing from the water during sample handling and transfer, or inappropriate use of vacuum sampling device, etc.

### *A. Sampling Recommendations*

Water samples should not be taken immediately following well development. Sufficient time should be allowed for the ground-water flow regime in the vicinity of the monitoring well to stabilize and to approach chemical equilibrium with the well construction materials. This lag time will depend on site conditions and methods of installation but often exceeds one week.

Well purging is nearly always necessary to obtain samples of water flowing through the geologic formations in the screened interval. Rather than using a general but arbitrary guideline of purging three casing volumes prior to sampling, it is recommended that an in-line water quality measurement device (e.g., flow-through cell) be used to establish the stabilization time for several parameters (e.g. , pH, specific conductance, redox, dissolved oxygen, turbidity) on a well-specific basis. Data on pumping rate, drawdown, and volume required for parameter stabilization can be used as a guide for conducting subsequent sampling activities.

The following are recommendations to be considered before, during and after sampling:

- use low-flow rates (<0.5 L/min), during both purging and sampling to maintain minimal drawdown in the well;
- maximize tubing wall thickness, minimize tubing length;
- place the sampling device intake at the desired sampling point;
- minimize disturbances of the stagnant water column above the screened interval during water level measurement and sampling device insertion;
- make proper adjustments to stabilize the flow rate as soon as possible;
- monitor water quality indicators during purging;
- collect unfiltered samples to estimate contaminant loading and transport potential in the subsurface system.

### *B. Equipment Calibration*

Prior to sampling, all sampling device and monitoring equipment should be calibrated according to manufacturer's recommendations and the site Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP). Calibration of pH should be performed with at least two buffers which bracket the expected range. Dissolved oxygen calibration must be corrected for local barometric pressure readings and elevation.

### *C. Water Level Measurement and Monitoring*

It is recommended that a device be used which will least disturb the water surface in the casing. Well depth should be obtained from the well logs. Measuring to the bottom of the well casing will only cause resuspension of settled solids from the formation and require longer purging times for turbidity equilibration. Measure well depth after sampling is completed. The water level measurement should be taken from a permanent reference point which is surveyed relative to ground elevation.

### *D. Pump Type*

The use of low-flow (e.g., 0.1-0.5 L/min) pumps is suggested for purging and sampling all types of analytes. All pumps have some limitation and these should be investigated with respect to application at a particular site. Bailers are inappropriate devices for low-flow sampling.

1) General Considerations

There are no unusual requirements for ground-water sampling devices when using low-flow, minimal drawdown techniques. The major concern is that the device give consistent results and minimal disturbance of the sample across a range of *low* flow rates (i.e., < 0.5 L/min). Clearly, pumping rates that cause minimal to no drawdown in one well could easily cause *significant* drawdown in another well finished in a less transmissive formation. In this sense, the pump should not cause undue pressure or temperature changes or physical disturbance on the water sample over a reasonable sampling range. Consistency in operation is critical to meet accuracy and precision goals.

2) Advantages and Disadvantages of Sampling Devices

A variety of sampling devices are available for low-flow (minimal drawdown) purging and sampling and include peristaltic pumps, bladder pumps, electrical submersible pumps, and gas-driven pumps. Devices which lend themselves to both dedication and consistent operation at definable low-flow rates are preferred. It is desirable that the pump be easily adjustable and operate reliably at these lower flow rates. The peristaltic pump is limited to shallow applications and can cause degassing resulting in alteration of pH, alkalinity, and some volatiles loss. Gas-driven pumps should be of a type that does not allow the gas to be in direct contact with the sampled fluid.

Clearly, bailers and other *grab* type samplers are ill-suited for low-flow sampling since they will cause repeated disturbance and mixing of *stagnant* water in the casing and the *dynamic* water in the screened interval. Similarly, the use of inertial lift foot-valve type samplers may cause too much disturbance at the point of sampling. Use of these devices also tends to introduce uncontrolled and unacceptable operator variability.

Summaries of advantages and disadvantages of various sampling devices are listed in Herzog et al. (1991), U. S. EPA (1992), Parker (1994) and Thurnblad (1994).

## E. Pump Installation

Dedicated sampling devices (left in the well) capable of pumping and sampling are preferred over <u>any</u> other type of device. Any portable sampling device should be slowly and carefully lowered to the middle of the screened interval or slightly above the middle (e.g., 1-1.5 m below the top of a 3 m screen). This is to minimize excessive mixing of the stagnant water in the casing above the screen with the screened interval zone water, and to minimize resuspension of solids which will have collected at the bottom of the well. These two disturbance effects have been shown to directly affect the time required for purging. There also appears to be a direct correlation between size of portable sampling devices relative to the well bore and resulting purge volumes and times. The key is to minimize disturbance of water and solids in the well casing.

## F. Filtration

Decisions to filter samples should be dictated by sampling objectives rather than as a *fix* for poor sampling practices, and field-filtering of certain constituents should not be the default. Consideration should be given as to what the application of field-filtration is trying to accomplish. For assessment of truly dissolved (as opposed to operationally *dissolved* [i.e., samples filtered with 0.45 μm filters]) concentrations of major ions and trace metals, 0.1 μm filters are recommended although 0.45 μm filters are normally used for most regulatory programs. Alkalinity samples must also be filtered if significant particulate calcium carbonate is suspected, since this material is likely to impact alkalinity titration results (although filtration itself may alter the $CO_2$ composition of the sample and, therefore, affect the results).

Although filtration may be appropriate, filtration of a sample may cause a number of unintended changes to occur (e.g. oxidation, aeration) possibly leading to filtration-induced artifacts during sample analysis and uncertainty in the results. Some of these unintended changes may be unavoidable but the factors leading to them must be recognized. Deleterious effects can be minimized by consistent application of certain filtration guidelines. Guidelines should address selection of filter type, media, pore size, etc. in order to identify and minimize potential sources of uncertainty when filtering samples.

In-line filtration is recommended because it provides better consistency through less sample handling, and minimizes sample exposure to the atmosphere. In-line filters are available in both disposable (barrel filters) and non-disposable (in-line filter holder, flat membrane filters) formats and various filter pore sizes (0.1-5.0 μm). Disposable filter cartridges have the advantage of greater sediment handling capacity when compared to traditional membrane filters. Filters must be pre-rinsed following manufacturer's recommendations. If there are no recommendations for rinsing, pass through a minimum of 1 L of ground water following purging and prior to sampling. Once filtration has begun, a filter cake may develop as particles larger than the pore size accumulate on the filter membrane. The result is that the effective pore diameter of the membrane is reduced and particles smaller than the stated pore size are excluded from the filtrate. Possible corrective measures include prefiltering (with larger pore size filters), minimizing particle loads to begin with, and reducing sample volume.

## G. Monitoring of Water Level and Water Quality Indicator Parameters

Check water level periodically to monitor drawdown in the well as a guide to flow rate adjustment. The goal is minimal drawdown (<0.1 m) during purging. This goal may be difficult to achieve under some circumstances due to geologic heterogeneities within the screened interval, and may require adjustment based on site-specific conditions and personal experience. In-line water quality indicator parameters should be continuously monitored during purging. The water quality indicator parameters monitored can include pH, redox potential, conductivity, dissolved oxygen (DO) and turbidity. The last three parameters are often most sensitive. Pumping rate, drawdown, and the time or volume required to obtain stabilization of parameter readings can be used as a future guide to purge the well. Measurements should be taken every three to five minutes if the above suggested rates are used. Stabilization is achieved after all parameters have stabilized for three successive readings. In lieu of measuring all five parameters, a minimum subset would include pH, conductivity, and turbidity or DO. Three successive readings should be within ± 0.1 for pH, ± 3% for conductivity, ± 10 mv for redox potential, and ± 10% for turbidity and DO. Stabilized purge indicator parameter trends are generally obvious and follow either an exponential or asymptotic change to stable values during purging. Dissolved oxygen and turbidity usually require the longest time for stabilization. The above stabilization guidelines are provided for rough estimates based on experience.

### *H. Sampling, Sample Containers, Preservation and Decontamination*

Upon parameter stabilization, sampling can be initiated. If an in-line device is used to monitor water quality parameters, it should be disconnected or bypassed during sample collection. Sampling flow rate may remain at established purge rate or may be adjusted slightly to minimize aeration, bubble formation, turbulent filling of sample bottles, or loss of volatiles due to extended residence time in tubing. Typically, flow rates less than 0.5 L/min are appropriate. The same device should be used for sampling as was used for purging. Sampling should occur in a progression from least to most contaminated well, if this is known. Generally, volatile (e.g., solvents and fuel constituents) and gas sensitive (e.g., $Fe^{2+}$, $CH_4$, $H_2S/HS^-$, alkalinity) parameters should be sampled first. The sequence in which samples for most inorganic parameters are collected is immaterial unless filtered (dissolved) samples are desired. Filtering should be done last and in-line filters should be used as discussed above. During both well purging and sampling, proper protective clothing and equipment must be used based upon the type and level of contaminants present.

The appropriate sample container will be prepared in advance of actual sample collection for the analytes of interest and include sample preservative where necessary. Water samples should be collected directly into this container from the pump tubing.

Immediately after a sample bottle has been filled, it must be preserved as specified in the site (QAPP). Sample preservation requirements are based on the analyses being performed (use site QAPP, FSP, RCRA guidance document [U. S. EPA, 1992] or EPA SW-846 [U. S. EPA, 1982] ). It may be advisable to add preservatives to sample bottles in a controlled setting prior to entering the field in order to reduce the chances of improperly preserving sample bottles or introducing field contaminants into a sample bottle while adding the preservatives.

The preservatives should be transferred from the chemical bottle to the sample container using a disposable polyethylene pipet and the disposable pipet should be used only once and then discarded.

After a sample container has been filled with ground water, a Teflon™ (or tin)-lined cap is screwed on tightly to prevent the container from leaking. A sample label is filled out as specified in the FSP. The samples should be stored inverted at 4°C.

Specific decontamination protocols for sampling devices are dependent to some extent on the type of device used and the type of contaminants encountered. Refer to the site QAPP and FSP for specific requirements.

### I. Blanks

The following blanks should be collected:

(1) field blank: one field blank should be collected from each source water (distilled/deionized water) used for sampling equipment decontamination or for assisting well development procedures.

(2) equipment blank: one equipment blank should be taken prior to the commencement of field work, from each set of sampling equipment to be used for that day. Refer to site QAPP or FSP for specific requirements.

(3) trip blank: a trip blank is required to accompany each volatile sample shipment. These blanks are prepared in the laboratory by filling a 40-mL volatile organic analysis (VOA) bottle with distilled/deionized water.

## V. Low-Permeability Formations and Fractured Rock

The overall sampling program goals or sampling objectives will drive how the sampling points are located, installed, and choice of sampling device. Likewise, site-specific hydrogeologic factors will affect these decisions. Sites with very low permeability formations or fractures causing discrete flow channels may require a unique monitoring approach. Unlike water supply wells, wells installed for ground-water quality assessment and restoration programs are often installed in low water-yielding settings (e.g., clays, silts). Alternative types of sampling points and sampling methods are often needed in these types of environments, because low-permeability settings may require extremely low-flow purging (<0.1 L/min) and may be technology-limited. Where devices are not readily available to pump at such low flow rates, the primary consideration is to avoid dewatering of the well screen. This may require repeated recovery of the water during purging while leaving the pump in place within the well screen.

Use of low-flow techniques may be impractical in these settings, depending upon the water recharge rates. The sampler and the end-user of data collected from such wells need to understand the limitations of the data collected; i.e., a strong potential for underestimation of actual contaminant concentrations for volatile organics, potential false negatives for filtered metals and potential false positives for unfiltered metals. It is suggested that comparisons be made between samples recovered using low-flow purging techniques and samples recovered using passive sampling techniques (i.e., two sets of samples). Passive sample collection would essentially entail acquisition of the sample with no or very little purging using a dedicated sampling system installed within the screened interval or a passive sample collection device.

### *A. Low-Permeability Formations (<0.1 L/min recharge)*

#### 1. Low-Flow Purging and Sampling with Pumps

a. "portable or non-dedicated mode" - Lower the pump (one capable of pumping at <0.1 L/min) to mid-screen or slightly above and set in place for minimum of 48 hours (to lessen purge volume requirements). After 48 hours, use procedures listed in Part IV above regarding monitoring water quality parameters for stabilization, etc., but do not dewater the screen. If excessive drawdown and slow recovery is a problem, then alternate approaches such as those listed below may be better.

b. "dedicated mode" - Set the pump as above at least a week prior to sampling; that is, operate in a dedicated pump mode. With this approach significant reductions in purge volume should be realized. Water quality parameters should stabilize quite rapidly due to less disturbance of the sampling zone.

#### 2. Passive Sample Collection

Passive sampling collection requires insertion of the device into the screened interval for a sufficient time period to allow flow and sample equilibration before extraction for analysis. Conceptually, the extraction of water from low yielding formations seems more akin to the collection of water from the unsaturated zone and passive sampling techniques may be more appropriate in terms of obtaining "representative" samples. Satisfying usual sample volume requirements is typically a problem with this approach and some latitude will be needed on the part of regulatory entities to achieve sampling objectives.

### *B. Fractured Rock*

In fractured rock formations, a low-flow to zero purging approach using pumps in conjunction with packers to isolate the sampling zone in the borehole is suggested. Passive multi-layer sampling devices may also provide the most "representative" samples. It is imperative in these settings to identify flow paths or water-producing fractures prior to sampling using tools such as borehole flowmeters and/or other geophysical tools.

After identification of water-bearing fractures, install packer(s) and pump assembly for sample collection using low-flow sampling in "dedicated mode" or use a passive sampling device which can isolate the identified water-bearing fractures.

## VI. Documentation

The usual practices for documenting the sampling event should be used for low-flow purging and sampling techniques. This should include, at a minimum: information on the conduct of purging operations (flow-rate, drawdown, water-quality parameter values, volumes extracted and times for measurements), field instrument calibration data, water sampling forms and chain of custody forms. See Figures 2 and 3 and "Ground Water Sampling Workshop -- A Workshop Summary" (U. S. EPA, 1995) for example forms and other documentation suggestions and information. This information coupled with laboratory analytical data and validation data are needed to judge the "useability" of the sampling data.

## VII. Notice

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Figure 2. **Ground Water Sampling Log**

**Project** ______________ **Site** ______________ **Well No.** ______________ **Date** ______________

**Well Depth** ______________ **Screen Length** ______________ **Well Diameter** ______________ **Casing Type** ______________

**Sampling Device** ______________ **Tubing type** ______________ **Water Level** ______________

**Measuring Point** ______________ **Other Infor** ______________

**Sampling Personnel** ______________

| Time | pH | Temp | Cond. | Dis.$O_2$ | Turb. | [ ]Conc | | | Notes |
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**Type of Samples Collected**

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**Information: 2 in = 617 ml/ft, 4 in = 2470 ml/ft:** $Vol_{cyl} = \pi r^2 h$, $Vol_{sphere} = 4/3\pi\ r^3$

Figure 3. **Ground Water Sampling Log** (with automatic data logging for most water quality parameters)

**Project** ______________ **Site** ______________ **Well No.** ____________ **Date** ____________________
**Well Depth** ____________ **Screen Length** _________ **Well Diameter** ________ **Casing Type** __________
**Sampling Device** ______________ **Tubing type** ____________________ **Water Level** ________________
**Measuring Point** __________________ **Other Infor** ______________________________________________

**Sampling Personnel** ______________________________________________________________________

| Time | Pump Rate | Turbidity | Alkalinity | [ ] Conc | Notes |
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**Type of Samples Collected**

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**Information: 2 in = 617 ml/ft, 4 in = 2470 ml/ft:** $Vol_{cyl} = \pi r^2 h$, $Vol_{sphere} = 4/3\pi\, r^3$