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**DEPARTMENT OF THE NAVY**  
**Mr. Greg Lorton, Remedial Project Manager**  
**Engineering Field Division, Southwest**  
**Naval Facilities Engineering Command**  
**San Diego, California**

**VOLUME 1 OF 3**  
**DATA SUMMARY REPORT**  
**SUPPLEMENTAL REMEDIAL INVESTIGATION**  
**DATA GAP SAMPLING FOR**  
**OPERABLE UNITS 1 AND 2**

**ALAMEDA POINT**  
**ALAMEDA, CALIFORNIA**

**DS.0385.15645**  
**July 25, 2002**

**Prepared By**

**TETRA TECH EM INC.**  
**10670 White Rock Road, Suite 100**  
**Rancho Cordova, California 95670**  
**(916) 853-4500**

---

**Neal Hutchison, Project Manager**



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Southwest Division
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## ABBREVIATIONS AND ACRONYMS

BTEX	Benzene, toluene, ethylbenzene, and xylenes
bgs	Below ground surface
BSU	Bay Sediment Unit
CAA	Corrective action area
CAP	Corrective action plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action Navy
COC	Chemicals of concern
Cr (III)	Trivalent chromium
Cr (VI)	Hexavalent chromium
DNAPL	Dense, nonaqueous-phase liquid
DQO	Data quality objective
EBS	Environmental baseline survey
EPA	U.S. Environmental Protection Agency
ERV	Environmental reference value
FLCAA	Flight line corrective action area
FS	Feasibility study
FSP	Field sampling plan
FTA	Fire Training Area
IDW	Investigation-derived waste
IWTP	Industrial waste treatment plant
LNAPL	Light, nonaqueous-phase liquid
MCL	Maximum Contaminant Level
NAPL	Nonaqueous-phase liquid
Navy	U.S. Department of the Navy
OU	Operable unit
PCB	Polychlorinated biphenyl
PDB	Passive diffusion bag
PRG	Preliminary Remediation Goal
QAPP	Quality assurance project plan
RI	Remedial investigation
RI/FS	Remedial investigation/feasibility study
RNS	Ribbon NAPL sampler

## ABBREVIATIONS AND ACRONYMS (Continued)

SVOC	Semivolatile organic compound
TEPH	Total extractable petroleum hydrocarbons
TPH	Total petroleum hydrocarbons
TPPH	Total purgeable petroleum hydrocarbons
TiEMI	Tetra Tech EM Inc.
UST	Underground storage tank
VOC	Volatile organic compound

## 1.0 INTRODUCTION

This supplemental remedial investigation (RI) data summary report was prepared under Contract Task Order 385 issued to Tetra Tech EM Inc. (TtEMI) by the U.S. Department of the Navy (Navy), Naval Facilities Engineering Command, Engineering Field Division, Southwest under Comprehensive Long-term Environmental Action Navy (CLEAN) II Contract No. N62474-94-D-7609. The data presented in this report were collected for the purposes of filling data gaps in the RI/feasibility study (RI/FS) for Operable Unit (OU)-1 and OU-2 at Alameda Point, in Alameda County, California. Data were collected in accordance with the field sampling plan (FSP) and accompanying quality assurance project plan (QAPP) for this project (TtEMI 2001a). Supplemental RI sampling was performed at Alameda Point between May 1 and November 15, 2001.

### 1.1 BACKGROUND

The Navy is conducting an RI/FS for 29 sites at Alameda Point under the Installation Restoration Program in conformance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Alameda Point is located on the northwestern side of Alameda Island, which is located on the eastern shore of San Francisco Bay, adjacent to the City of Oakland, California (see Figure 1.1-1).

Data gaps were identified during regulatory review of the draft feasibility study (FS) report for OU-1, dated April 8, 1999 (TtEMI 1999a) and the draft RI report for OU-2, dated June 29, 1999 (TtEMI 1999b). Evaluation of remedial alternatives in the draft OU-1 FS report revealed data gaps in three of the OU-1 sites. Review of the data collected for the OU-2 RI revealed data gaps in various areas throughout the OU-2 sites. CERCLA sites and corresponding OUs are shown in Figure 1.1-2.

Several data gap categories were identified that fall into one of the following groups:

- (1) Data gaps identified in regulatory agency comments on the Draft OU-1 FS and Draft OU-2 RI reports
- (2) Sources recommended by the environmental baseline survey (EBS) program for additional sampling under the Installation Restoration Program
- (3) Data gaps for non time-critical removal actions proposed by the Navy for soil and groundwater contamination, including possible nonaqueous-phase liquid (NAPL) at OU-1 and OU-2 sites

- (4) Groundwater contaminant plumes at several sites that have not been sufficiently delineated because of inadequate monitoring points for evaluating groundwater quality and changes in depths to groundwater over time

Data collected during this project will be used to support completion of the Alameda Point CERCLA process including (1) performing removal actions, (2) preparing and implementing corrective action plans (CAP), (3) completing RI/FSs, and (4) preparing remedial action plans and records of decision; thus facilitating transfer of Alameda Point property to the City of Alameda.

Several additional data gap categories were identified after the finalization of the FSP/QAPP. These additional data gaps are described in Addenda A through D of the Supplemental RI FSP/QAPP (TtEMI 2001b, c, d, and 2002a), as follows:

- (1) Collection of soil and groundwater data in support of the underground storage tank (UST)/total petroleum hydrocarbon (TPH) program (Addenda A, C, and D)
- (2) Determination of geotechnical parameters at sites where non time-critical removal actions are planned (Addendum B)
- (3) Soil and groundwater characterization at EBS sites (Addenda A and D)
- (4) Additional soil and groundwater characterization at various CERCLA sites (Addendum D)

A portion of the data collected as part of these addenda are not included in this report for various reasons.

The following list describes those data that are not included in this report:

- TPH data collected under Addenda A and C that are not applicable to the CERCLA RI/FS investigation. These data have been forwarded to the data users working on the UST closure program.
- Data relating to geotechnical parameters collected under Addendum B. These data have been forwarded to the Navy's remedial action contractor for use in selection of remedial action alternatives. However, raw data, such as cone penetrometer test data, have been included in the appendices.
- Data relating to EBS sites collected under Addenda A and D. These data have been forwarded to the data users working on the EBS parcel transfer program. However, VOC groundwater data for EBS Parcel 8 are presented in plume delineation figures in this report.

## 1.2 GENERAL DESCRIPTION OF DATA GAPS AND SAMPLING PERFORMED TO MEET DATA QUALITY OBJECTIVES

The purpose of the supplemental RI investigation was to obtain information necessary to address data gap categories described in Section 1.1. General descriptions of each data gap and the sampling performed to meet the project data quality objectives (DQO) are provided below. These descriptions generally apply to more than one site. The DQOs are summarized in OU-specific tables presented in Appendix A (these tables are reprinted from the QAPP). Screening criteria used as a basis for in-field decision making and in determining the decision rules for the DQOs (Step 5 of the DQO process) are presented in Appendix B. In addition, the sample register tables with appropriate updates based on actual field work performed are presented in Appendix C.

### 1.2.1 Delineation of Contaminant Plumes in Groundwater

**Description of Data Gap:** Existing RI/FS data indicates that volatile organic compounds (VOC) are present in groundwater; however, the lateral and vertical extent of VOCs in groundwater has not been adequately delineated. In addition, plume migration and attenuation as well as recent remedial activities may have altered plume boundaries over time. Under this data gap category, definition of VOC plumes at OU-1 and OU-2 CERCLA sites will be updated, and a plume delineation at EBS Parcel 8 will be performed. Where TPH is commingled with VOC plumes, TPH also will be delineated. In addition, field data will be collected to determine preliminarily if natural attenuation of VOC groundwater contaminants is occurring.

**Sampling Performed:** All monitoring wells within the site boundaries were resampled as part of the delineation of contaminant plumes in groundwater. All specified groundwater monitoring wells were sampled using a slow-purge method for collection of grab groundwater samples. In addition, multi-level, passive diffusion bag (PDB) samplers were placed in a selected number of wells so that depth-specific samples could be collected.

In areas where monitoring wells were unable to provide adequate data, such as the edge of a defined plume where no previous data were available or where previous historical activities may have impacted the shape of the plume, groundwater samples were collected using a direct-push sampling system. Initial sampling locations were identified based on historical characterization of the plumes. Samples were collected from step-out locations until contaminant concentrations fell below applicable screening

criteria, which are defined as the maximum contaminant levels (MCL) for VOCs and preliminary remediation criteria, as identified in the TPH program, for TPH. Additional groundwater samples were collected near the centers of the plumes in support of the dense, nonaqueous-phase liquid (DNAPL) investigation (described in Section 1.2.2). Groundwater samples were submitted to either an on-site mobile laboratory for fast turn around time or to a fixed laboratory for analysis of VOCs and TPH concentrations. A detailed description of the investigation approach is presented in Appendix B-1 of the FSP (TtEMI 2001a). Sampling results are summarized in Section 2.1.1.

### **1.2.2 Characterization of Dense Nonaqueous-Phase Liquids in Soil**

**Description of Data Gap:** Separate-phase chlorinated VOCs in the form of DNAPL may be present at CERCLA Sites 4 and 5; however, the presence of DNAPL has not been confirmed nor has the distribution of DNAPL been adequately characterized. Under this data gap category, characterization of DNAPL contamination will be conducted in support of removal actions at CERCLA Sites 4 and 5. If analyses of soil and groundwater samples indicate the presence of DNAPL, boundaries in soil must be adequately identified for efficient design of the remedial technology. Samples collected under this data gap category will also be used to evaluate whether DNAPL has migrated into the first sand stringer of the Bay Sediment Unit (BSU) or below the low-permeability interface between alluvial and fluvial deposits of the Merritt Sand Formation.

**Sampling Performed:** Soil and groundwater samples were collected using a direct-push sampling system. Initial sampling locations were selected based on historical data that indicated VOC concentrations exceeded 1 percent solubility. At several suspected DNAPL locations, nearby monitoring wells were sampled using a PDB sampler. Based on the results from the direct-push groundwater and soil samples and PDB groundwater samples, additional sampling locations were identified if the concentration of any chlorinated VOC exceeded 1 percent of its solubility, or there was a trend of increasing concentration with increasing depth.

Soil samples were evaluated in the field using phase-separation methods for the visual determination of DNAPL. Groundwater samples were submitted to an on-site mobile laboratory and analyzed for VOC and TPH concentrations. Lateral and vertical step-out sampling were conducted until the concentration of the highest chlorinated VOC was below 1 percent solubility for that compound. At Site 5, the Navy limited sampling into the BSU to a maximum depth of 20 feet below ground surface (bgs). Details of the

approach are discussed in Appendix B-2 of the FSP (TtEMI 2001a). In Building 360 (Site 4), visual inspection of the sub-floor beneath the plating and cleaning shops was performed. Sampling results are summarized in Section 2.1.2.

### **1.2.3 Characterization of Organic Contaminants in Soil and Groundwater**

Chlordane was previously detected in soil and groundwater samples associated with removal of UST 608-1; however, the lateral and vertical extent of the contamination is not characterized sufficiently to conduct removal actions or evaluate remedial options. In addition, at various TPH-related source locations across the installation, TPH or benzene, toluene, ethyl benzene, and xylenes (BTEX) were previously identified above preliminary remediation criteria defined in the Alameda Point TPH strategy technical memorandum (Navy 2001); however, insufficient information exists to determine whether TPH-impacted soil and groundwater is isolated or widespread at these locations.

**Sampling Performed:** Soil and groundwater samples were collected at Site 16 to determine the extent of chlordane contamination related to former UST 608-1. Samples were sent to an off-site laboratory for analysis of organochlorine pesticides including chlordane. In addition, soil and groundwater samples were collected, and soil shake tests and piezometer sampling were performed at various TPH-related sites to determine the impact of TPH-related activities on soil and groundwater. Soil and groundwater samples were submitted to an off-site laboratory for analysis of total purgeable petroleum hydrocarbons (TPPH), total extractable petroleum hydrocarbons (TEPH), BTEX, and lead, where applicable. Soil shake tests and dual-phase probe sampling from piezometers were performed to determine if floating product (light, nonaqueous-phase liquid [LNAPL]) was present at locations where TPH concentrations were previously detected above 20 milligrams per liter in water or 14,000 milligrams per kilogram in soil. Sampling results are summarized in Section 2.1.3.

### **1.2.4 Delineation of Contaminants in Soil to Support Removal Actions**

**Description of Data Gap:** Existing analytical data for shallow soil samples indicates isolated areas with chemical concentrations that pose unacceptable risks to human health. The boundaries of these areas have not been defined adequately enough to allow early removal actions. Data gathered under this data gap category will be used to define the extent of contamination, in support of soil removal actions at CERCLA sites within OU-1, specifically, CERCLA Sites 14 and 15. Elevated concentrations detected in

initial sampling will be used to determine potential step-out sampling locations until concentrations are below removal action goals and the removal action area is completely defined. This characterization will allow the Navy to perform early removal actions, or in the case of Site 15, complete an on-going removal action.

**Sampling Performed:** Soil samples were collected at Sites 14 and 15 in an effort to determine the vertical and lateral extent of soil contamination. Initial sampling locations were identified based on historical data. Samples were collected from step-out locations until contaminant concentrations fell below applicable screening criteria, which are defined in Appendix B-3 of the FSP (TtEMI 2001a). Soil samples were sent to a fixed laboratory for analysis. Sampling results are summarized in Section 2.1.4.

### **1.2.5 Collection of Soil Gas Data to Support Risk Assessment**

**Description of Data Gap:** Volatilization of chemicals from groundwater into buildings is an exposure route that will be evaluated in the revised risk assessments for OU-1 and OU-2. Health risks associated with inhalation of volatilized chemicals contained in indoor air can be highly uncertain because of the difficulty in characterizing vapor migration through the soil. Recent advances in assessing vapor migration indicate that the use of soil gas data in the Johnson and Ettinger model (Johnson and Ettinger 1991) may reflect more accurately concentrations of volatile chemicals expected to enter buildings and thus provide a better indicator of indoor air risks than use of soil or groundwater data (Johnson and others 1998). No current soil vapor data are available for use in the risk assessment.

**Sampling Performed:** Soil gas samples were collected from groundwater contaminant plume areas at varying depths below the ground surface at CERCLA Sites 6, 14, and 16 in OU-1 and CERCLA Sites 3, 4, 5, 9, 13, 21, 22, and 23 in OU-2. Soil gas samples were analyzed for VOCs and methane and non-methane gases. In addition, soil samples from adjacent borings were collected and analyzed for geotechnical parameters. Soil gas data collected under this DQO will be used in the risk modeling for OU-1 and OU-2. Details of the sampling approach and sampling results are summarized in Section 2.1.5.

### **1.2.6 Characterization of Inorganic Contaminants in Soil and Groundwater**

**Description of Data Gap:** Existing analytical data indicate cadmium, chromium, and cyanide may be present in surface and shallow soils or groundwater above screening levels near suspected source areas

such as the Building 360 (Site 4) and Building 5 (Site 5) plating shops and their associated industrial waste treatment plants (IWTP). Existing data also indicate elevated pH levels and cadmium contamination in surface soils at the northern end of Building 360. In addition, EBS data indicate lead is present in shallow soil and groundwater above screening levels in an unknown source area located between Buildings 118 and 517 in Site 3. However, the lateral and vertical extent of these contaminants that exceed screening levels have not been adequately delineated in these areas. The scope of proposed soil removal actions cannot be properly evaluated. Risk may be posed by metals in groundwater associated with a release from suspected sources.

**Sampling Performed:** Subsurface soil and groundwater samples were collected at the Sites 4 and 5 Plating Shops and at their associated IWTPs and at the unknown source area in Site 3 in an effort to determine the lateral and vertical extent of previously detected soil and groundwater contamination. Subsurface soil samples were also collected at previous sampling locations in the northern portion of Building 360 where elevated pH and cadmium concentrations were detected. Initial sampling locations were identified based on historical data. For metals in soil and groundwater, samples were collected from step-out locations until contaminant concentrations fell below applicable screening criteria, which are defined in Appendix B-3 of the FSP (TtEMI 2001a). A limited groundwater investigation was performed at the Building 5 Plating Shop and associated IWTP. Groundwater at five initial locations and five step-out locations was sampled to determine the extent of cyanide contamination. Samples were sent to a fixed laboratory for analysis. Sampling results are summarized in Section 2.1.6.

### **1.2.7 Chromium Speciation in Soil to Support Risk Assessment**

**Description of Data Gap:** Soils in OU-1 Sites 8, 14, and 15, as well as OU-2 Sites 4, 5, 21, and 23 may contain concentrations of chromium that pose unacceptable risks to human health (TtEMI 1999b and c). Soil samples collected during previous RI/FS investigations were analyzed for total chromium; however, the two common species of chromium, trivalent chromium (Cr [III]) and hexavalent chromium (Cr [VI]) were not distinguished by the standard analytical method used for metals analysis. Without data for chromium speciation, a conservative estimate for the human health risk calculations assumed that 100 percent of concentration reported as total chromium was in the hexavalent form, Cr (VI); based on the California-modified Preliminary Remediation Goal (PRG), Cr(VI) has a toxicity 500,000-times that of Cr(III). This assumption does not represent the typical distribution of chromium species in soil at

Alameda Point and produces artificially elevated risk values, which in turn may result in unnecessary remedial actions at these sites.

**Sampling Performed:** To properly assess human health risk at these sites, soil samples were collected and analyzed for both total chromium and Cr (VI). Speciated concentrations of chromium in soil will be used to recalculate the human health risk at CERCLA Sites 8, 14, 15, 4, 5, 21, and 23. Sampling results are summarized in Section 2.1.7.

### **1.2.8 Storm Sewer Exposure Pathway Investigation**

**Description of Data Gap:** During historical operations at Alameda Point, industrial wastes were disposed of through the storm sewer system and into the San Francisco Bay. Two pathways in this system should be addressed with respect to contaminant migration: (1) preferential flow of contaminated groundwater from CERCLA sites to downstream sites and surface water through the storm sewer bedding material, and (2) preferential flow of contaminated groundwater from CERCLA sites to downstream sites and surface water through cracks or breaks in storm sewer lines. If the bedding material and storm sewer lines act as preferential flow paths to surface water, remedial alternatives will be evaluated for addressing these pathways.

**Sampling Performed:** To determine if storm sewer bedding materials are acting as a preferential pathway for contaminant migration (Pathway 1), soil and groundwater samples were collected at locations along storm sewer lines on the downgradient edge of known plumes. Geotechnical and chemical data were used to determine if migration through the bedding material is occurring. In an effort to determine baseline conditions for contaminated groundwater infiltration into the storm sewer lines downstream of known groundwater contaminant plumes (Pathway 2), storm water samples were collected from manholes or catch basins at the downstream edge of contaminant plumes and at the last manhole or outfall accessible, in areas where suspected contaminant migration is occurring. Details of the sampling approach and sampling results are summarized in Section 2.1.8.

## 2.0 RESULTS OF DATA GAP SAMPLING PROGRAM

Data collected during the Alameda Point OU-1 and -2 data gap investigation have been compiled and presented in several formats. The first of which is a tabular summary of field activities performed during the investigation. Tables 2-1 through 2-8 provide a summary of field activities performed at each site and are arranged by DQO. For each DQO, these tables provide site-by-site information such as the number of samples collected for each sample type and media, the sample depth or depth interval, and analyses performed. In addition, the tables specify the location in the document or appendices where other relevant information may be found, such as data summary tables, figures, and field data.

Tables 2-9 through 2-32 present a statistical summary of the data by site that includes the following parameters:

- Total number of on-site and fixed laboratory samples analyzed for each analytical parameter
- Number of valid (non-rejected) results
- Minimum, maximum, and mean detected concentrations
- Minimum and maximum reporting limits

Additional data are presented in Appendices D through R as follows:

### Binder 2 of 3

- D Site-Specific Detected Chemical Data
- E Field Soil Gas Chemical Data
- F Field Groundwater Chemical Data
- G Storm Sewer Data and Data Quality Objective Evaluation
- H Fixed Laboratory Chemical and Physical Data (on read-only-memory compact disk)
- I Photographs of Samples for Qualitative Evaluation of LNAPL and Shake Test Results Summary Table
- J Photographs of Ribbon NAPL Samplers (RNS), Results Summary Table, and Visual Inspection Report for Sub-Floor Area in Building 360
- K Cone Penetrometer Data and Groundwater Parameter Summary Tables
- L Surveyor Data
- M Monitoring Well Sampling Sheets and Groundwater Parameter Summary Tables

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- N Water Level Measurements
- O Boring Logs and Direct-Push Groundwater Parameter Summary Tables
- P Photocopies of Field Notebooks
- Q Field Sampling Plan Change Order Request Forms
- R Investigation-Derived Waste Analytical Reports and Shipping Manifests

Data presented in the above referenced appendices will be referenced in the following sections as appropriate.

## 2.1 SITE-SPECIFIC SAMPLING RESULTS BY DATA QUALITY OBJECTIVE

The following sections present the results of planned sampling at each site. Results are presented by DQO.

### 2.1.1 Delineation Of Contaminant Plumes In Groundwater

Limited investigation of groundwater contaminant plumes was performed at OU-1 Sites 6, 14, and 16, and OU-2 Sites 3, 4, 5, 9, 10, 11, and 21. Various contaminant plumes were investigated including chlorinated VOCs, TPH, and dichlorobenzene. The following table describes the groundwater contaminants investigated at each site:

<u>Operable Unit</u>	<u>Site</u>	<u>Groundwater Contaminant</u>
1	6	Chlorinated VOCs west of Building 41
	14	Chlorinated VOCs west of Building 528
	16	Dichlorobenzene west of the CANS yard and chlorinated VOCs northwest of Building 608
2A	9	Chlorinated VOCs to the west and south of Building 410
2B	3	TPH northwest of Site 3
	4	Chlorinated VOCs in the vicinity and to the west of Building 360 and TPH east of Building 397
	11	TPH along fuel line northwest of USTs 37-1 through 37-4 and TPH at two oil-water separators near Building 14

<u>Operable Unit</u>	<u>Site</u>	<u>Groundwater Contaminant</u>
2B	21	Chlorinated VOCs in the vicinity of Building 162; TPH along the fuel line west of Building 162; and chlorinated VOCs in the vicinity of Building 398
2C	5	Chlorinated VOCs in the vicinity of Building 5 and TPH near the northeast corner of Building 5
	10	Chlorinated VOCs on the north side of Building 400
EBS Parcel	8	Chlorinated VOCs northwest of Building 497

As part of the groundwater plume delineation of the above-mentioned areas, water-level measurements and groundwater samples were collected at existing wells within the boundary of each CERCLA site. Groundwater samples collected from monitoring wells were sent to an offsite, fixed laboratory for analysis of specified compounds. Analytical methods included VOCs, TPPH, TEPH, and semivolatile organic compounds (SVOC), depending on the contaminant plume being investigated. Detected analyte tables are presented in Appendix D. Field analytical parameters, such as reduction oxidation potential, ferrous iron, and dissolved oxygen, are presented in Appendix F. Stabilization parameters, such as pH, conductivity, temperature, and specific conductance, are presented in Appendix M. Water level measurements are presented in Appendix N.

In addition to monitoring well sampling, direct-push groundwater sampling was performed to complete characterization of the vertical and horizontal extent of contaminant plumes at each site. Where necessary, step-down or step-out sampling was performed when contaminant concentrations exceeded screening criteria (screening criteria are presented in Appendix B along with applicable reporting limits for each compound). Direct-push groundwater samples were either analyzed onsite using a mobile laboratory, or sent offsite to a fixed laboratory for analysis of VOCs, TEPH, or TPPH, depending on the plume being investigated.

Table 2-1 provides a summary of field activities performed at each site. Figures 2.1-1 through 2.1-46 present the VOC results by site and plume area. The primary objective of these figures is to demonstrate that the DQOs stated in the FSP/QAPP (TtEMI 2001a) were met. In general, the DQOs for the groundwater data gap sampling effort were to define the horizontal and vertical limits of the chlorinated VOC and TPH contamination plumes to MCLs, or to screening levels discussed in the TPH strategy. A secondary objective of these figures is to show the presence of the contamination in relation to the hydrogeologic units present at Alameda Point.

Target chemicals of concern (COC) were selected after evaluation of existing data and risks associated with each chemical. Several chlorinated VOCs and TPH were selected as target COCs based on the quantity of data points available, concentrations present in relation to screening levels, and risks (either human health or ecological) associated with the COC. A brief list of some of the COCs include vinyl chloride; 1,1,1-trichloroethane; trichloroethene; 1,1-dichloroethane; tetrachloroethene; total (cis- and trans-) 1,2-dichloroethene; TEPH as diesel, motor oil, JP-5; TPPH as gasoline; benzene; chlordane; and dichlorobenzene.

Existing RI/FS data and data collected during the data gap sampling effort were used to create the MCL/screening level plume contours. Plume contour figures include only sample data collected from January 1998 through December 2001, unless data prior to 1998 added value to creation of the plume maps (which was the case for TPH). At each site or OU, data for target COCs were evaluated. In some cases, insufficient data points were available to prepare plume contours for a specific COC. For those COCs where sufficient data points were available, multi-depth plume contour figures were prepared.

For each plume figure, concentrations of target COCs were contoured within a specific depth interval that generally correspond to hydrogeologic unit description tables presented in the FSP/QAPP. This will assist in future modeling efforts and FSs, as the contaminant transport through the hydrogeologic units is considered in these activities. The number of intervals and the depths presented were selected on a site-specific basis. If multiple samples were collected from different depths at a single sampling point within the depth interval, the highest concentration detected was used for that sampling point. This provides a worse case scenario within the plume. For larger plume areas, such as in OU-2B, large-format figures were prepared where either two or three depth intervals were plotted. For the deeper intervals, no contours were drawn if concentrations did not exceed the MCL or screening level. For Site 14, only the upper depth interval, ground surface to 30 feet bgs, was contoured. Although there are two deeper locations at the site where concentrations for COCs exceed the MCL or screening criteria, there was insufficient data to contour the deeper interval.

### **2.1.2 Characterization of Dense Nonaqueous-Phase Liquids in Soil**

In an attempt to detect and define the limits of DNAPL contamination at Sites 4 and 5, groundwater and soil sampling were performed and Ribbon NAPL Samplers (RNS) were installed at locations where chlorinated VOCs had previously been detected in the groundwater at concentrations above 1-percent

solubility. Concentrations of chlorinated VOCs in groundwater exceeding 1-percent solubility may indicate the presence of DNAPL in soil. Table 2-2 provides a summary of field activities performed at each site.

In locations where DNAPL was suspected and monitoring wells were already in place, multi-level, PDB samplers were used for the collection of depth-discrete samples from the screened interval of the wells, as described in the FSP (TtEMI 2001a). In each well, five, 2-foot sections of PDB were filled with deionized water, daisy-chained together, and lowered into the well to the depth of the well screen. The PDB samplers were left in place for 14 days allowing full exchange of formation water with the deionized water in the PDBs. PDB samplers were removed from the wells, transferred to sample vials, and sent to an off-site laboratory for analysis of VOCs. Detected analyte tables are presented in Appendix D. Field analytical parameters, such as reduction oxidation potential, ferrous iron, and dissolved oxygen, are presented in Appendix F. Stabilization parameters, such as pH, conductivity, temperature, and specific conductance, are presented in Appendix M. Water level measurements are presented in Appendix N.

Although concentrations of chlorinated VOCs exceeding 1-percent solubility may indicate the presence of DNAPL in the soil formation, results for all PDB samplers used for depth-discrete sampling at Sites 4 and 5 were below 1-percent solubility for the targeted chlorinated VOCs. In these areas, no further investigation of DNAPL was performed.

In addition to PDB samplers, RNSs were installed at potential source locations at Sites 4 and 5 where DNAPL was suspected, but no monitoring wells were located. In these locations, soil borings were advanced so that RNSs could be installed. During installation, soil samples collected from the borings were tested for the physical presence of DNAPL using a phase-separation shake test where a sample of soil was shaken with water in a glass vial and allowed to stand until the sediments had cleared. Visible signs of DNAPL would have included dual-phase separation of the liquid showing a meniscus at the bottom of the water column, just above the settled sediments. No positive shake tests were detected for DNAPL at either site.

RNSs were installed at the soil boring locations in an attempt to qualitatively identify DNAPL. RNSs were deployed through the hollow-stem of a direct-push drill rod, left in place for several hours, then retrieved. If DNAPL was present at the RNS sampling locations, the non-aqueous organic liquid would

have stained the colored dye impregnated into the hydrophobic RNS material. At each location sampled, no evidence of DNAPL was observed. Boring logs and photographs of recovered RNS are presented in Appendices J and K, respectively.

In addition to dual-phase shake tests and RNS sampling, groundwater samples were collected from each soil boring after removal of RNSs. These groundwater samples were either analyzed for chlorinated VOCs at an on-site mobile laboratory, or sent to an off-site laboratory for analysis. At several locations in Site 5, the highest concentration for one of the chlorinated VOCs did exceed 1 percent of its solubility, and at these locations, step-out groundwater samples were collected using a direct-push sampling rig until the compound was detected at a concentration less than its 1-percent solubility. Detected analyte tables for groundwater samples are presented in Appendix D. Figures 2.2-1 and 2.2-2 present the RNS sampling locations.

As part of the DNAPL investigation at Building 360 (CERCLA Site 4), close inspection of the sub-floor areas beneath the cleaning and plating shops was performed. The two areas were inspected for staining in order to identify potential release points from leaking process tanks. Although no staining indicative of chlorinated solvent spillage was observed in either area, there were, however, soil and concrete structures beneath both the plating and cleaning shops where a solid, white or yellow precipitate had formed. Precipitates of this nature may indicate the presence of metal salts released from the plating and cleaning processes. Appendix J includes a detailed summary of the visual inspection.

Results of the DNAPL investigation, along with cone-penetrometer data that was described in Addendum B (and presented in Appendix L), were submitted to the Navy's remedial action contractor for use in designing groundwater treatment systems for the indicated sites.

### **2.1.3 Characterization of Organic Contaminants in Soil and Groundwater**

Limited investigation of soil and groundwater was performed at OU-1 Site 16 for chlordane contamination related to the removal of former UST 608-1. In addition, limited investigation of soil and groundwater was performed for TPH and BTEX contamination and determination of LNAPL at various corrective action areas (CAA) across the installation. Also, in an attempt to determine the source of the tarry material in the subsurface soils at Site 13, tar samples were collected for TPH forensic analysis. The following table describes the groundwater contaminants investigated at each site:

<u>Operable Unit</u>	<u>Site</u>	<u>Parameter</u>
2A	13	Tar samples collected from the former refinery area for forensic TPH analysis
1	16	Chlordane in soil and one groundwater monitoring well near former UST-608
CAA	3A	Soil shake tests and dual-phase probe sampling from one piezometer for determination of LNAPL
CAA	4C	TPPH and BTEX in groundwater and soil shake tests and dual-phase probe sampling from one piezometer for determination of LNAPL
CAA	9A	TEPH, TPPH, and BTEX in soil and groundwater monitoring wells
CAA	12	TEPH, TPPH, and BTEX in soil
Flight Line CAA (FLCAA)	A	Soil shake tests and dual-phase probe sampling from one piezometer for determination of LNAPL
FLCAA	B	TEPH, TPPH, and BTEX in soil
EBS Parcel	23G	TEPH, TPPH, and BTEX in soil

Soil samples were collected using a direct-push sampling rig and were sent to an offsite, fixed laboratory for analysis of specified compounds. Groundwater monitoring wells were sampled using a low-flow sampling method and also were sent to an offsite, fixed laboratory for analysis. Analytical methods included organochlorine pesticides, specifically chlordane, in four soil samples and one monitoring well sample collected from Site 16, and TPPH, TEPH, and BTEX in soil and monitoring well samples collected from various CAAs and FLCAAs. Soil shake tests and dual-phase probe sampling from piezometers were performed at CAA-3A, CAA-4C, and FLCAA-A to determine if LNAPL was present in the shallow groundwater. In addition, two tar samples were collected from the former refinery area at Site 13. These samples were sent to a forensic TPH laboratory for identification of the petroleum source of the tar.

Detected analyte tables for soil and groundwater samples are presented in Appendix D. Field analytical parameters, such as reduction oxidation potential, ferrous iron, and dissolved oxygen, are presented in Appendix F. Stabilization parameters, such as pH, conductivity, temperature, and specific conductance, are presented in Appendix M. Water level measurements are presented in Appendix N. Photographs showing example soil shake tests for LNAPL are presented in Appendix I.

Table 2-3 provides a summary of field activities performed at each site. Figure 2.3-1 presents the results for chlordane in soil at Site 16. The primary objective of this figure is to demonstrate that the DQO stated in the FSP/QAPP (TtEMI 2001a) was met. In general, the DQO for characterization of chlordane in soil at Site 16 was to define the horizontal and vertical limits of the contamination to the U.S. Environmental Protection Agency (EPA) Region 9 residential PRG. TPH, BTEX, and LNAPL sampling data for CAA sites, and the results of the forensic TPH analyses for the tar samples from Site 13, were provided to TtEMI's TPH Program Manager and will be presented in forthcoming TPH Program documents. No results figures for the TPH-related sites were prepared for this data summary report.

**2.1.4 Delineation Of Contaminants In Soil to Support Removal Actions**

Soil samples were collected at Site 14 in an effort to determine the vertical and lateral extent of dioxin contamination in soil in and around the former Fire Training Area (FTA). In addition, soil samples were collected between the north fence line of Site 15 and the Oakland Inner Harbor in an effort to define the extent of polychlorinated biphenyl (PCB) and lead contamination in the wetlands area of the site. Initial sampling locations were identified based on data previously collected during RI and removal action activities. The following table describes the parameters investigated at each site:

<u>Operable Unit</u>	<u>Site</u>	<u>Parameter</u>
1	14	Dioxins and furans in soil at the FTA
1	15	PCBs and lead in soil along the wetlands area

Subsurface soil samples were collected at Site 14 using a direct-push drill rig. Surface soil samples were collected at Sites 14 and 15 using a hand auger, as were the composite soil samples collected from the berm at the Site 14 FTA. Samples collected from Site 14 were submitted to a fixed laboratory for analysis of dioxins and furans; samples collected from Site 15 were submitted to a fixed laboratory for analysis of PCBs and lead. Additional soil samples for dioxins and furans were collected at Site 14 in subsequent rounds of step-out sampling.

In addition to the samples collected at the Site 14 FTA, four surface soil samples were collected at a suspected FTA location south of Perimeter Road, outside of the Site 14 boundary. These samples were

submitted to an off-site laboratory for analysis of total metals, SVOCs (including polynuclear aromatic hydrocarbons, dioxins and furans, PCBs, TPPH, and TEPH.

Table 2-4 provides a summary of field activities performed at each site. Detected analyte tables for contaminants in soil are presented in Appendix D. Figure 2.4-1 presents dioxin results for Site 14. Figure 2.4-2 presents lead and PCB results for Site 15. The primary objective of these figures is to demonstrate that the DQOs stated in the FSP/QAPP (TtEMI 2001a) were met. In general, the DQO for characterization of dioxins in soils at Site 14 and lead and PCBs in soils at Site 15 was to define the horizontal and vertical limits of the contamination to EPA Region 9 PRGs or, in the case of lead at Site 15, to the screening value determined using the California Department of Toxic Substances Control Lead-Spread Model.

### **2.1.5 Collection of Soil Gas Data to Support Risk Assessment**

Soil gas samples were collected from groundwater contaminant plume areas at depths below the ground surface at CERCLA Sites 6, 14, and 16 in OU-1, and CERCLA Sites 3, 4, 5, 9, 13, 21, 22, and 23 in OU-2, based on the following criteria:

- (1) For locations where groundwater depth was less than 6 feet bgs, samples were collected from depths near the ground surface at approximately 1.5 feet bgs and just above the water table.
- (2) For locations where groundwater depth was greater than 6 feet bgs, an additional sample was collected at the mid-point between the upper and lower sampling points.

Soil gas samples were collected using a direct-push, soil vapor probe and a slow-purge, vacuum-monitored induction system. At each location sampled, the stem of the vapor probe was sealed with moistened bentonite. After placement of the soil gas probe, soil gas samples were collected at a rate of 100 to 200 milliliters per minute with a down-hole vacuum not exceeding 20 inches of water. Sample flow was controlled and monitored using a micro-fine, calibrated rotometer. Sampling vacuum was monitored using a magnehelic gauge positioned on the sample-probe side of the induction system. Low-flow, low-vacuum sampling insured soil gases were purged without bias to the more- or less-volatile compounds.

Prior to the start of sampling, five locations representing plume areas in OU-1, OU-2A, OU-2B, OU-2C, and one TPH site, were sampled in five, five-minute increments to develop efficiency curves for the target analytes (chlorinated VOCs, BTEX, and TPPH). Samples were collected in one-liter Tedlar® bags and analyzed by an on-site laboratory. The sampling efficiency curves provided sufficient information to determine optimum purge times prior to starting sample collection. Five minute purge times with a 30-minute sample collection time following was determined to be optimum for collection of the soil gas samples. Soil gas results from the on-site mobile laboratory are presented in Appendix E.

Soil gas samples were collected in SUMMA canisters. SUMMA canisters were tested for vacuum both before and after sampling. After collection, the SUMMA canisters were packed and shipped to an offsite air laboratory for analysis. Soil gas samples were analyzed for VOCs including chlorinated VOCs, BTEX, and naphthalene by EPA Compendium Air Method TO-15 (EPA 1988) and for methane and non-methane gases (such as oxygen, nitrogen, carbon dioxide, and methane and non-methane hydrocarbons) by American Society of Testing and Materials methods. In addition, soil samples from adjacent borings were collected and analyzed for the following geotechnical parameters: particle size, soil texture, volumetric moisture, soil total porosity, and soil dry bulk density.

Table 2-5 provides a summary of field activities performed at each site. Detected analyte tables for soil gas samples are presented in Appendix D. Figure 2.5-1 presents the results for detected soil gas constituents at all sites sampled.

### **2.1.6 Characterization of Inorganic Contaminants in Soil and Groundwater**

The specific objectives for the investigation of inorganic contamination in soil and groundwater related to the two plating shops were (1) determine the extent of cadmium-and chromium-contaminated soil in the plating shops to support potential removal actions, (2) determine whether Cr (VI) is present at concentrations of concern in soil and groundwater at the plating shops, (3) evaluate whether cyanide is present at concentrations of concern in groundwater at the Building 5 Plating Shop, (4) determine the extent of elevated pH and cadmium contamination in soil at the northern portion of Building 360, and (5) determine the extent of lead contamination in soil and groundwater at the unknown source area in Site 3. The following table describes the parameters investigated at each site:

<u>Operable Unit</u>	<u>Site</u>	<u>Parameter</u>
2B	3	Lead in soil and groundwater between Buildings 118 and 517
2B	4	Cadmium and chromium in soil at the Building 360 Plating Shop and the Site 4 IWTP, and cadmium and elevated pH in surface soil at the northern end of Building 360
2C	5	Cadmium and cyanide in soil and groundwater at the Building 5 Plating Shop and the Site 5 IWTP

Subsurface soil and groundwater samples were collected at Sites 3, 4, and 5 using a direct-push drill rig. Samples were submitted to a fixed laboratory for analysis of cadmium, total chromium, Cr (VI), cyanide, and pH, as appropriate for each site. Additional samples for lead in soil and groundwater at Site 3, cadmium in soil at Sites 4 and 5, and cyanide in groundwater at Site 5 were collected in subsequent rounds of step-out sampling.

Table 2-6 provides a summary of field activities performed at each site. Detected analyte tables are presented in Appendix D. Figures 2.6-1 through 2.6-7 present results at Sites 3, 4, and 5. The primary objective of these figures is to demonstrate that the DQOs stated in the FSP/QAPP (TtEMI 2001a) were met. In general, the DQO for characterization of contaminants at Sites 3, 4, and 5 was to define the horizontal and vertical limits of the contamination to the EPA Region 9 residential PRGs.

### **2.1.7 Chromium Speciation in Soil to Support Risk Assessment**

Shallow soil samples were collected at seven CERCLA sites for chromium speciation. Soil samples were collected using either a direct-push sampling rig or a hand auger from previous sampling locations and depths where total chromium concentrations produced artificially elevated risk values, based on the assumption that 100 percent of concentration reported as total chromium was in the form of Cr (VI). Speciated concentrations for chromium in soil will be used to recalculate the human health risk for OU-1 Sites 8, 14, and 15, and OU-2 Sites 4, 5, 21, and 23.

Table 2-7 provides a summary of field activities performed at each site. Detected analyte tables for soil and groundwater samples are presented in Appendix D. Figure 2.7-1 presents the results for chromium speciation in soil for all sites sampled.

### **2.1.8 Storm Sewer Exposure Pathway Investigation**

To determine if storm sewer bedding materials are acting as a preferential pathway for contaminant migration (Pathway 1), soil and groundwater samples were collected at locations along storm sewer lines on the downgradient edge of known plumes. Vacuum excavation borings were advanced immediately adjacent to storm sewer lines where undisturbed samples of the bedding material were collected. For comparison purposes, samples of the native artificial fill were collected at the approximate depth of the storm sewer line, 10 feet off of storm sewer line at each vacuum excavation location. The soil samples were sent to an offsite geotechnical laboratory for analysis of geotechnical parameters. Comparison of the geophysical properties of the samples will provide information on whether the bedding material is more permeable than the native surrounding fill, possibly promoting contaminant migration from the upgradient plume.

At locations where groundwater was present in the vacuum excavation borehole, a groundwater sample was collected and analyzed for groundwater contaminants (related to the upgradient plume) to determine if chemical concentrations exceed applicable screening criteria (environmental reference values [ERV] for non-drinking water areas; the most restrictive criterion between ERVs, MCLs, and residential PRGs for drinking water areas). If the groundwater sample from an initial vacuum excavation location contained contaminants that exceeded the screening criteria, step-out samples were collected downstream of the initial sampling location. Step-out sampling continued until concentrations were below screening criteria or other plumes were encountered.

Storm sewer lines identified in the Draft Final Storm Sewer Study Report (TtEMI 2000) that are submerged (below the water table), damaged, and intersect groundwater contaminant plumes were the focus for Pathway 2. In an effort to determine baseline conditions for contaminated groundwater infiltration into the storm sewer lines downstream of known groundwater contaminant plumes, water samples were collected from initial sampling locations, such as manholes or catch basins, at the downstream edge of the contaminant plume. If concentrations of contaminants exceeded ERVs at the initial sampling locations (or if a manhole or catch basin was inaccessible), then water samples were collected from manholes or catch basins closest to the outfall or, in some cases, from the outfall itself. Details of the approach are discussed in Appendix B-2 of the FSP (TtEMI 2001a).

Table 2-8 provides a summary of field activities performed for the storm sewer pathway investigation. Detected analyte tables for soil and groundwater samples are presented in Appendix D. Figure 2.8-1 provides the results for geotechnical and groundwater data collected along storm sewer bedding corridors and storm water data collected from manholes, catch basins, and outfalls.

### 3.0 DEVIATIONS FROM SAMPLING PLAN

Minor problems were encountered during implementation of field work for the data gap investigation. These problems necessitated changes in field activities that deviated from the FSP/QAPP. In some cases, such as during soil and groundwater sampling for lead at Site 3, step-out locations were identified where the original scope of the FSP did not call for step-out sampling, or at Site 16, where the number of step-outs required to meet the DQO exceeded authorized numbers because the size of the plume was larger than anticipated. In several cases, sampling locations along the storm sewer could not be sampled because either the storm line was not found during excavation, or a manhole or catch basin could not be located. If possible, alternative procedures were performed, if approved. All proposed changes to the FSP/QAPP were documented in FSP Change Order Request Forms. These forms were faxed to the Project Quality Assurance Manager, and when approved verbally over the phone, were signed by the field site manager and implemented. FSP Change Order Request Forms are presented in Appendix Q.

## **4.0 DATA QUALITY OBJECTIVE EVALUATION**

The following sections present an evaluation of the decision rule for each DQO based on the sampling results performed at each site. Results are presented by site or OU plume area for each DQO.

### **4.1 DELINEATION OF CONTAMINANT PLUMES IN GROUNDWATER**

Limited investigation of groundwater contaminant plumes was performed at OU-1 Sites 6, 14, and 16, and OU-2 Sites 3, 4, 5, 9, 10, 11, and 21. The horizontal and vertical extent of various contaminant plumes was investigated, including chlorinated VOCs, TPH, and dichlorobenzene. Based on a review of the contaminant plumes presented in Figures 2.1-1 through 2.1-46, attainment of the DQO for sites and OU plume areas was evaluated and a decision rule selected. Table 4-1 describes the groundwater contaminants investigated, the decision attained, and the need for additional site-specific data to further clarify a decision rule.

### **4.2 CHARACTERIZATION OF DENSE NONAQUEOUS-PHASE LIQUIDS IN SOIL**

An investigation was conducted to detect and define the limits of DNAPL contamination at OU-2B Site 4 and OU-2C Site 5. RNSs were installed at potential source locations at Sites 4 and 5 where DNAPL was suspected, but no monitoring wells were located. During RNS installation, soil from the borings was tested for the physical presence of DNAPL using a phase-separation shake test. In addition to dual-phase shake tests and RNS sampling, groundwater samples were collected from each soil boring after removal of RNSs. In locations where DNAPL was suspected and monitoring wells were already in place, multi-level, PDB samplers were used for the collection of depth-discrete samples from the screened interval of the wells.

Based on a review of the groundwater, RNS, PDB, phase-separation shake test sample data collected at locations presented in Figures 2.2-1 and 2.2-2, attainment of the DQO for Sites 4 and 5 was evaluated and a decision rule selected. Table 4-2 describes the contaminants investigated, the decision attained, and the need for additional site-specific data to further clarify a decision rule.

#### **4.3 CHARACTERIZATION OF ORGANIC CONTAMINANTS IN SOIL AND GROUNDWATER**

Limited investigation of the horizontal and vertical extent of chlordane in soil, related to the removal of former UST 608-1, was performed at OU-1 Site 16. Based on a review of the data presented in Figure 2.3-1 for Site 16, attainment of the DQO for Site 16 was evaluated and a decision rule selected. Table 4-3 describes the contaminants investigated, the decision attained, and the need for additional site-specific data to further clarify a decision rule.

In addition, limited investigation of soil and groundwater was performed for TPH and BTEX contamination and determination of LNAPL at various TPH-related sites across the installation. Also, in an attempt to determine the source of the tarry material in the subsurface soils at Site 13, tar samples were collected for TPH forensic analysis. TPH, BTEX, and LNAPL sampling data for CAA sites, and the results of the forensic TPH analyses for the tar samples from Site 13, were provided to the TPH Program Manager and will be presented in forthcoming TPH Program documents. No results figures for the TPH-related sites were prepared for this data summary report.

#### **4.4 DELINEATION OF CONTAMINANTS IN SOIL TO SUPPORT REMOVAL ACTIONS**

Limited investigation of the horizontal and vertical extent of dioxin in soil, related to the former FTA and a suspected FTA south of Perimeter Road, was performed at OU-1 Site 14. In addition, a limited investigation of the horizontal and vertical extent of PCBs and lead in soil, in the wetland area between the facility fence line and the Oakland Inner Harbor, was performed at OU-1 Site 15. Based on a review of the data presented in Figures 2.4-1 and 2.4-2, attainment of the DQO for Site 16 was evaluated and a decision rule selected. Table 4-4 describes the contaminants investigated, the decision attained, and the need for additional site-specific data to further clarify a decision rule.

#### **4.5 COLLECTION OF SOIL GAS DATA TO SUPPORT RISK ASSESSMENT**

Soil gas and geotechnical data were collected in soil above groundwater contaminant plumes in order to support evaluation of the inhalation exposure pathway in site-specific and OU plume area risk assessments at OU-1 Sites 6, 14, and 16; OU-2A Sites 9, 13, 21, and 23; OU-2B Sites 3, 4, and 21; and OU-2C Site 5. Contaminant investigated included chlorinated VOCs, BTEX, TPPH, methane and non-methane gases. In addition, soil samples were collected and analyzed for the following geotechnical

parameters to support the inhalation model: particle size, soil texture, volumetric moisture, soil total porosity, and soil dry bulk density. Based on a review of the data presented in Figure 2.5-1 for all of the sites, attainment of the DQO for each site was evaluated and a decision rule selected. Table 4-5 describes the contaminants investigated, the decision attained, and the need for additional site-specific data to further clarify a decision rule.

#### **4.6 CHARACTERIZATION OF INORGANIC CONTAMINANTS IN SOIL AND GROUNDWATER**

A limited investigation of the horizontal and vertical extent of metals, cyanide, and acidity in soil and groundwater was performed at the Site 4 and Site 5 plating shops and an unknown source area at Site 3. The specific objectives for the investigation of inorganic contamination in soil and groundwater were to (1) determine the extent of cadmium-and chromium-contaminated soil in the plating shops at Sites 4 and 5 to support potential removal actions, (2) determine whether Cr (VI) is present at concentrations of concern in soil and groundwater at the plating shops at Sites 4 and 5, (3) evaluate whether cyanide is present at concentrations of concern in groundwater at the Building 5 Plating Shop, (4) determine the extent of elevated pH and cadmium contamination in soil at the northern portion of Building 360 (Site 4), and (5) determine the extent of lead contamination in soil and groundwater at the unknown source area in Site 3. Based on a review of the data presented in Figures 2.6-1 through 2.6-7, attainment of the DQO for each site was evaluated and a decision rule selected. Table 4-6 describes the contaminants investigated, the decision attained, and the need for additional site-specific data to further clarify a decision rule.

#### **4.7 CHROMIUM SPECIATION IN SOIL TO SUPPORT RISK ASSESSMENT**

Shallow soil samples were collected at seven CERCLA sites for chromium speciation. Soil samples were collected from previous sampling locations and depths where total chromium concentrations produced artificially elevated risk values, based on the assumption that 100 percent of concentration reported as total chromium was in the form of Cr (VI). Speciated concentrations for chromium in soil will be used to recalculate the human health risk for OU-1 Sites 8, 14, and 15; OU-2A Site 23, OU-2B Sites 4 and 21; and OU-2C Site 5. Based on a review of the data presented in Figure 2.7-1, attainment of the DQO for each site was evaluated and a decision rule selected. Table 4-3 describes the contaminants investigated, the decision attained, and the need for additional site-specific data to further clarify a decision rule.

#### 4.8 STORM SEWER EXPOSURE PATHWAY INVESTIGATION

To determine if storm sewer bedding materials are acting as a preferential pathway for contaminant migration at Alameda Point, soil and groundwater samples were collected at locations along storm sewer lines on the downgradient edge of known plumes. In addition, in an effort to determine baseline conditions for contaminated groundwater infiltration into the storm sewer lines downstream of known groundwater contaminant plumes, water samples were collected from initial sampling locations, such as manholes or catch basins, at the downstream edges of contaminant plumes. Figure 2.8-1 provides the results for soil and groundwater samples that were collected along storm sewer bedding corridors and groundwater infiltration samples collected from manholes, catch basins, and outfalls.

An in-depth evaluation to determine if the DQOs were met for the storm sewer exposure pathway investigation is presented in Appendix G. Tables 2 and 3 in Appendix G depict a summary of the decision processes used, based on the DQOs outlined in Table A-8 of the FSP/QAPP (TtEMI 2001a), for conducting the evaluation of the bedding materials pathway and the infiltration pathway, respectively. The analytical results supporting these decision processes are also summarized in Tables 2 and 3 of Appendix G when TPH and/or VOCs were encountered.

Based on data presented in the DQO evaluation, results of the storm sewer pathway investigation indicate that neither the storm sewer bedding materials or the storm sewer lines (that are in disrepair and located within known groundwater contaminant plumes) are acting as preferred conduits for the transport of known COCs currently found in the soil and groundwater at Alameda Point, and no further evaluation of these storm sewer pathways is recommended at this time.

## 5.0 INVESTIGATION-DERIVED WASTE DISPOSAL SUMMARY

Investigation-derived waste (IDW) collected during the implementation of the data gap sampling effort was handled and disposed of in accordance with TtEMI's IDW management plan (PRC Environmental Management, Inc. 1994). Roughly 2,300 gallons of wastewater was generated during sampling activities. Wastewater included well purge water and equipment decontamination water and was stored onsite in a 5,000 gallon Baker® tank. In addition to the wastewater, approximately 12.5 tons of waste soil was generated during sampling activities. Waste soil consisted of soil cuttings generated from installation of borings and was stored onsite in a covered roll-off bin.

Based on analytical testing, both the waste soil and wastewater were classified as non-RCRA hazardous waste and were transported to Kettleman Hills Facility, a Class I treatment and landfill disposal facility, on December 12, 2001. Analytical reports and shipping manifests are presented in Appendix Q.

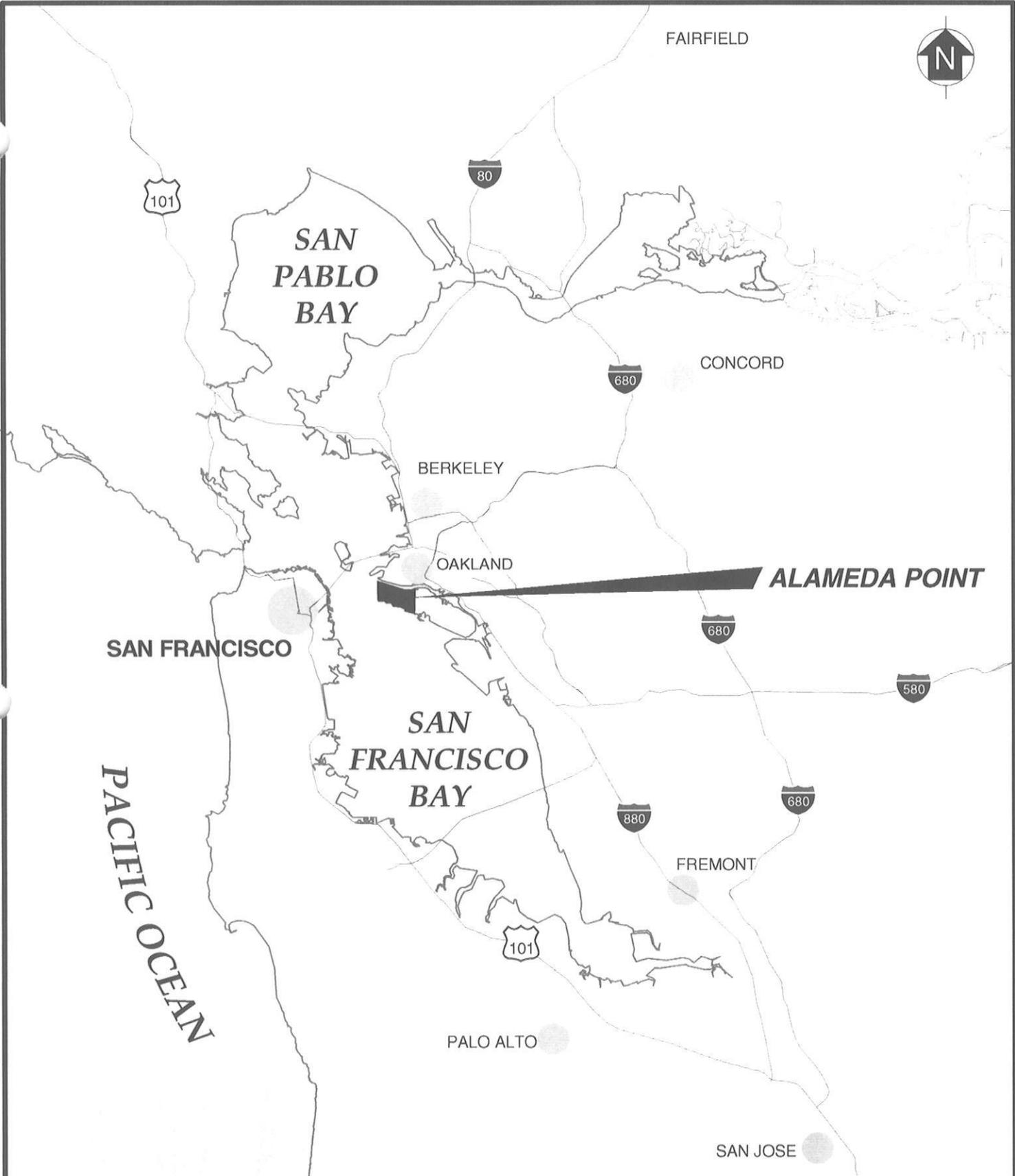
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## FIGURES

# DATA SUMMARY REPORT SUPPLEMENTAL REMEDIAL INVESTIGATION DATA GAP SAMPLING FOR OPERABLE UNITS 1 AND 2

DATED 25 JULY 2002

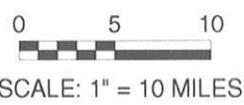


**VICINITY MAP**



**LEGEND**

- CITY
- 🛣 INTERSTATE HIGHWAY
- 🛣 U.S. HIGHWAY
- ⌋ SHORELINE



ALAMEDA POINT ALAMEDA, CALIFORNIA	
FIGURE 1.1-1 ALAMEDA POINT REGIONAL LOCATION MAP MAY 30, 2001	
 Tetra Tech EM Inc.	DS.0385.15645

**LEGEND**

**BOUNDARIES**

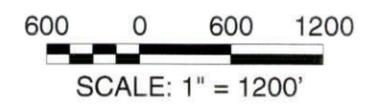
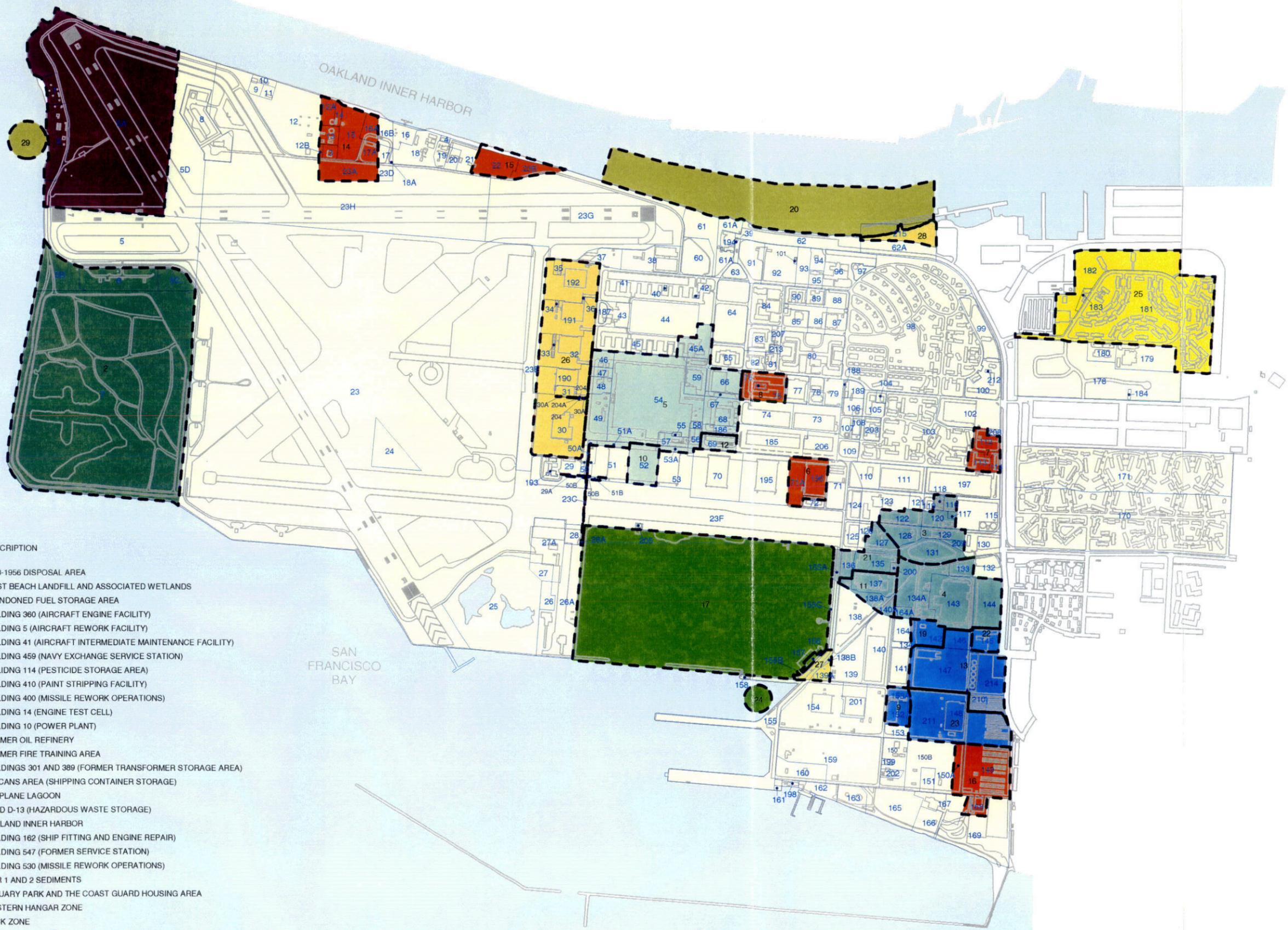
-  ENVIRONMENTAL BASELINE SURVEY PARCEL
-  INSTALLATION RESTORATION SITE BOUNDARY

-  OPERABLE UNIT 1
-  OPERABLE UNIT 2A
-  OPERABLE UNIT 2B
-  OPERABLE UNIT 2C
-  OPERABLE UNIT 3
-  OPERABLE UNIT 4A
-  OPERABLE UNIT 4B
-  OPERABLE UNIT 4C
-  OPERABLE UNIT 5
-  OPERABLE UNIT 6

**SITE FEATURE**

-  LAND COVER

SITE	DESCRIPTION
1	1943-1956 DISPOSAL AREA
2	WEST BEACH LANDFILL AND ASSOCIATED WETLANDS
3	ABANDONED FUEL STORAGE AREA
4	BUILDING 360 (AIRCRAFT ENGINE FACILITY)
5	BUILDING 5 (AIRCRAFT REWORK FACILITY)
6	BUILDING 41 (AIRCRAFT INTERMEDIATE MAINTENANCE FACILITY)
7	BUILDING 459 (NAVY EXCHANGE SERVICE STATION)
8	BUILDING 114 (PESTICIDE STORAGE AREA)
9	BUILDING 410 (PAINT STRIPPING FACILITY)
10	BUILDING 400 (MISSILE REWORK OPERATIONS)
11	BUILDING 14 (ENGINE TEST CELL)
12	BUILDING 10 (POWER PLANT)
13	FORMER OIL REFINERY
14	FORMER FIRE TRAINING AREA
15	BUILDINGS 301 AND 389 (FORMER TRANSFORMER STORAGE AREA)
16	C-2 CANS AREA (SHIPPING CONTAINER STORAGE)
17	SEAPLANE LAGOON
19	YARD D-13 (HAZARDOUS WASTE STORAGE)
20	OAKLAND INNER HARBOR
21	BUILDING 162 (SHIP FITTING AND ENGINE REPAIR)
22	BUILDING 547 (FORMER SERVICE STATION)
23	BUILDING 530 (MISSILE REWORK OPERATIONS)
24	PIER 1 AND 2 SEDIMENTS
25	ESTUARY PARK AND THE COAST GUARD HOUSING AREA
26	WESTERN HANGAR ZONE
27	DOCK ZONE
28	TODD SHIPYARD
29	SKEET RANGE

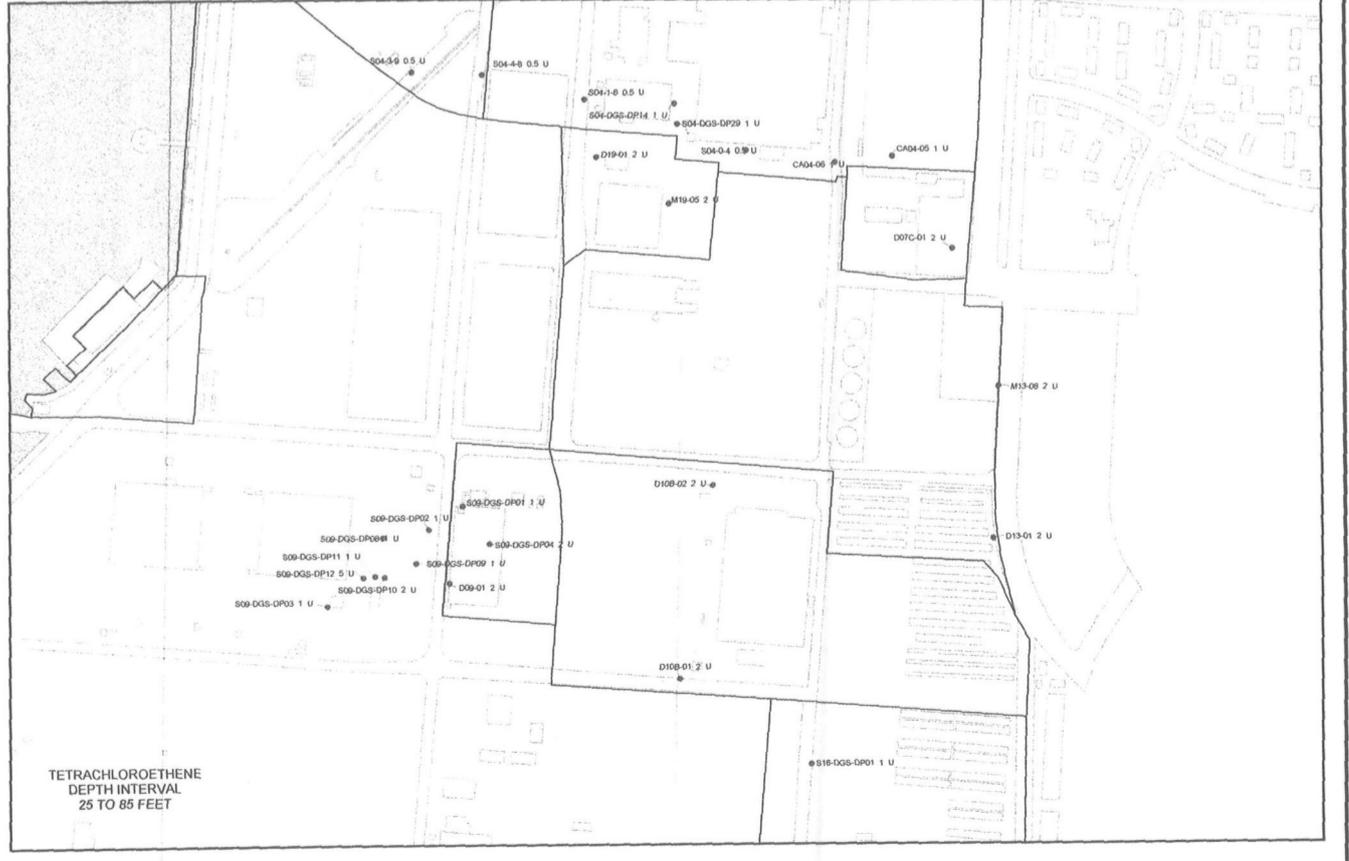
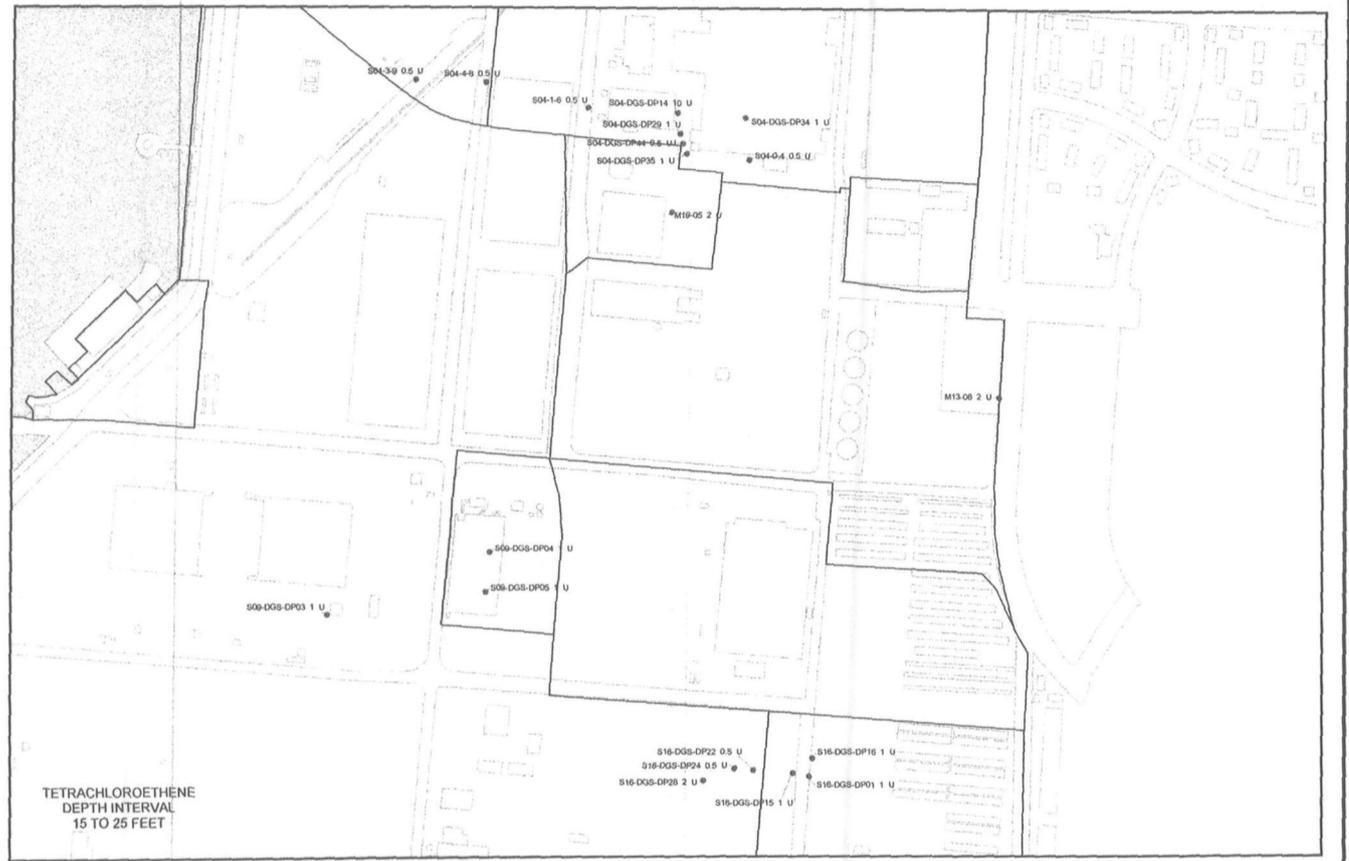
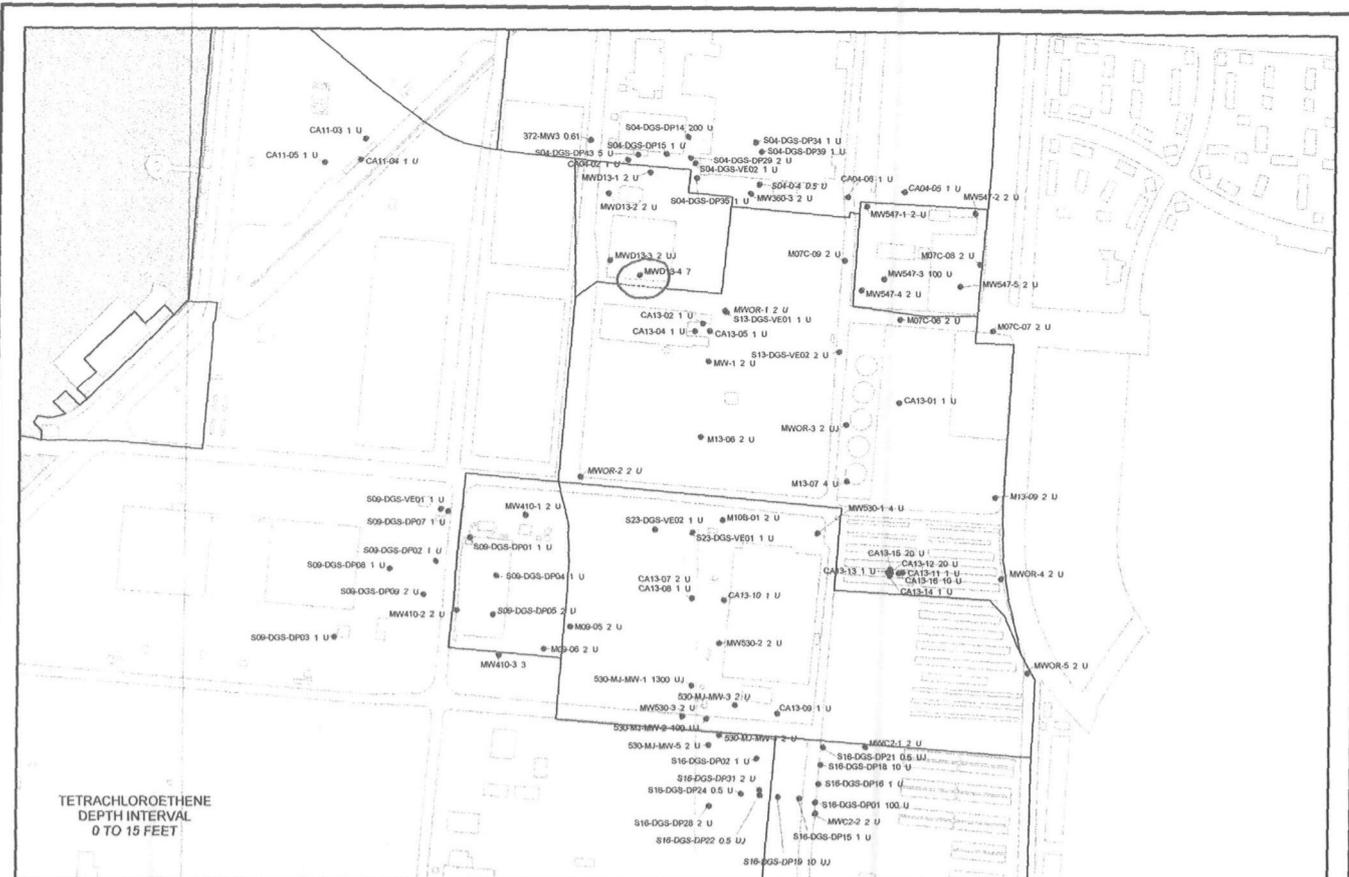


**FIGURE 1.1-2  
OPERABLE UNITS AND  
CERCLA SITES**

ALAMEDA POINT  
ALAMEDA, CALIFORNIA  
MAY 2002







- LEGEND**
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
  - SAMPLING LOCATIONS BELOW THE MCL
  - CERCLA SITE BOUNDARIES
  - ▨ LAND COVER
  - ▭ GROUNDWATER ABOVE MCL
  - ~ MCL LINE FOR TETRACHLOROETHENE

**NOTE:**  
MAXIMUM CONTAMINANT LEVEL FOR TETRACHLOROETHENE = 5.0 ug/L  
ALL RESULTS ARE REPORTED IN ug/L

**QUALIFIERS**  
U - NON-DETECT  
J - ESTIMATED VALUE

**POINT NAME**  
CONCENTRATION QUALIFIER  
806-DGS-DP09 0.05 U

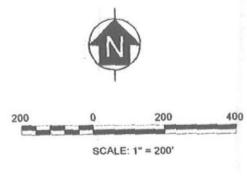
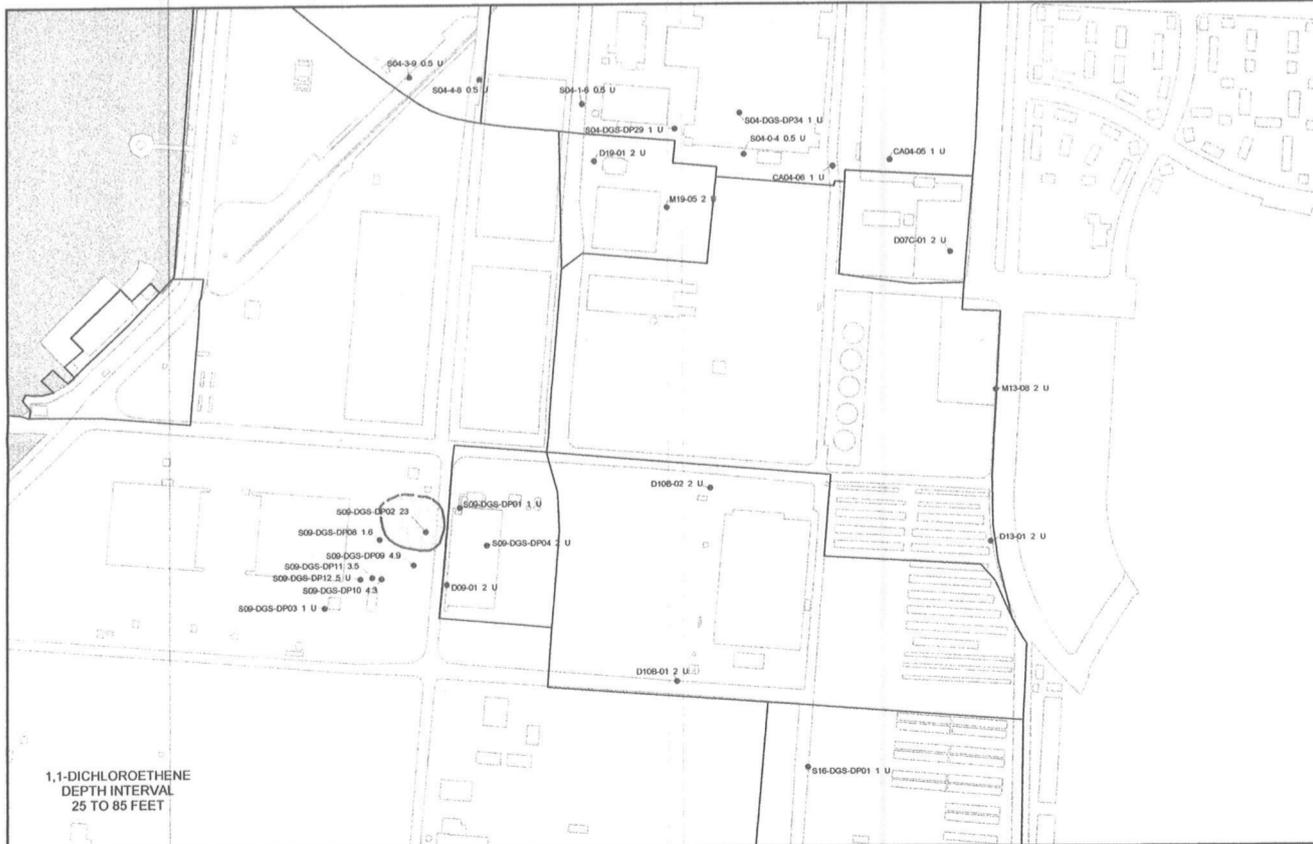
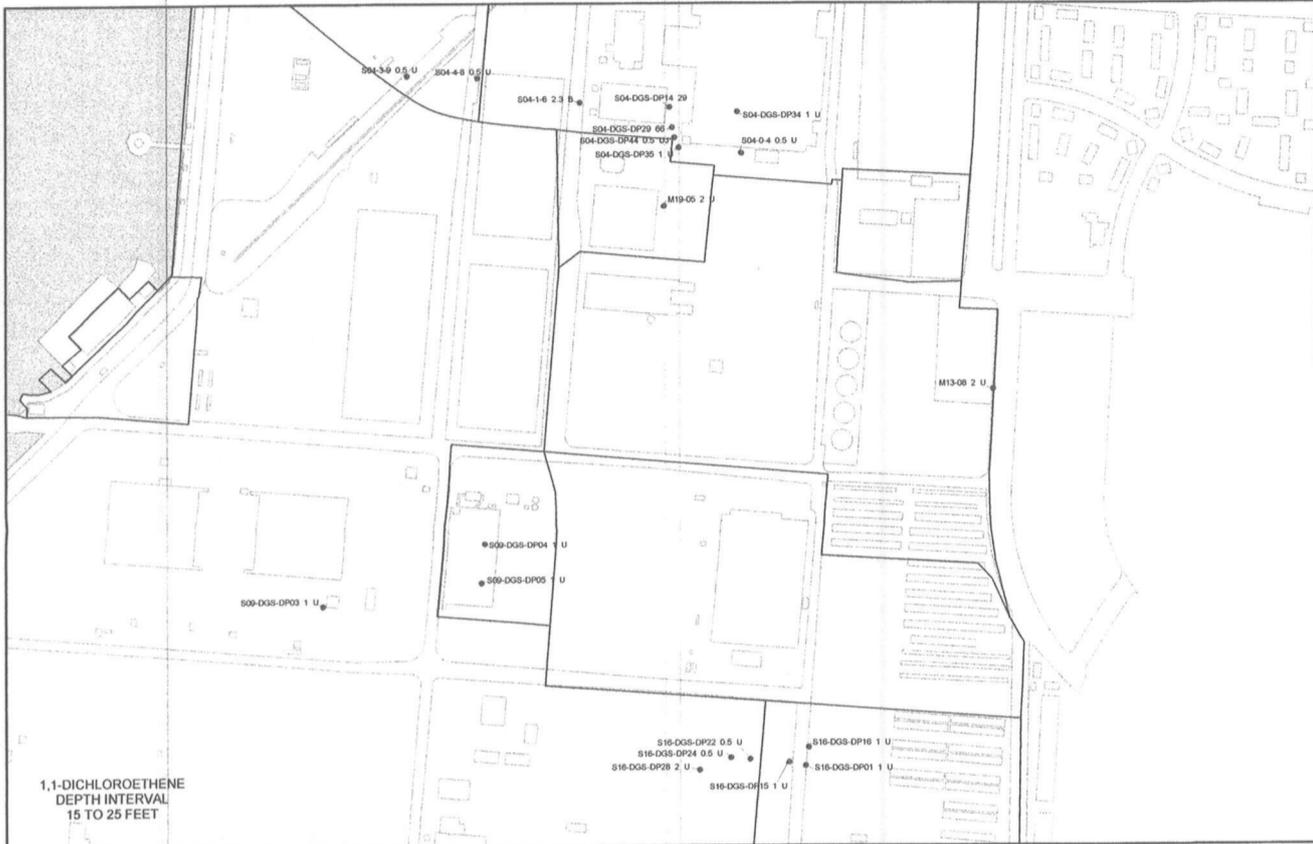
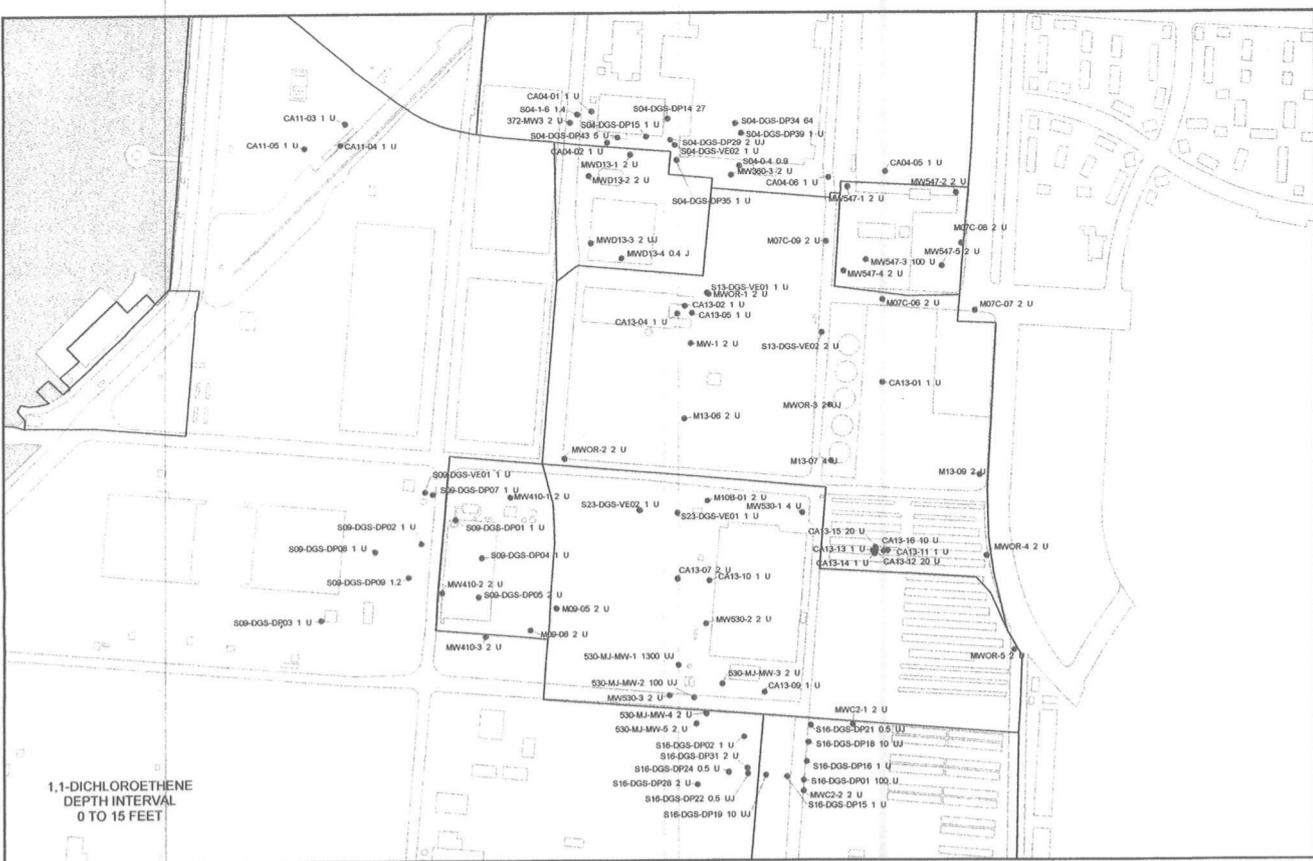


FIGURE 2.1-2  
GROUNDWATER CONTAMINATION PLUME DELINEATION  
TETRACHLOROETHENE  
OPERABLE UNIT 2A, ALAMEDA POINT  
ALAMEDA, CALIFORNIA  
MAY, 2002



DS.0385.15645



**LEGEND**

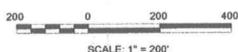
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
- SAMPLING LOCATIONS BELOW THE MCL
- CERCLA SITE BOUNDARIES
- ▨ LAND COVER
- ▭ GROUNDWATER ABOVE MCL
- ▮ MCL LINE FOR 1,1-DICHLOROETHENE

**NOTE:**  
 MAXIMUM CONTAMINANT LEVEL FOR 1,1-DICHLOROETHENE = 6.0 ug/L  
 ALL RESULTS ARE REPORTED IN ug/L

**QUALIFIERS**  
 U- NON-DETECT  
 J- ESTIMATED VALUE

**CONCENTRATION QUALIFIER**

**POINT NAME**  
 S06-DGS-DP09 0.05 U

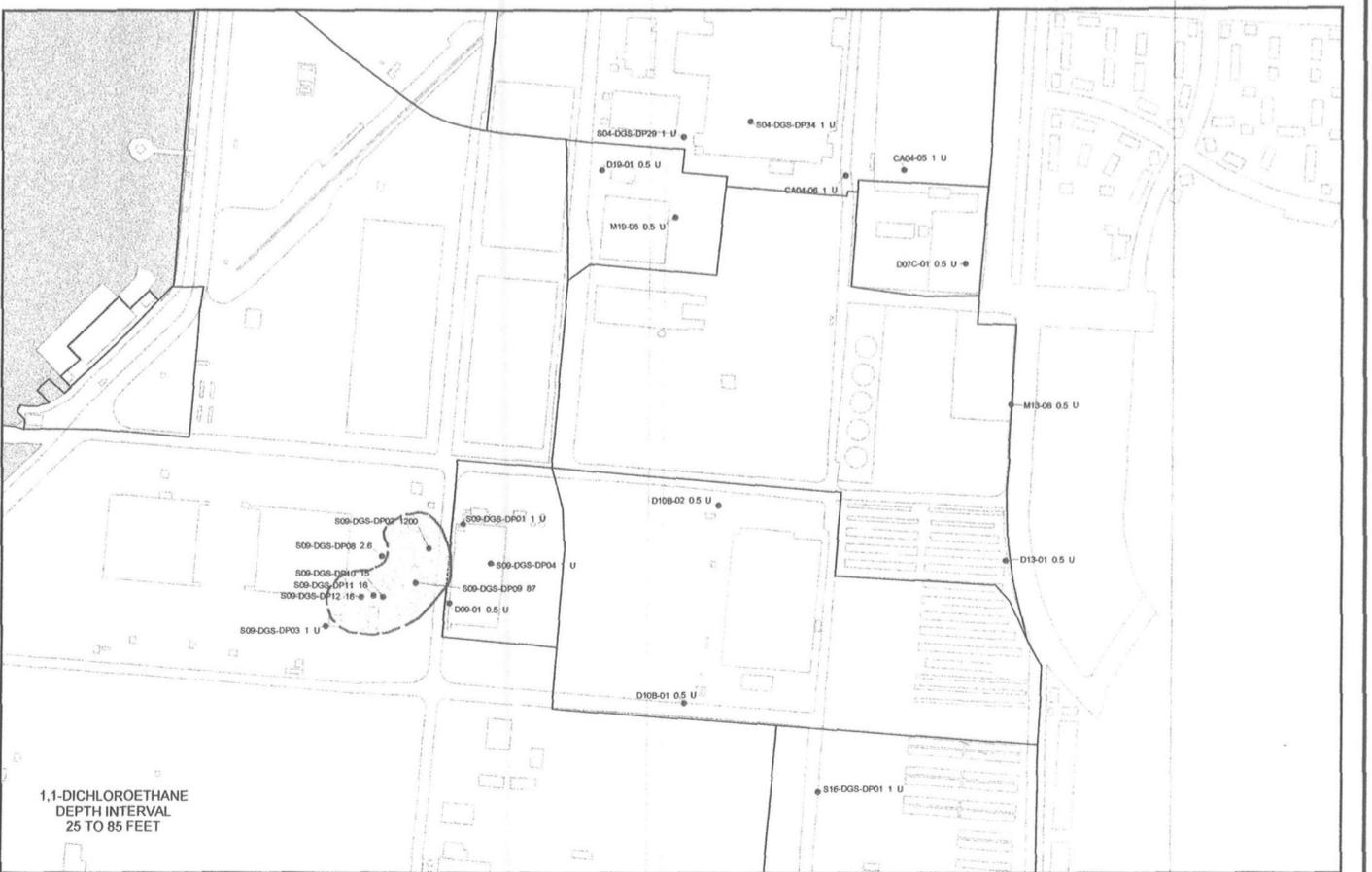
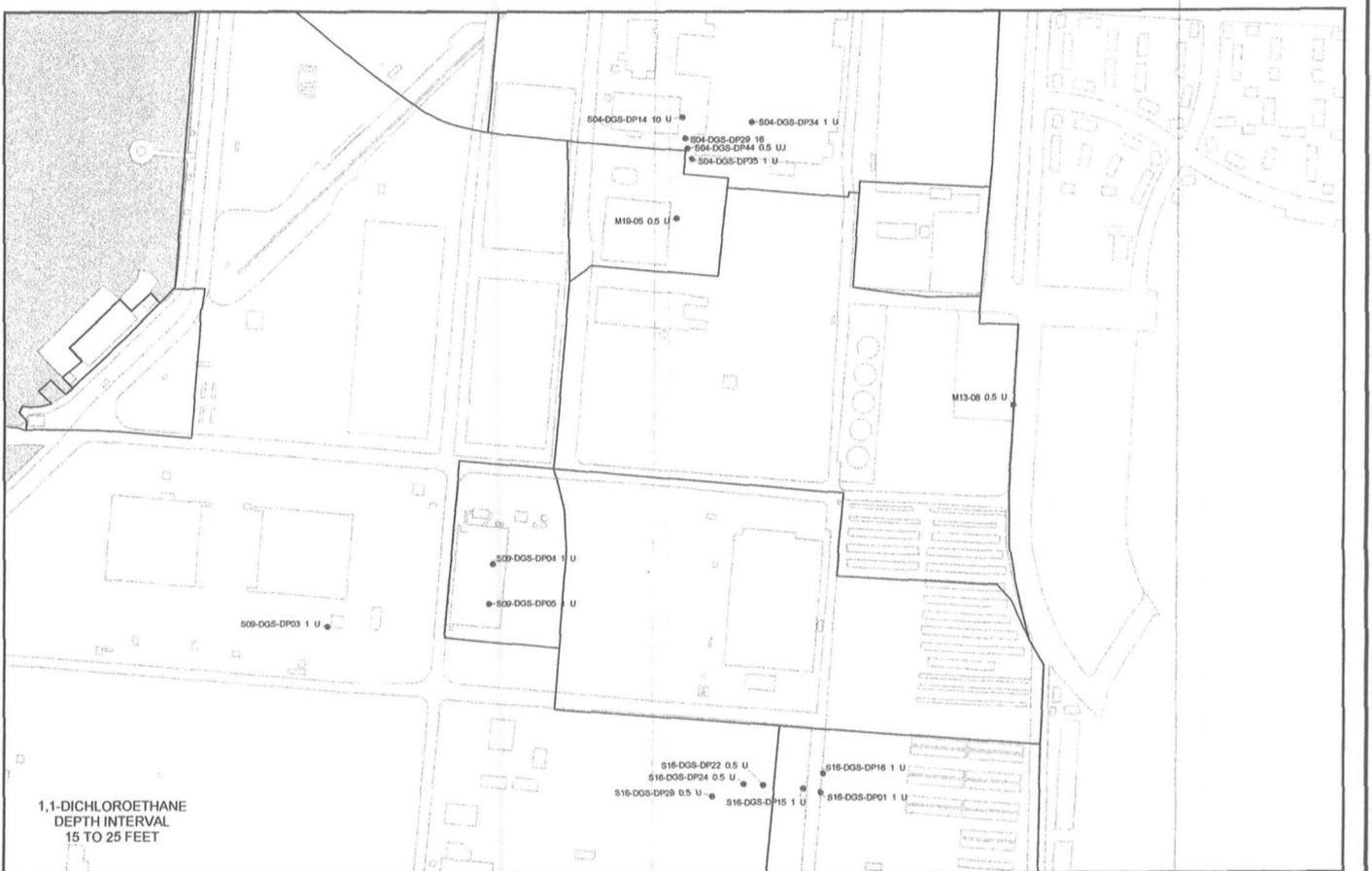
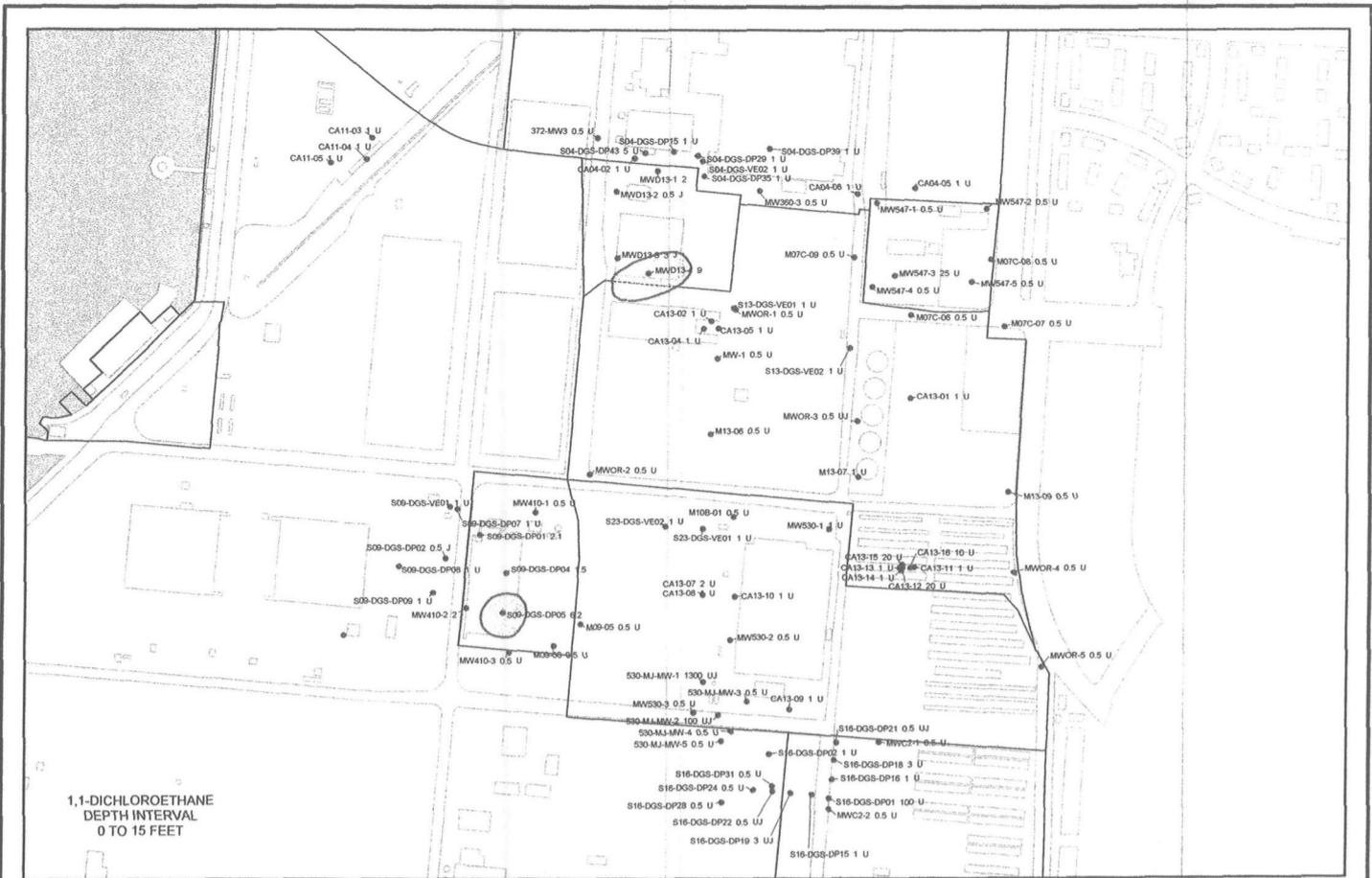


SCALE: 1" = 200'

**FIGURE 2.1-3**  
 GROUNDWATER CONTAMINATION PLUME DELINEATION  
 1,1-DICHLOROETHENE  
 OPERABLE UNIT 2A, ALAMEDA POINT  
 ALAMEDA, CALIFORNIA  
 MAY, 2002

**Tt Tetra Tech EM Inc.**

DS.0385.15645



**LEGEND**

- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
- SAMPLING LOCATIONS BELOW THE MCL
- CERCLA SITE BOUNDARIES
- ▨ LAND COVER
- ▨ GROUNDWATER ABOVE MCL
- ▨ MCL LINE FOR 1,1-DICHLOROETHANE

**NOTE:**

MAXIMUM CONTAMINANT LEVEL FOR 1,1-DICHLOROETHANE = 5.0 ug/L  
ALL RESULTS ARE REPORTED IN ug/L

**QUALIFIERS**

- U - NON-DETECT
- J - ESTIMATED VALUE

CONCENTRATION QUALIFIER  
POINT NAME  
S06-DGS-DP09 0.05 U

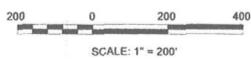
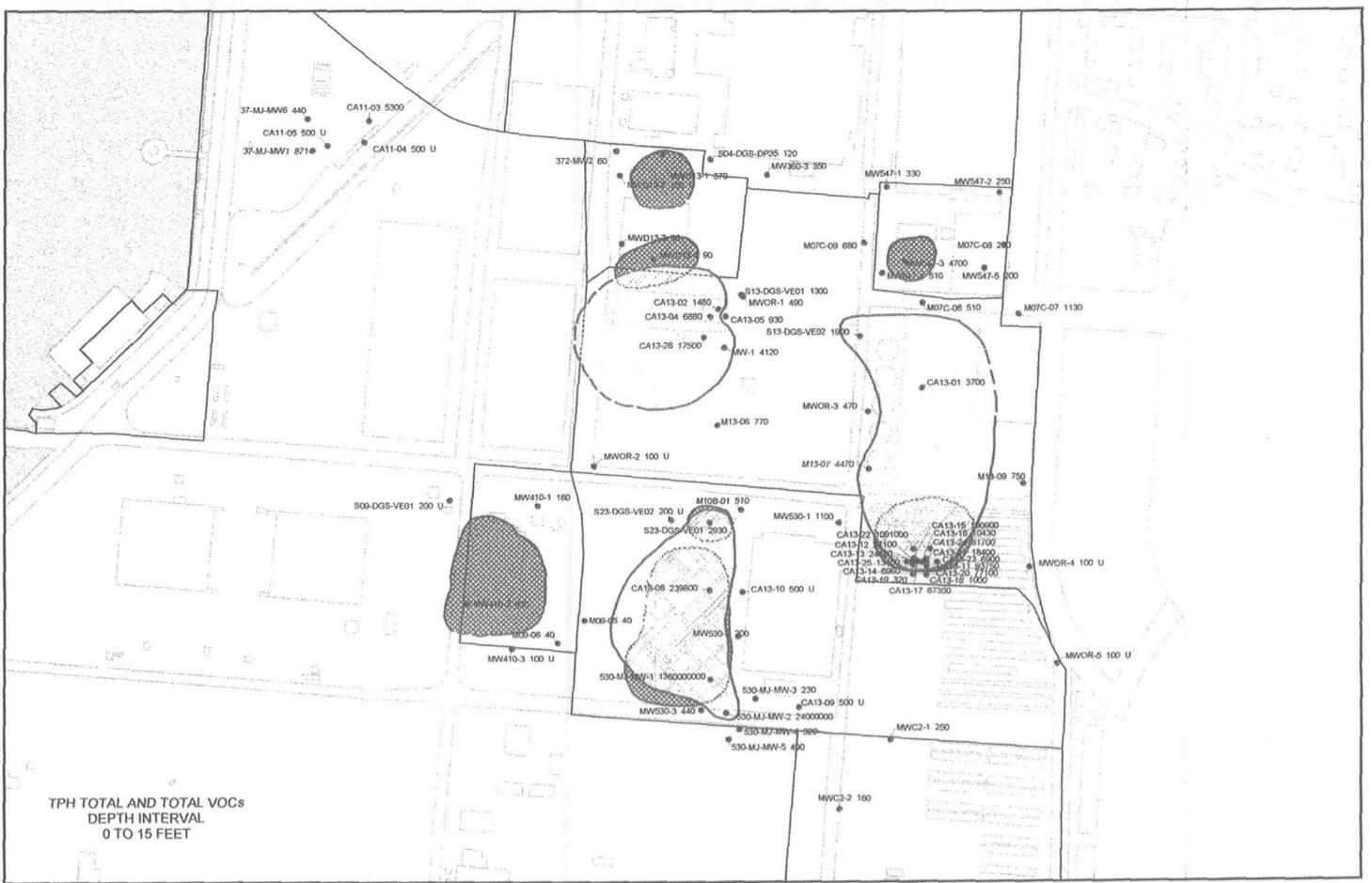


FIGURE 2.1-4  
GROUNDWATER CONTAMINATION PLUME DELINEATION  
1,1-DICHLOROETHANE  
OPERABLE UNIT 2A, ALAMEDA POINT  
ALAMEDA, CALIFORNIA  
MAY, 2002



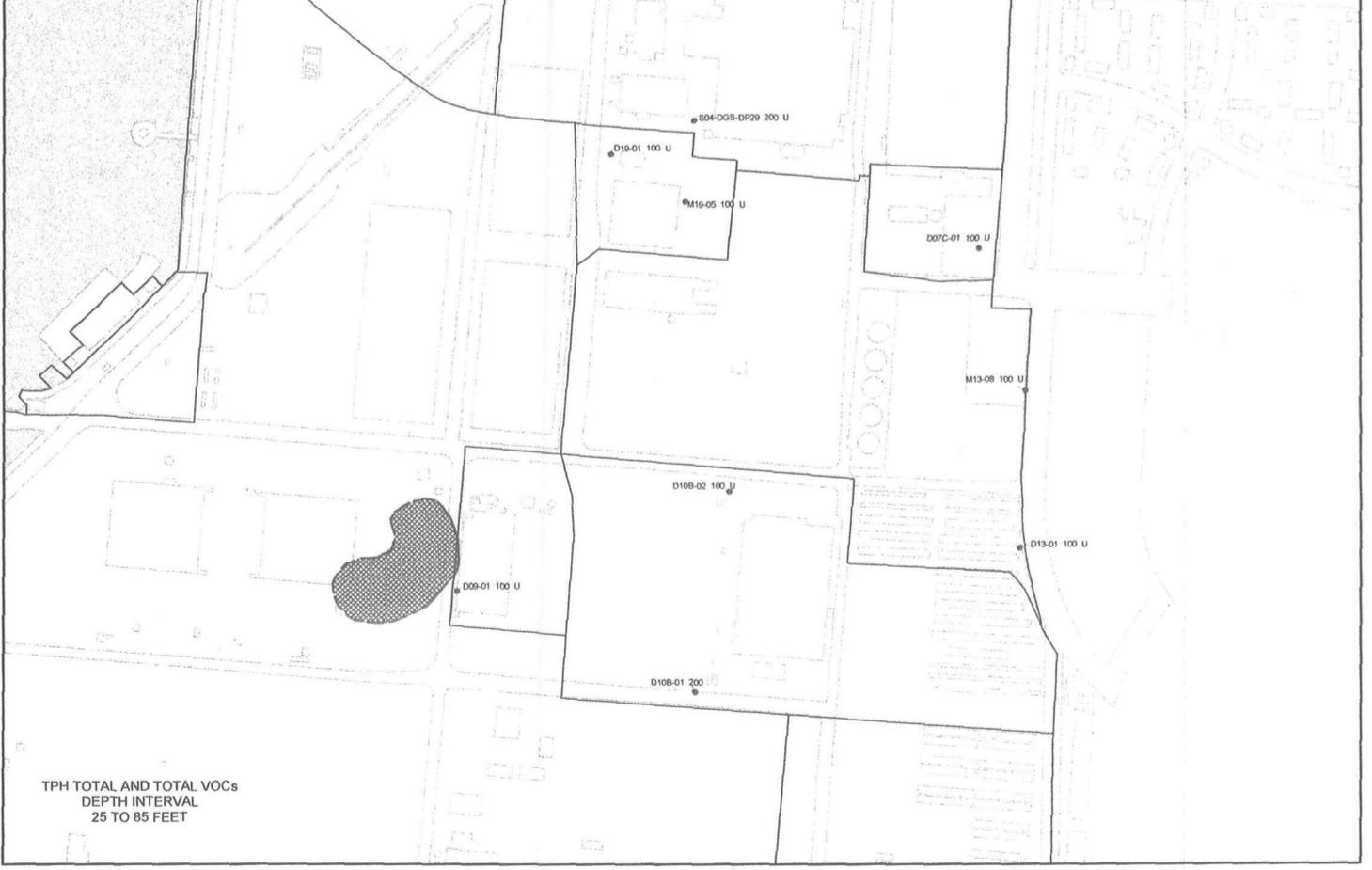




TPH TOTAL AND TOTAL VOCs  
DEPTH INTERVAL  
0 TO 15 FEET



TPH TOTAL AND TOTAL VOCs  
DEPTH INTERVAL  
15 TO 25 FEET



TPH TOTAL AND TOTAL VOCs  
DEPTH INTERVAL  
25 TO 85 FEET

- LEGEND**
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
  - SAMPLING LOCATIONS BELOW THE MCL
  - CERCLA SITE BOUNDARIES
  - LAND COVER
  - GROUNDWATER ABOVE MCL
  - ▨ TOTAL VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
  - MCL LINE FOR TPH TOTAL

NOTE:  
MAXIMUM CONTAMINANT LEVEL FOR  
TPH TOTAL = 1400 ug/L  
ALL RESULTS ARE REPORTED IN ug/L

QUALIFIERS  
U- NON-DETECT  
J- ESTIMATED VALUE

POINT NAME	CONCENTRATION	QUALIFIER
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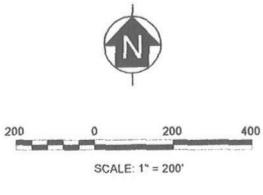
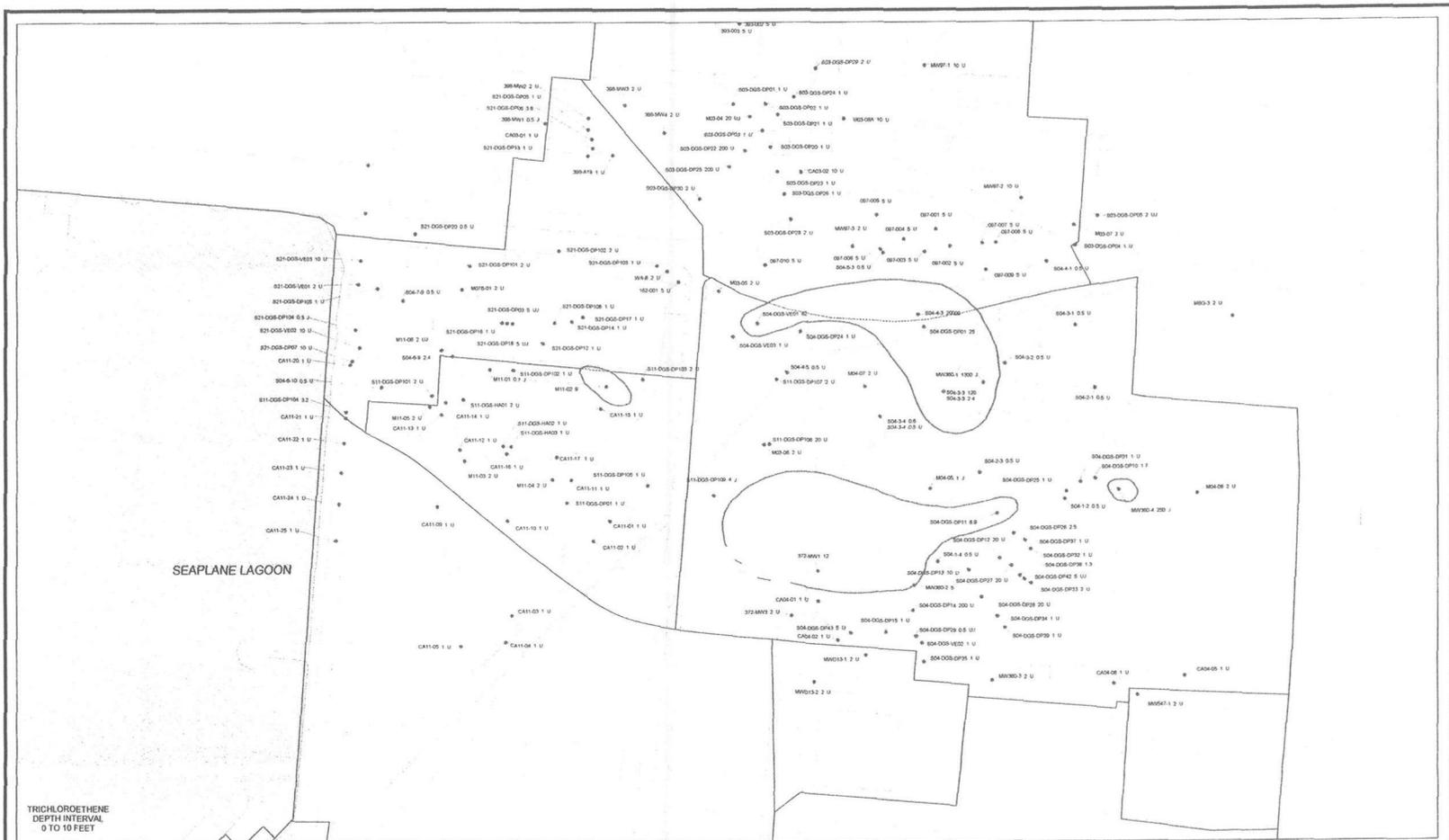


FIGURE 2.1-7  
GROUNDWATER CONTAMINATION PLUME DELINEATION  
TPH TOTAL AND TOTAL VOCs  
OPERABLE UNIT 2A, ALAMEDA POINT  
ALAMEDA, CALIFORNIA  
MAY, 2002







- LEGEND**
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
  - SAMPLING LOCATIONS BELOW THE MCL
  - LAND COVER
  - CERCLA SITE BOUNDARIES
  - GROUNDWATER ABOVE MCL
  - MCL LINE FOR TRICHLOROETHENE

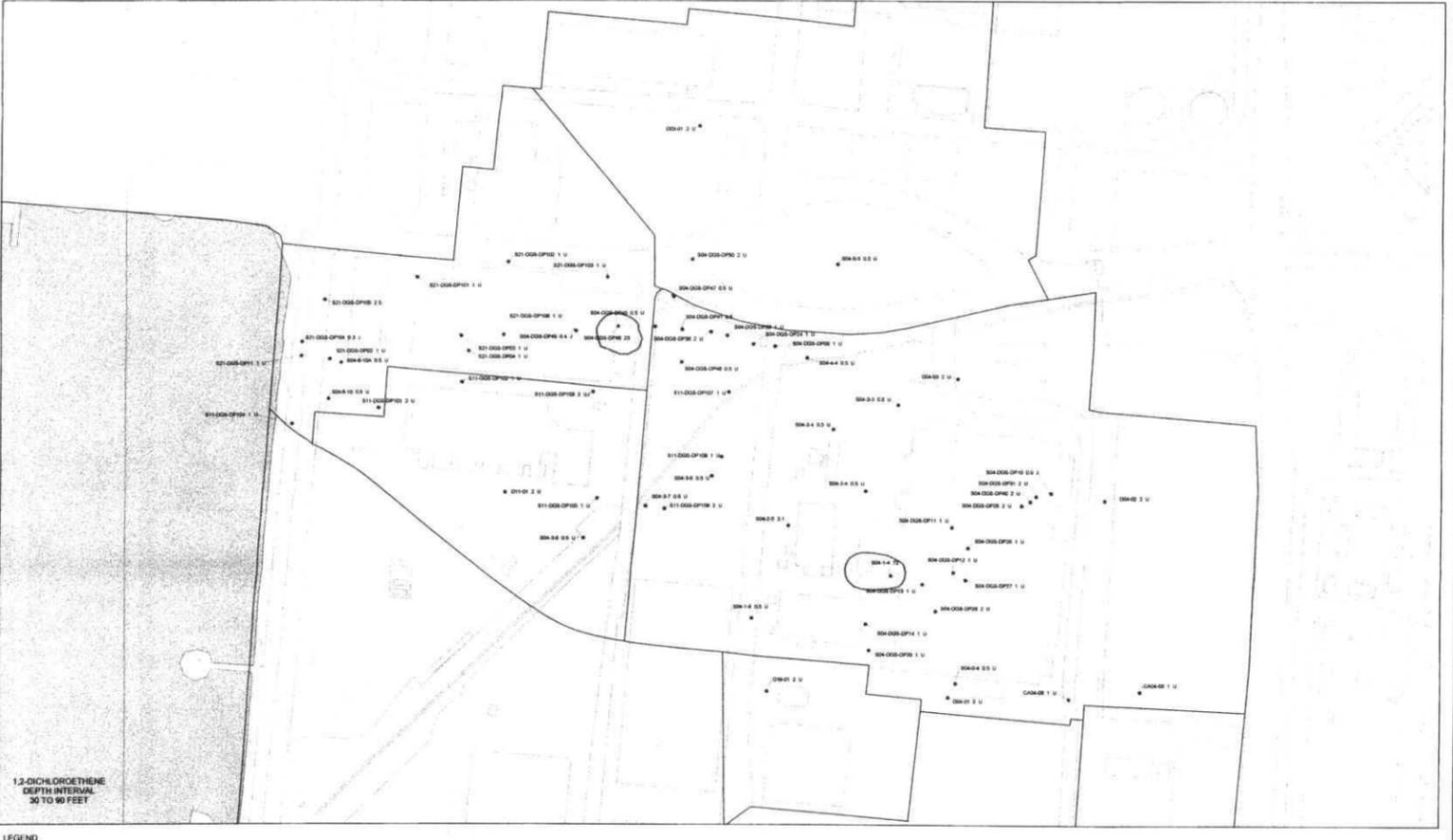
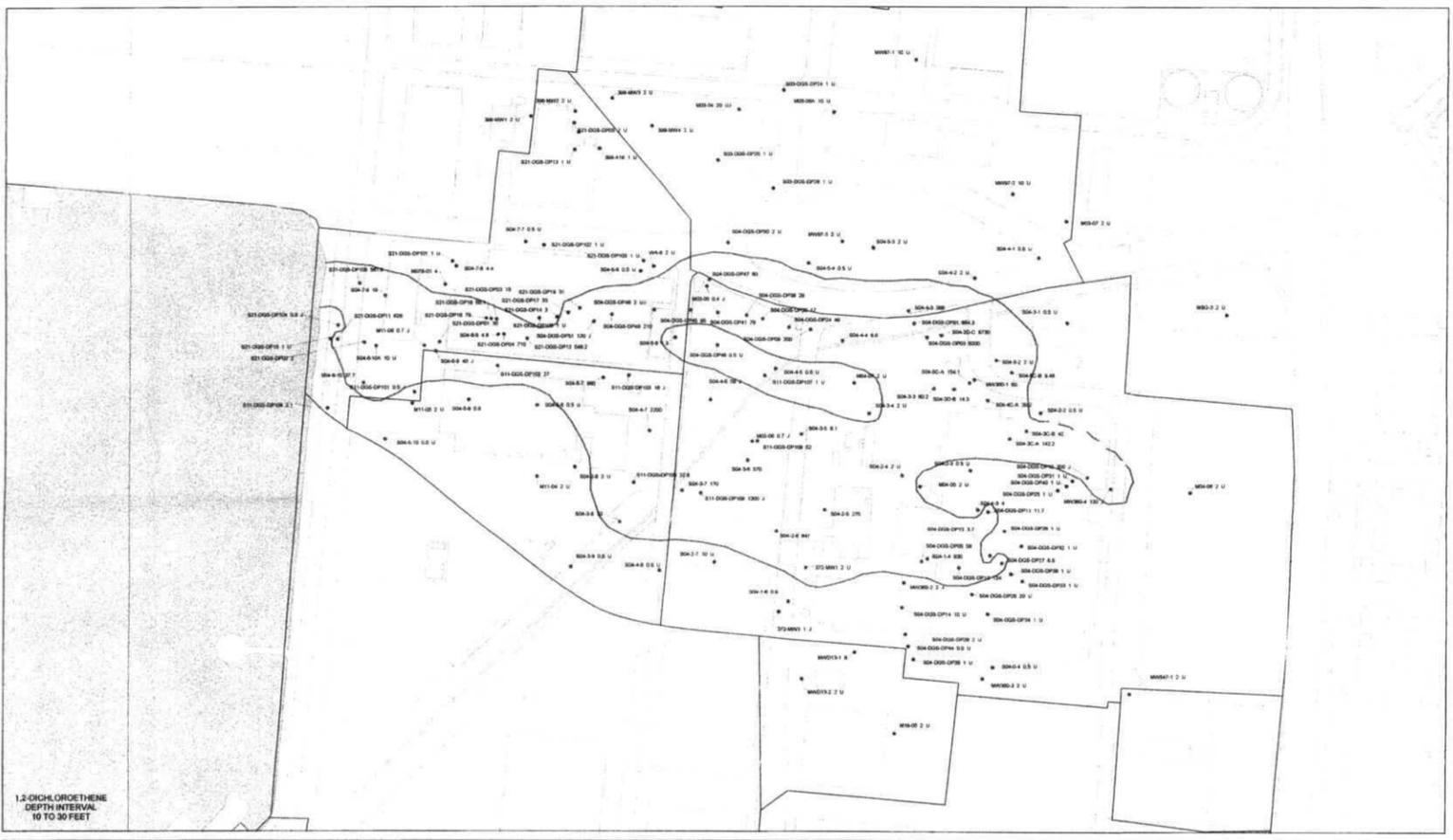
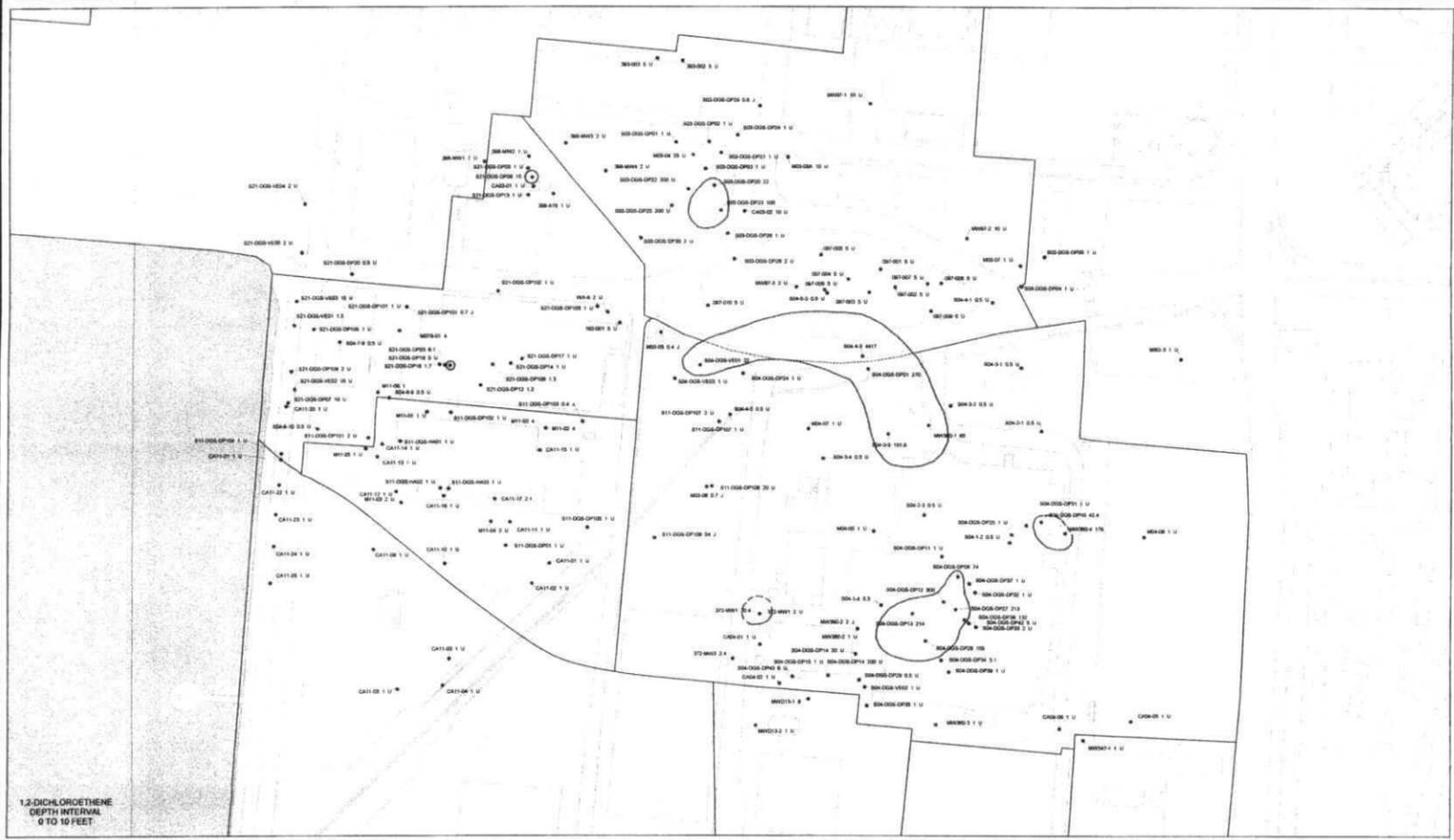
**NOTE:**  
 MAXIMUM CONTAMINANT LEVEL FOR TRICHLOROETHENE = 5.0 ug/L  
 ALL RESULTS ARE REPORTED IN ug/L  
 QUALIFIERS  
 U - NON-DETECT  
 J - ESTIMATED VALUE  
 CONCENTRATION QUALIFIER  
 POINT NAME

S04-DOS-DP109 0.05 U



50 0 50 100  
 SCALE: 1" = 50'

**FIGURE 2.1-9**  
 GROUNDWATER CONTAMINATION PLUME DELINEATION  
 TRICHLOROETHENE PLUMES  
 OPERABLE UNIT 20, ALAMEDA POINT  
 ALAMEDA, CALIFORNIA  
 APRIL, 2002



**LEGEND**

- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
- SAMPLING LOCATIONS BELOW THE MCL
- LAND COVER
- CERCLA SITE BOUNDARIES
- GROUNDWATER ABOVE MCL
- MCL LINE FOR 1,2-DICHLOROETHENE

**NOTE:**  
 MAXIMUM CONTAMINANT LEVEL FOR 1,2-DICHLOROETHENE = 6.0 ug/L  
 ALL RESULTS ARE REPORTED IN ug/L

**QUALIFIERS**  
 U - NON-DETECT  
 J - ESTIMATED VALUE

**CONCENTRATION QUALIFIER**  
 POINT NAME  
 S04-DGS-DP109 0.05 U

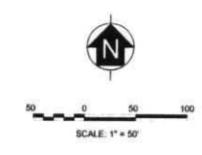
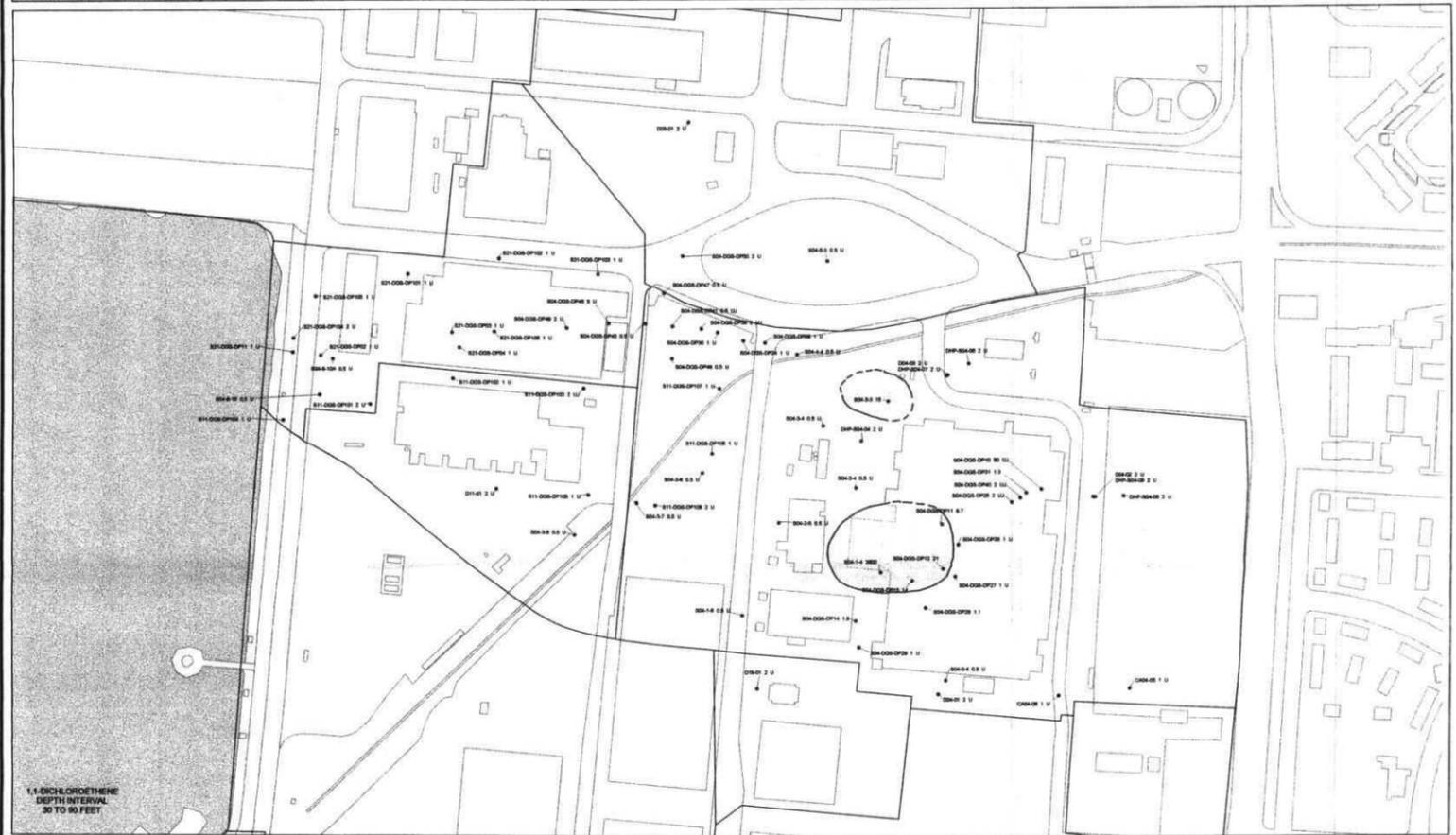
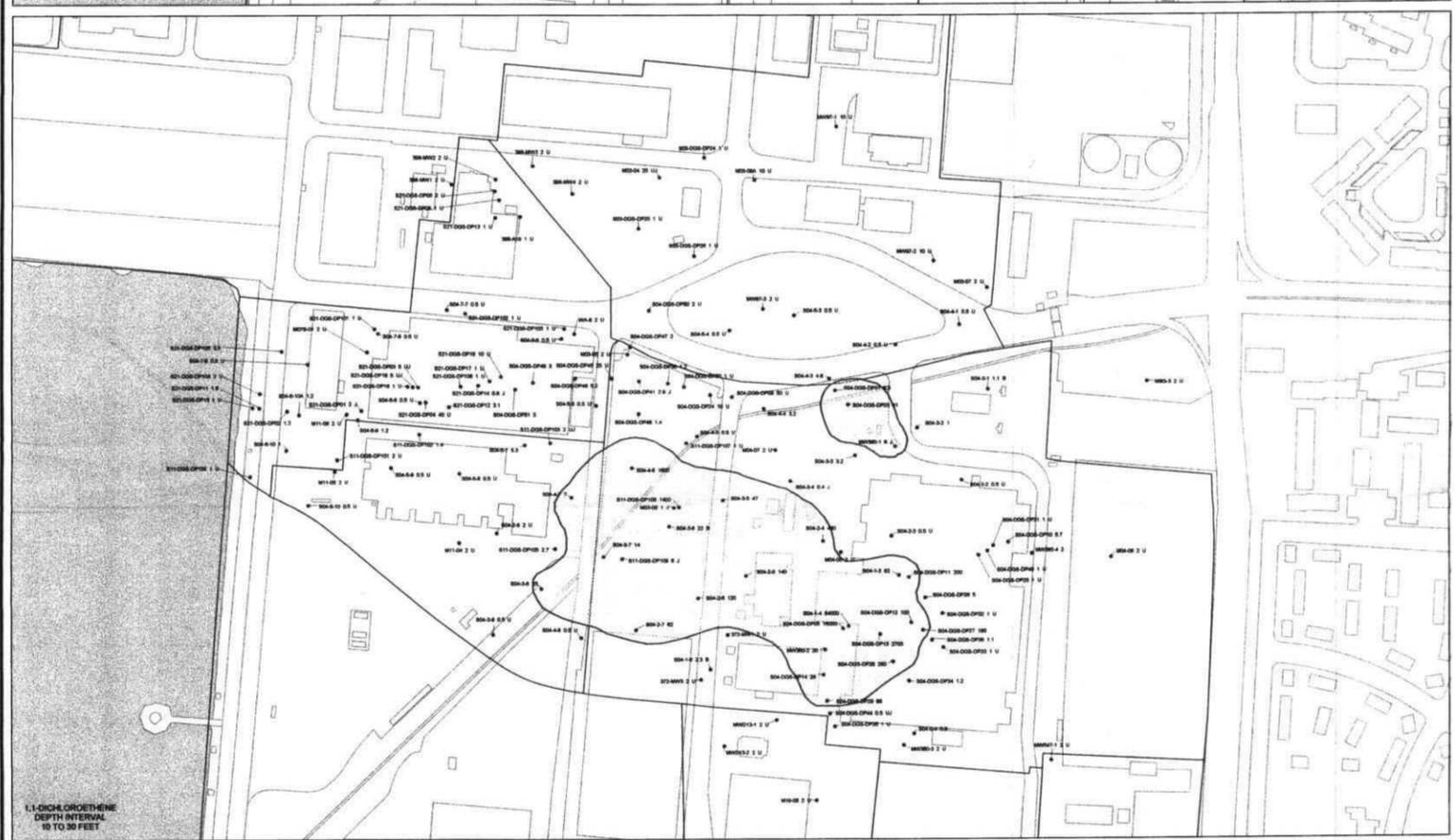
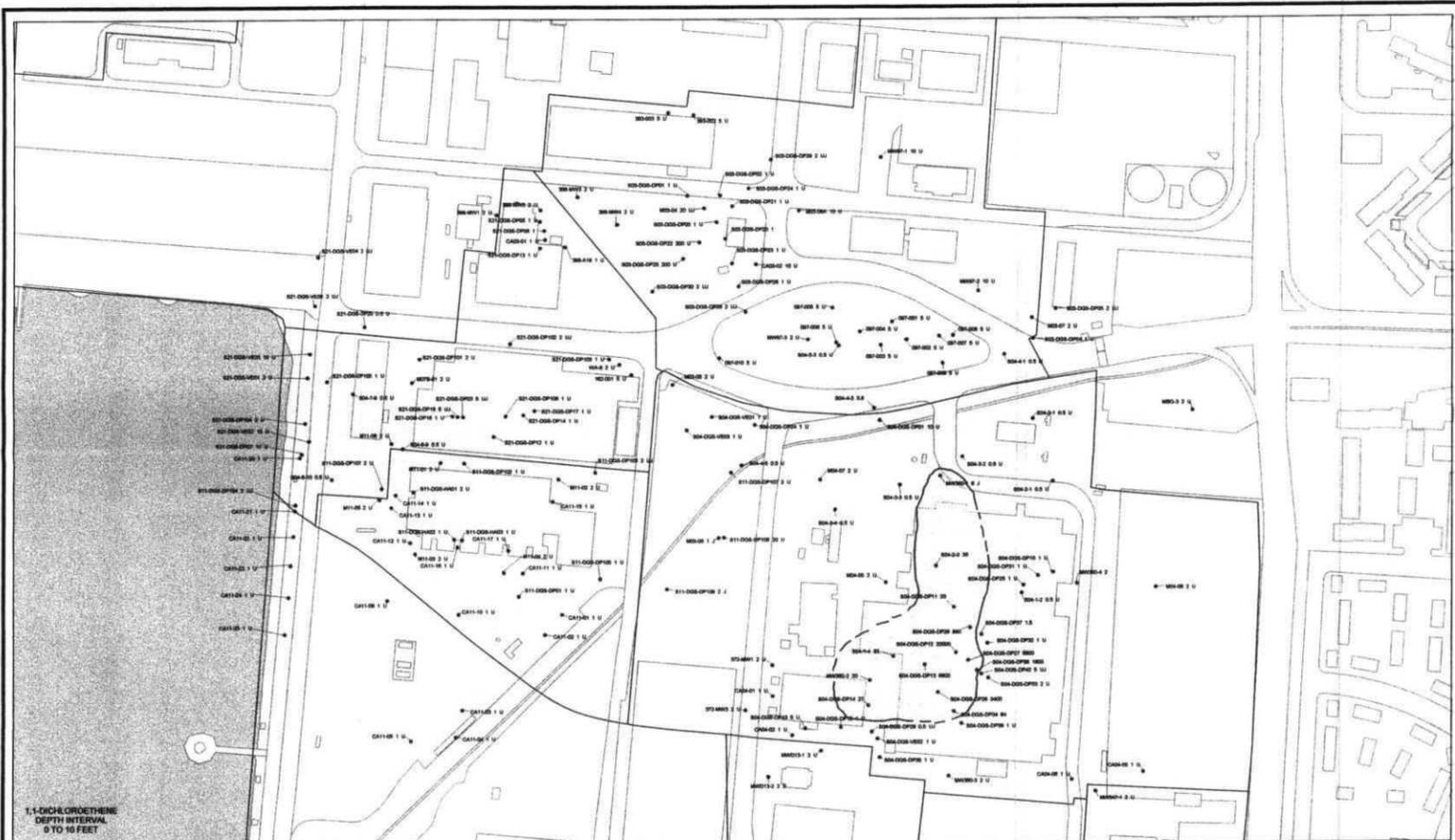


FIGURE 2.1-10  
 GROUNDWATER CONTAMINATION PLUME DELINEATION  
 1,2-DICHLOROETHENE (TOTAL PLUMES)  
 OPERABLE UNIT 28, ALAMEDA POINT  
 ALAMEDA, CALIFORNIA  
 APRIL 2002

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 05.0385.15645

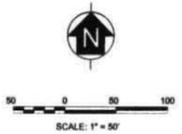


- LEGEND**
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
  - SAMPLING LOCATIONS BELOW THE MCL
  - ▭ LAND COVER
  - ▭ CERCLA SITE BOUNDARIES
  - ▭ GROUNDWATER ABOVE MCL
  - MCL LINE FOR 1,1-DICHLOROETHENE

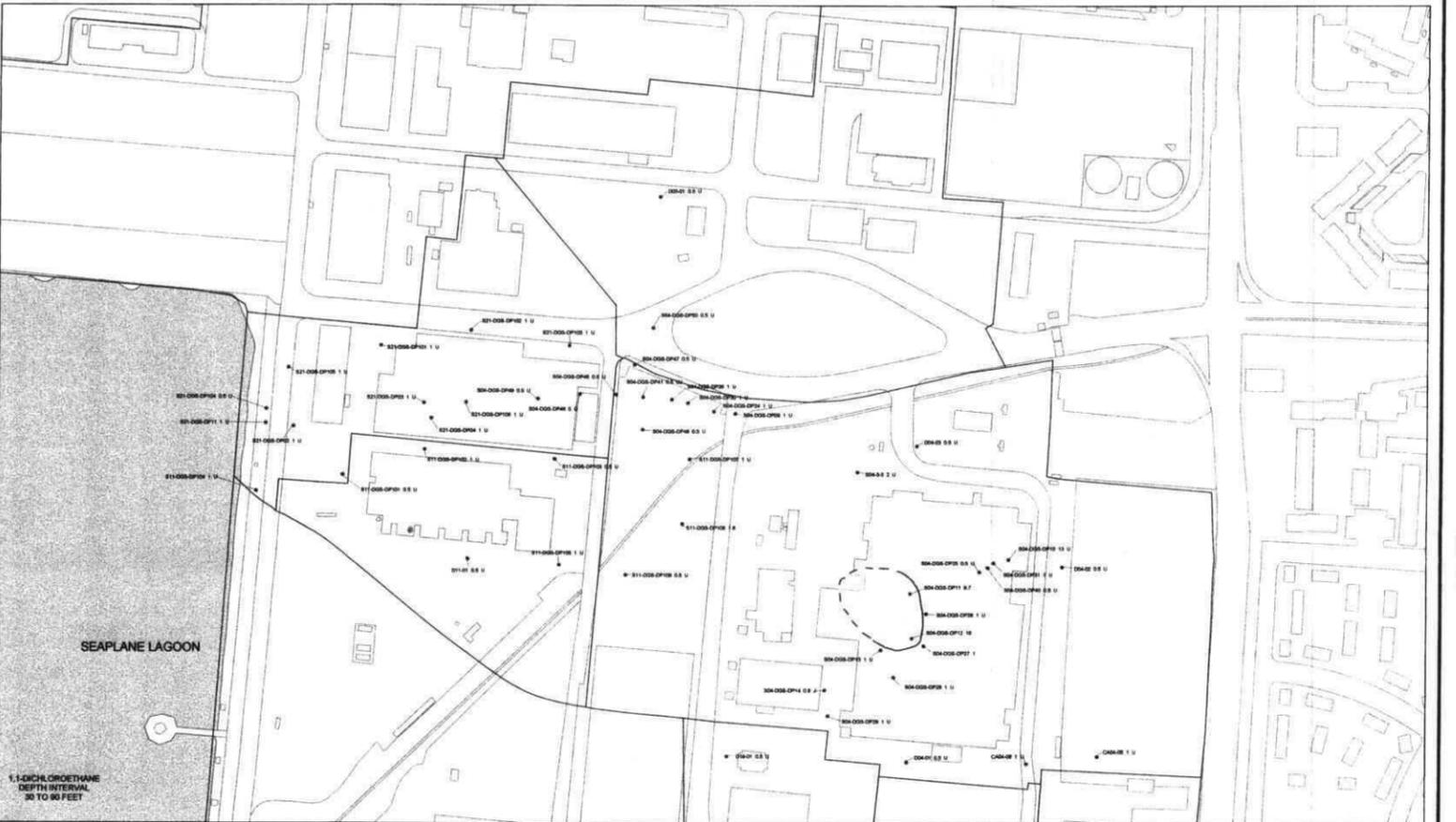
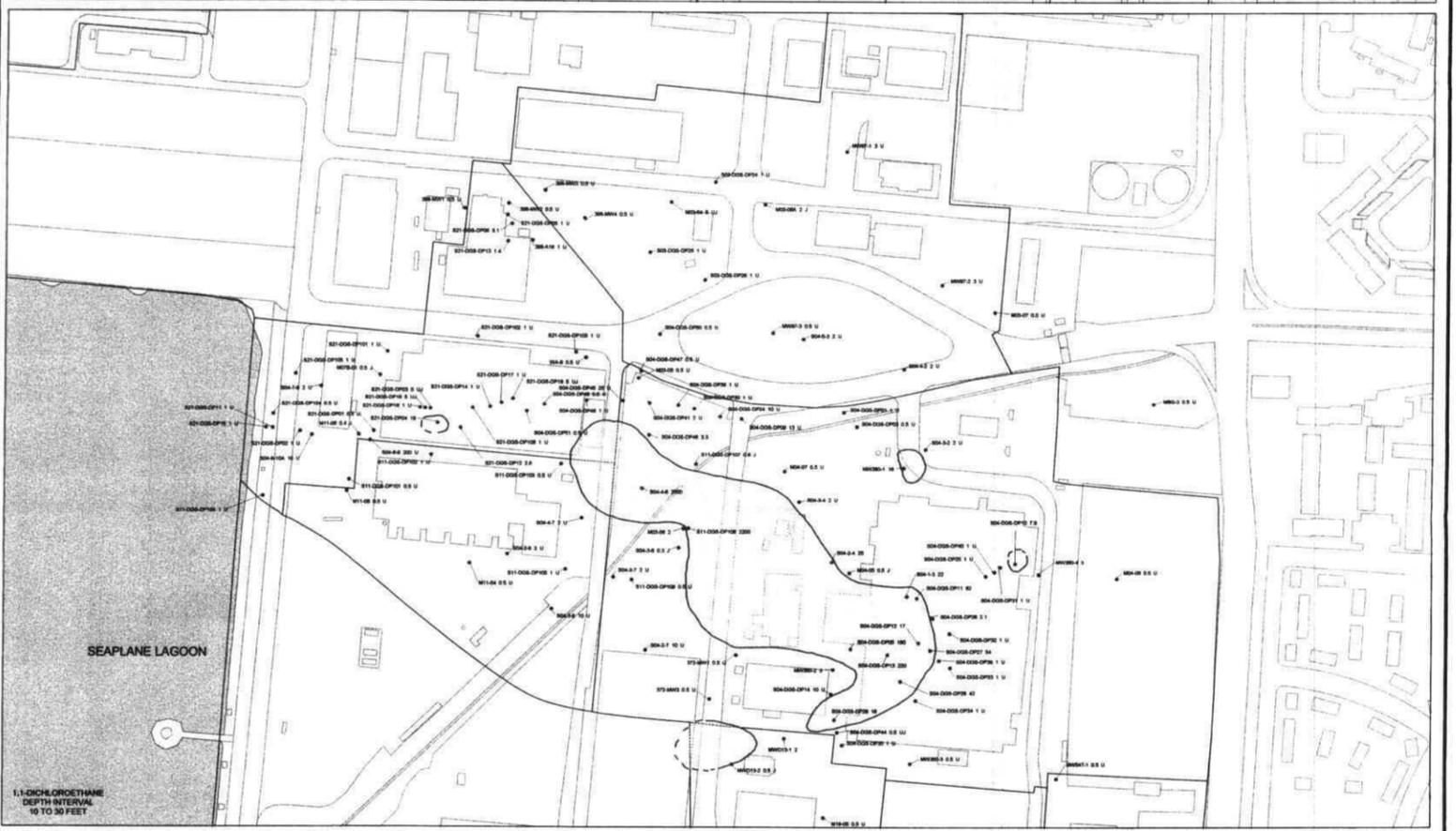
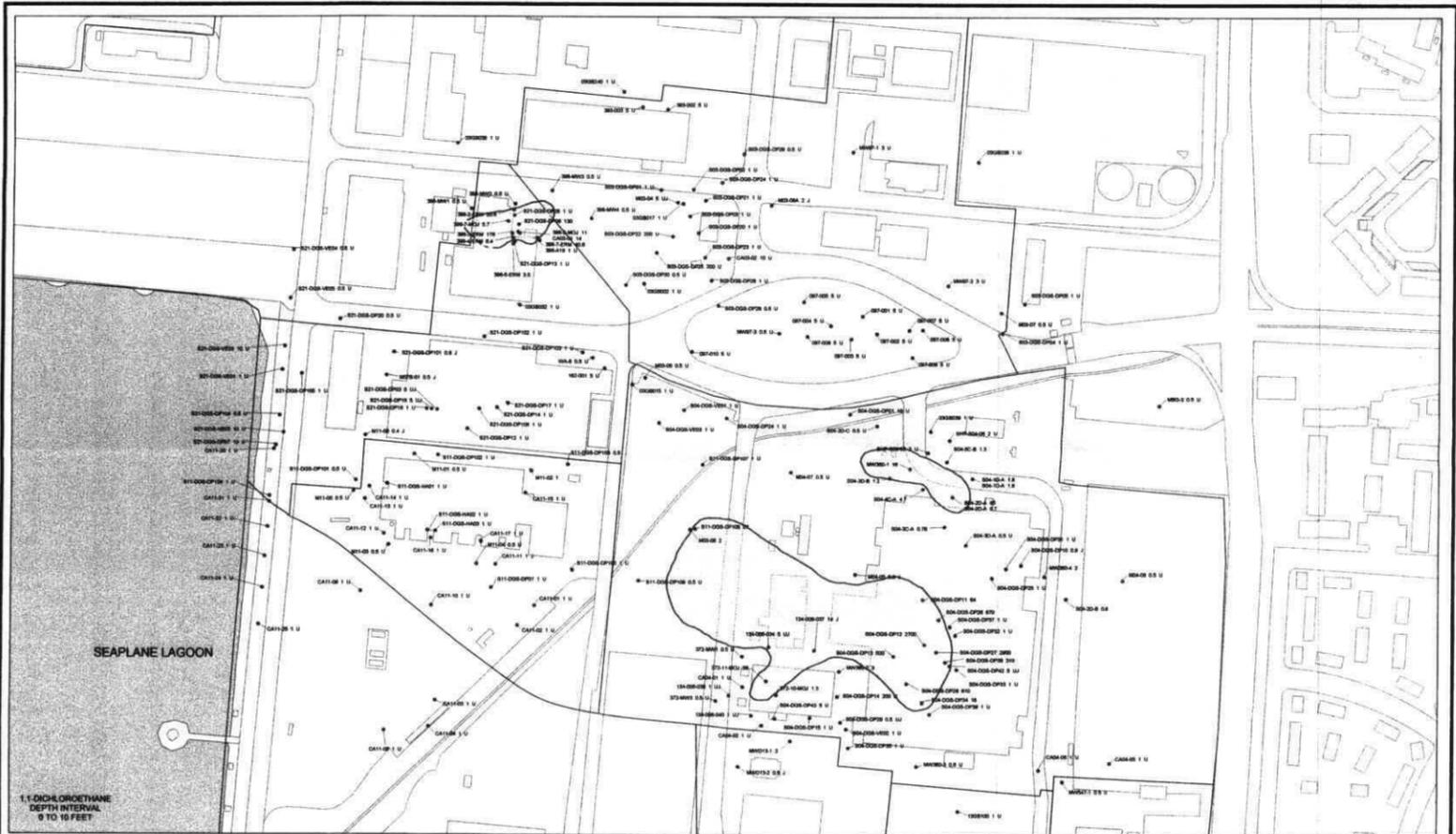
**NOTE:**  
 MAXIMUM CONTAMINANT LEVEL FOR 1,1-DICHLOROETHENE = 6.0 ug/L  
 ALL RESULTS ARE REPORTED IN ug/L

**QUALIFIERS**  
 U- NON-DETECT  
 J- ESTIMATED VALUE  
 CONCENTRATION QUALIFIER

**POINT NAME**  
 S04-DGS-OP109 0.05 U



**FIGURE 2.1-11**  
 GROUNDWATER CONTAMINATION PLUME DELINEATION  
 1,1-DICHLOROETHENE PLUMES  
 OPERABLE UNIT 28, ALAMEDA POINT  
 ALAMEDA, CALIFORNIA  
 APRIL 2002



- LEGEND**
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
  - SAMPLING LOCATIONS BELOW THE MCL
  - ▭ LAND COVER
  - ▭ CERCLA SITE BOUNDARIES
  - ▭ GROUNDWATER ABOVE MCL
  - ▭ MCL LINE FOR 1,1-DICHLOROETHANE

**NOTE**  
 MAXIMUM CONTAMINANT LEVEL FOR 1,1-DICHLOROETHANE = 5.0 ug/L  
 ALL RESULTS ARE REPORTED IN ug/L  
 QUALIFIERS  
 U- NON-DETECT  
 J- ESTIMATED VALUE

**CONCENTRATION QUALIFIER**  
 POINT NAME  
 S04-DGS-OP109 0.05 U

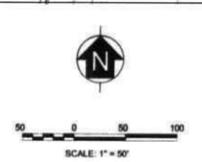
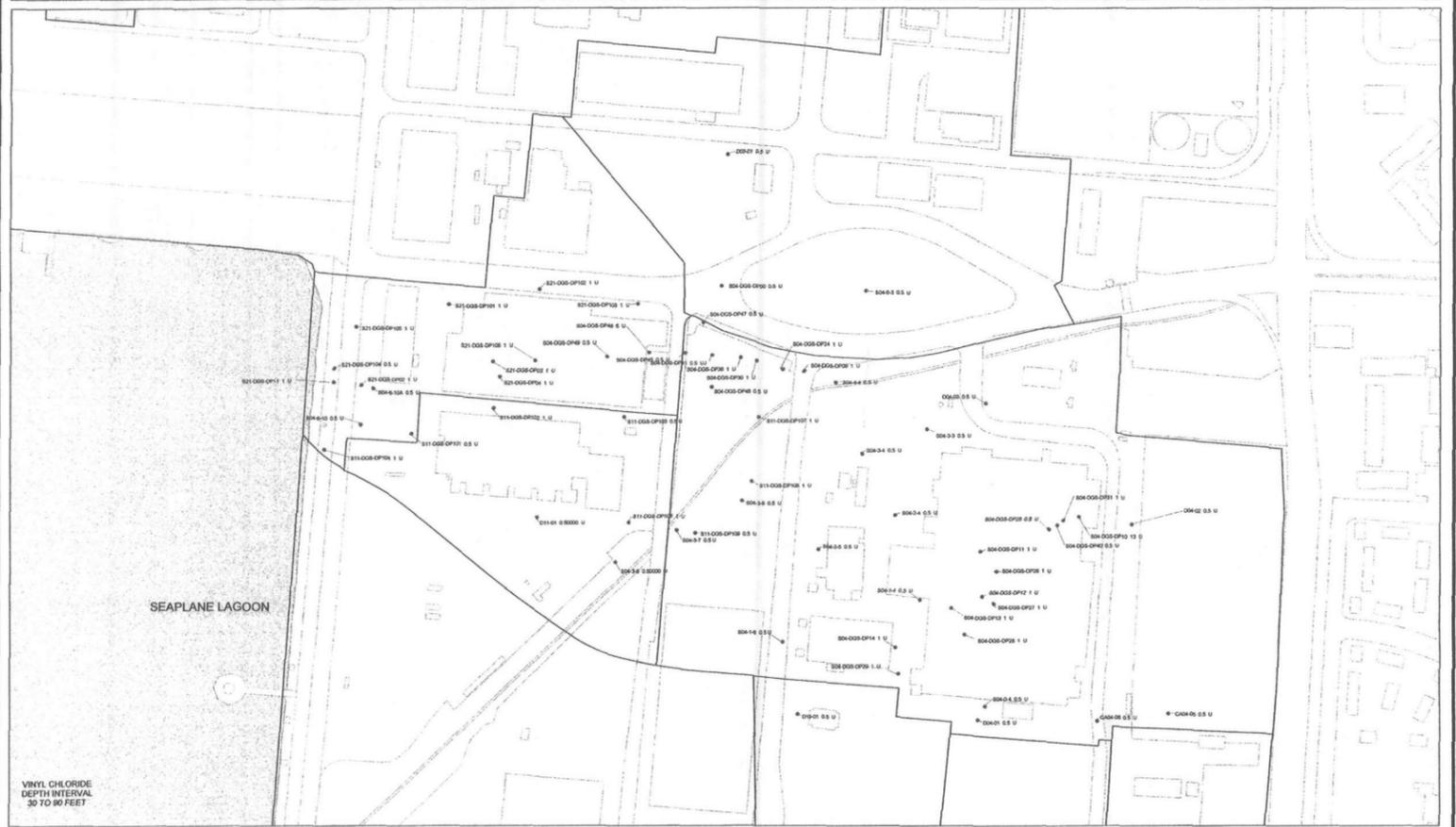
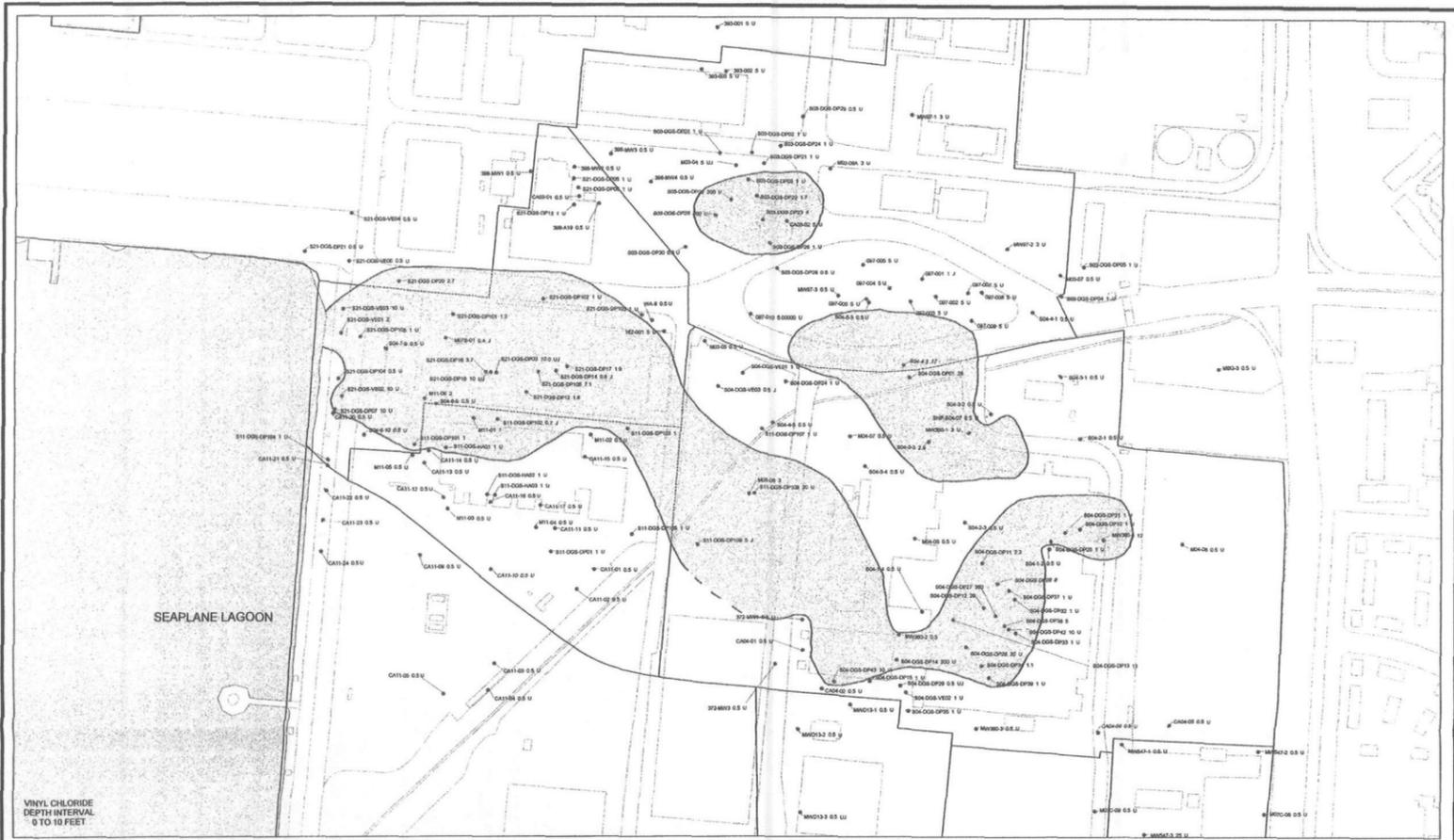


FIGURE 2.1-12  
 GROUNDWATER CONTAMINATION PLUME DELINEATION  
 1,1-DICHLOROETHANE PLUMES  
 OPERABLE UNIT 28, ALAMEDA POINT  
 ALAMEDA, CALIFORNIA  
 APRIL 2002



- LEGEND**
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
  - SAMPLING LOCATIONS BELOW THE MCL
  - LAND COVER
  - CERCLA SITE BOUNDARIES
  - ▨ GROUNDWATER ABOVE MCL
  - MCL LINE FOR VINYL CHLORIDE

**NOTE:**  
 MAXIMUM CONTAMINANT LEVEL FOR VINYL CHLORIDE = 0.5 ug/L.  
 ALL RESULTS ARE REPORTED IN ug/L.

**QUALIFIERS**  
 U - NON DETECT  
 J - ESTIMATED VALUE

**CONCENTRATION QUALIFIER**

**POINT NAME**  
 S04-DSS-DP109 0.05 U

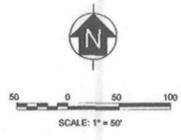
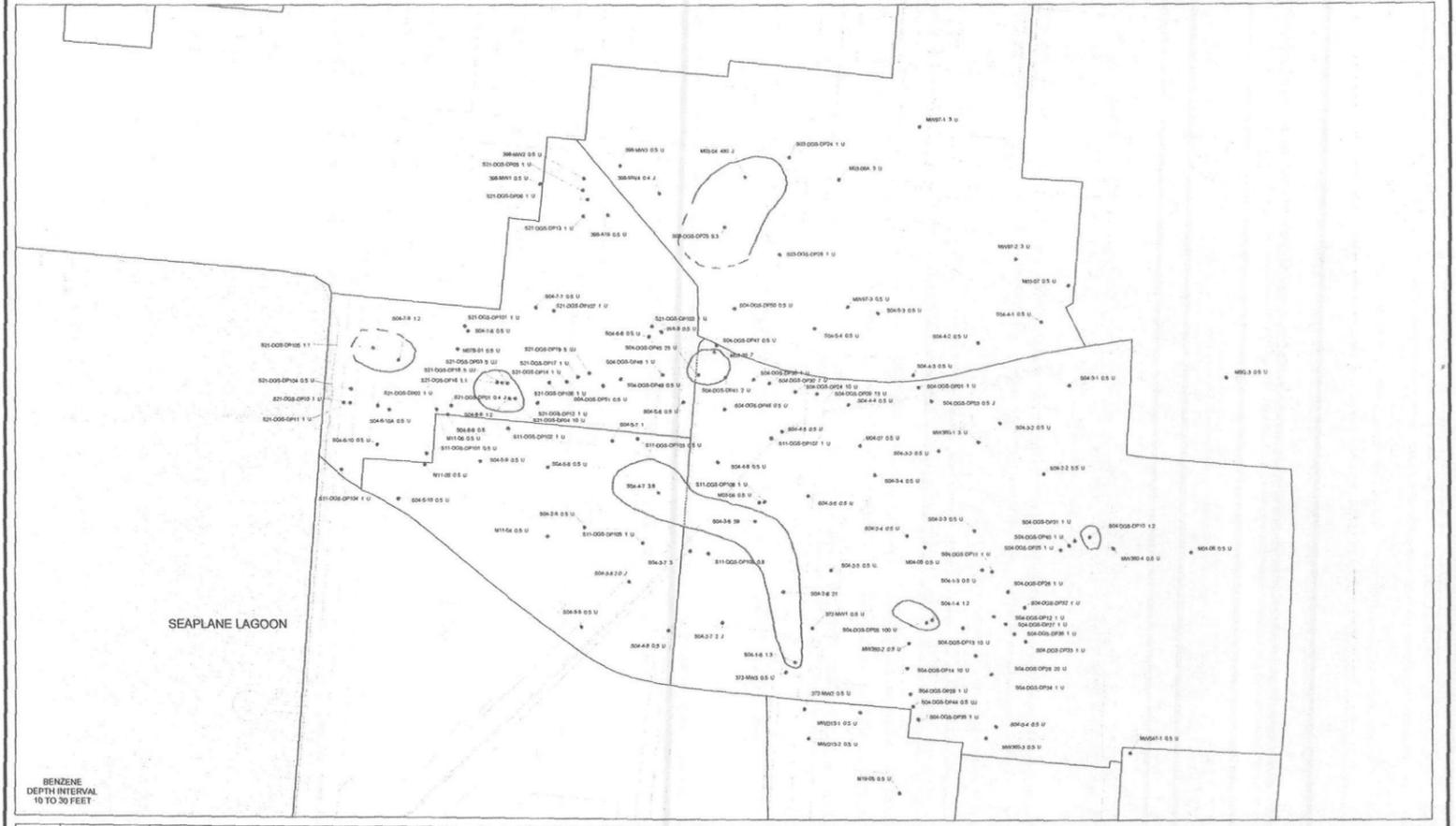
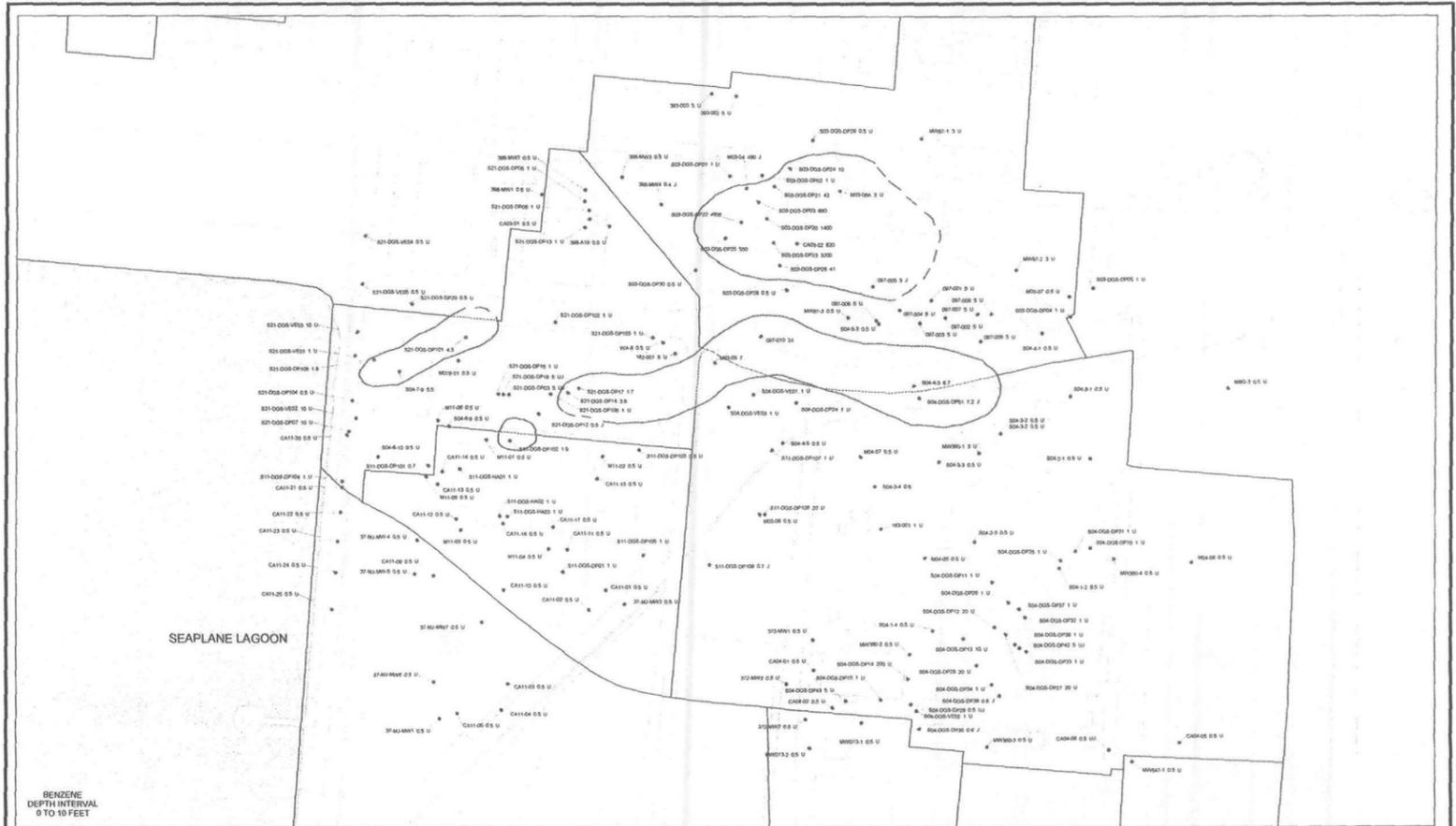


FIGURE 2.1-13  
 GROUNDWATER CONTAMINATION PLUME DELINEATION  
 VINYL CHLORIDE PLUMES  
 OPERABLE UNIT 28, ALAMEDA POINT  
 ALAMEDA, CALIFORNIA  
 APRIL 2002



**LEGEND**

- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
- SAMPLING LOCATIONS BELOW THE MCL
- LAND COVER
- CERCLA SITE BOUNDARIES
- GROUNDWATER ABOVE MCL
- MCL LINE FOR BENZENE

**NOTE:**  
 MAXIMUM CONTAMINANT LEVEL FOR BENZENE = 1.0 ug/L  
 ALL RESULTS ARE REPORTED IN ug/L  
 QUALIFIERS  
 (J) - NON-DETECT  
 (U) - ESTIMATED VALUE  
 CONCENTRATION QUALIFIER  
 POINT NAME QUALIFIER  
 S04-DGS-DP109 0.05 U

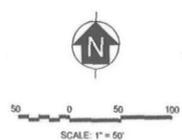
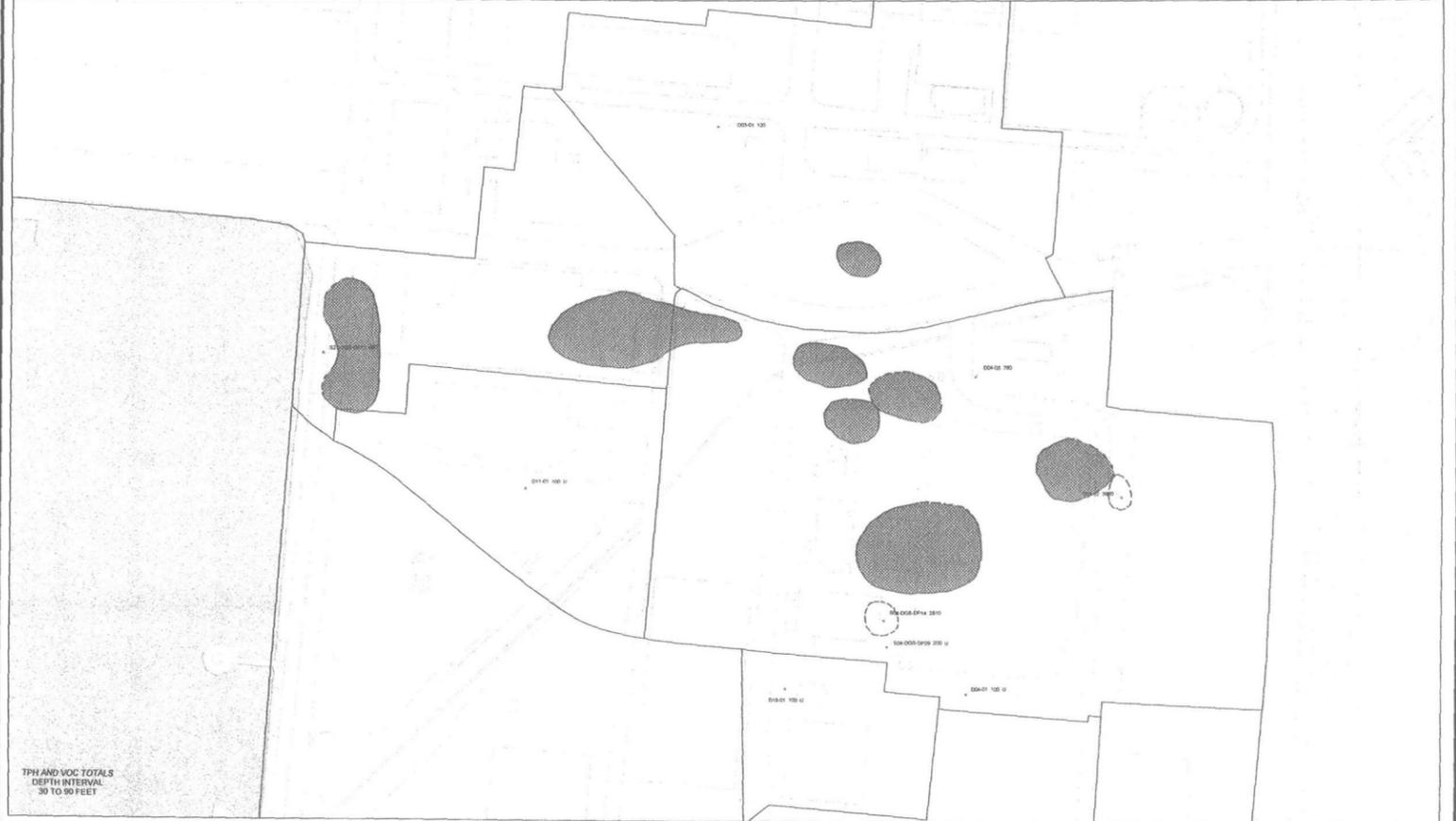
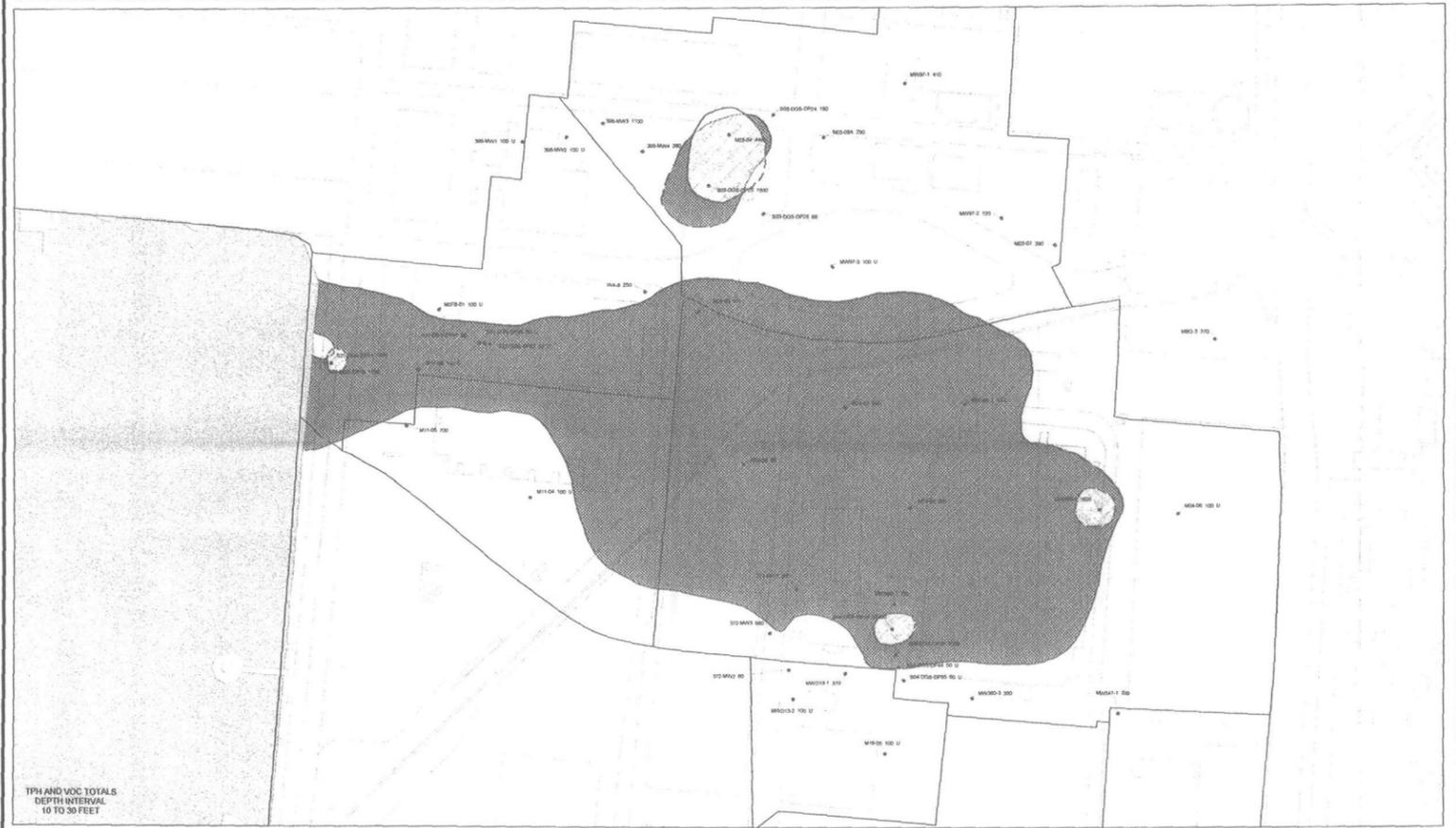
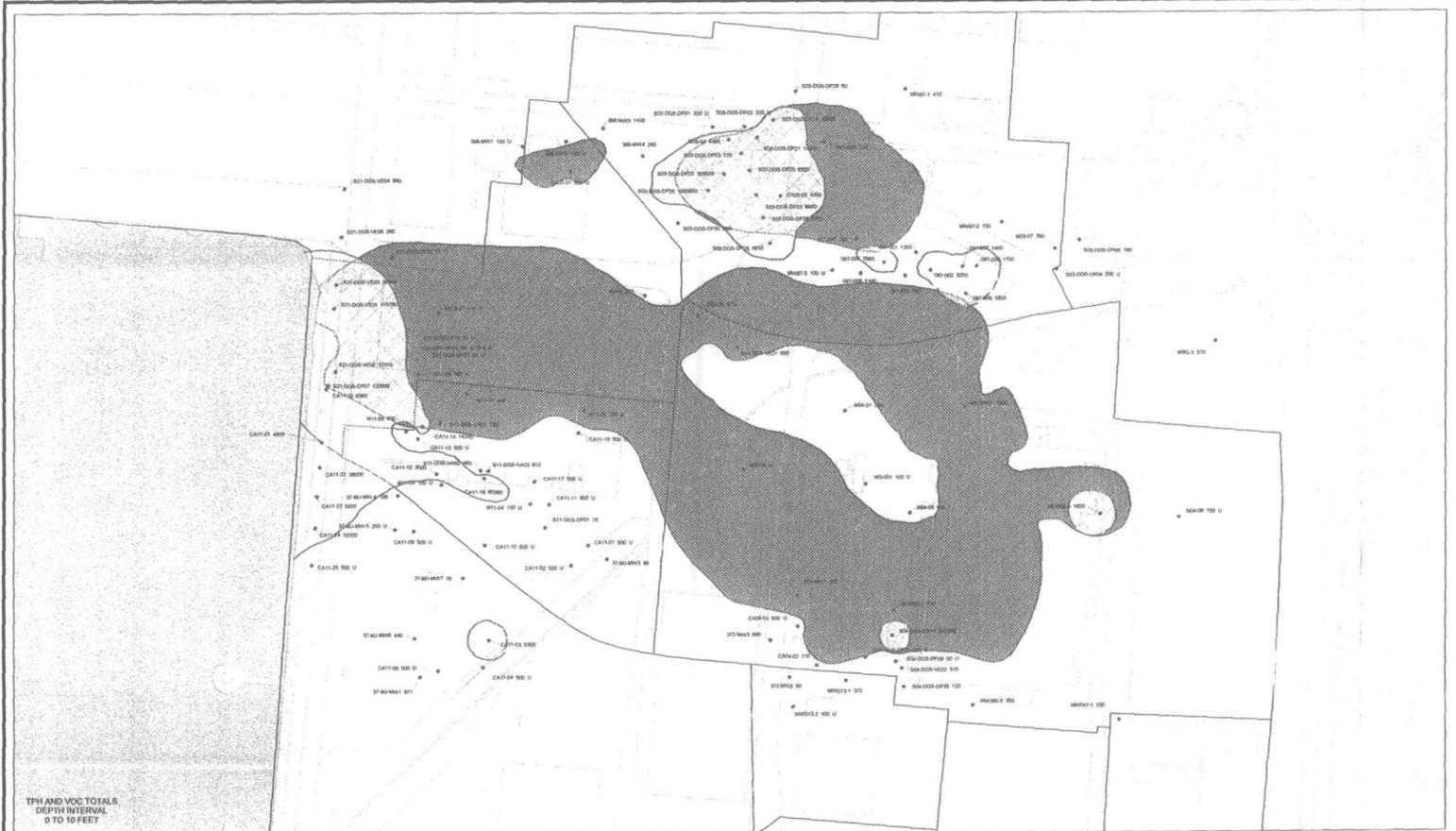


FIGURE 2.1-14  
 GROUNDWATER CONTAMINATION PLUME DELINEATION  
 OPERABLE UNIT 2B, ALAMEDA POINT  
 ALAMEDA, CALIFORNIA  
 APRIL 2002



- LEGEND**
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
  - SAMPLING LOCATIONS BELOW THE MCL
  - ▭ LAND COVER
  - ▭ CERCLA SITE BOUNDARIES
  - ▭ GROUNDWATER ABOVE MCL
  - ▭ MCL LINE FOR TPH TOTAL
  - ▭ TOTAL VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER

**NOTE**  
MAXIMUM CONTAMINANT LEVEL FOR TPH TOTAL = 1400.0 ug/L  
ALL RESULTS ARE REPORTED IN ug/L

**QUALIFIERS**  
U - NONDETECT  
J - ESTIMATED VALUE

**CONCENTRATION QUALIFIER**  
POINT NAME  
S04-DGS-DP109 0.05 U

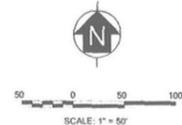
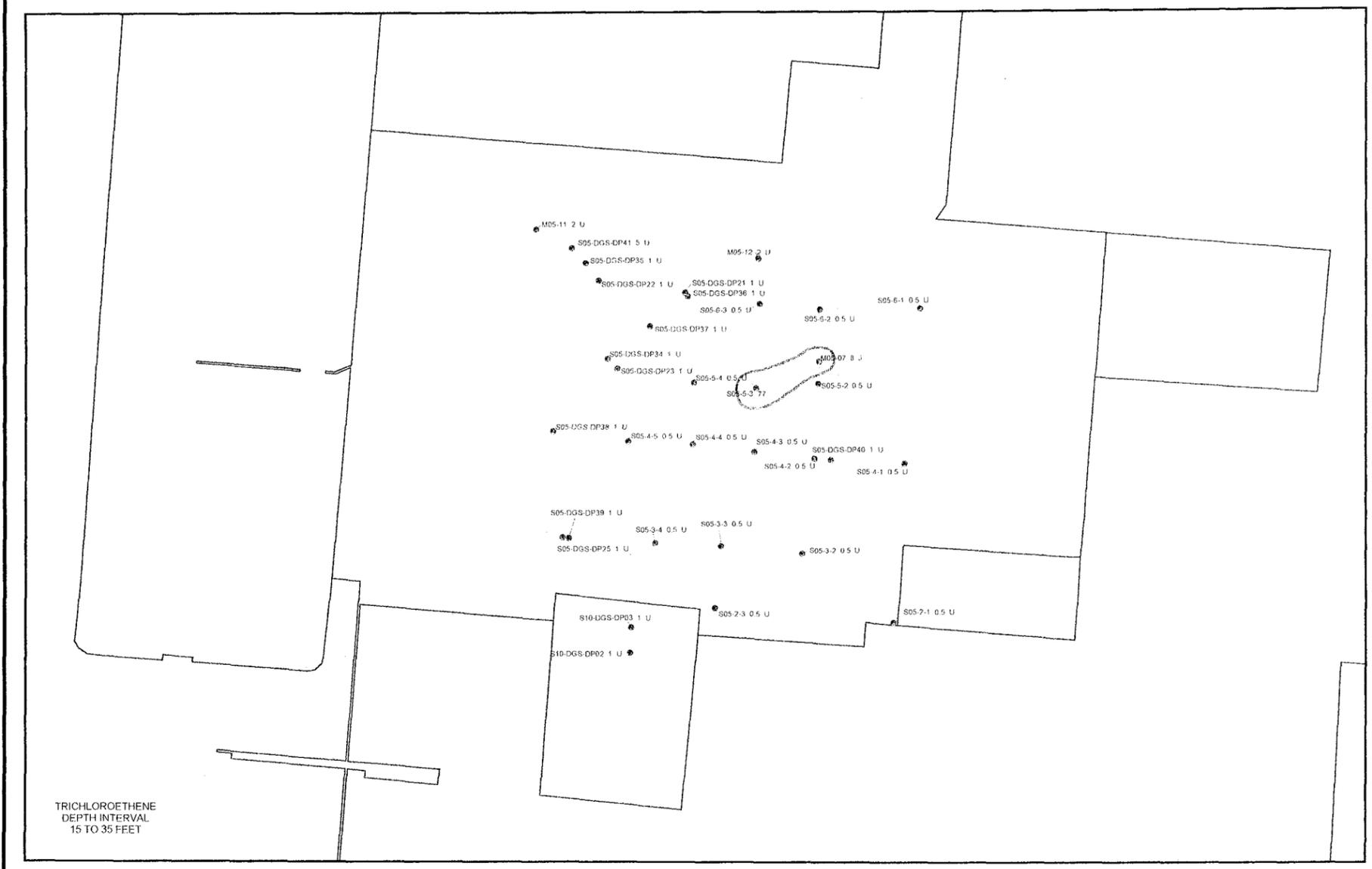
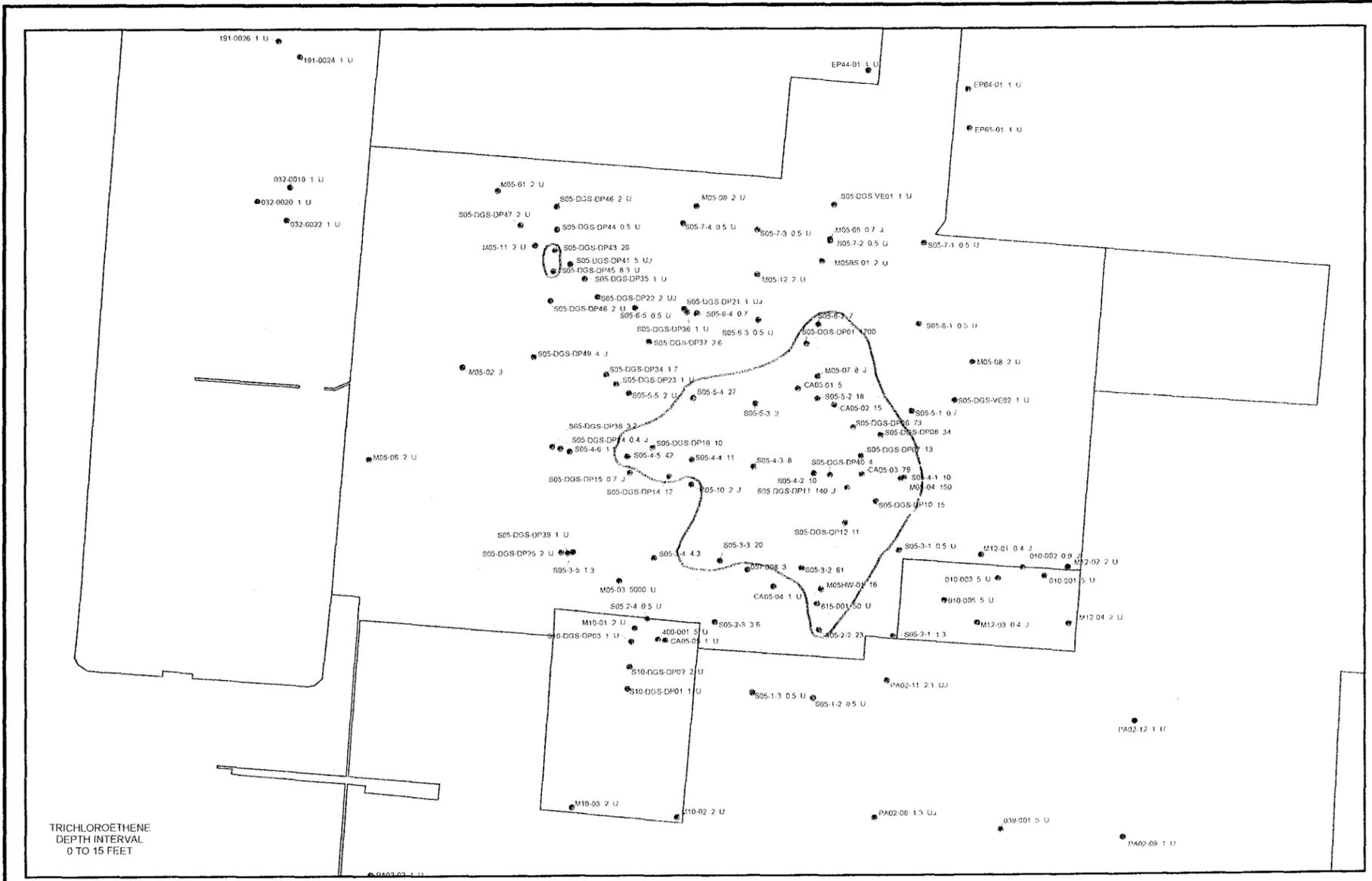


FIGURE 2.1-16  
GROUNDWATER CONTAMINATION PLUME DELINEATION  
TPH TOTAL PLUMES  
OPERABLE UNIT 28, ALAMEDA POINT  
ALAMEDA, CALIFORNIA  
APRIL 2002



- LEGEND**
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
  - SAMPLING LOCATIONS BELOW THE MCL
  - CERCLA SITE BOUNDARIES
  - LAND COVER
  - GROUNDWATER ABOVE MCL
  - ▭ MCL LINE FOR TRICHLOROETHENE

NOTE:  
MAXIMUM CONTAMINANT LEVEL FOR TRICHLOROETHENE = 5.0 ug/L  
ALL RESULTS ARE REPORTED IN ug/L

QUALIFIERS  
U - NON-DETECT  
J - ESTIMATED VALUE

POINT NAME	CONCENTRATION	QUALIFIER
S06-DGS-DP09	0.05	U

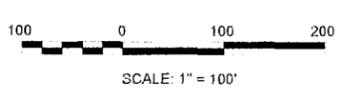
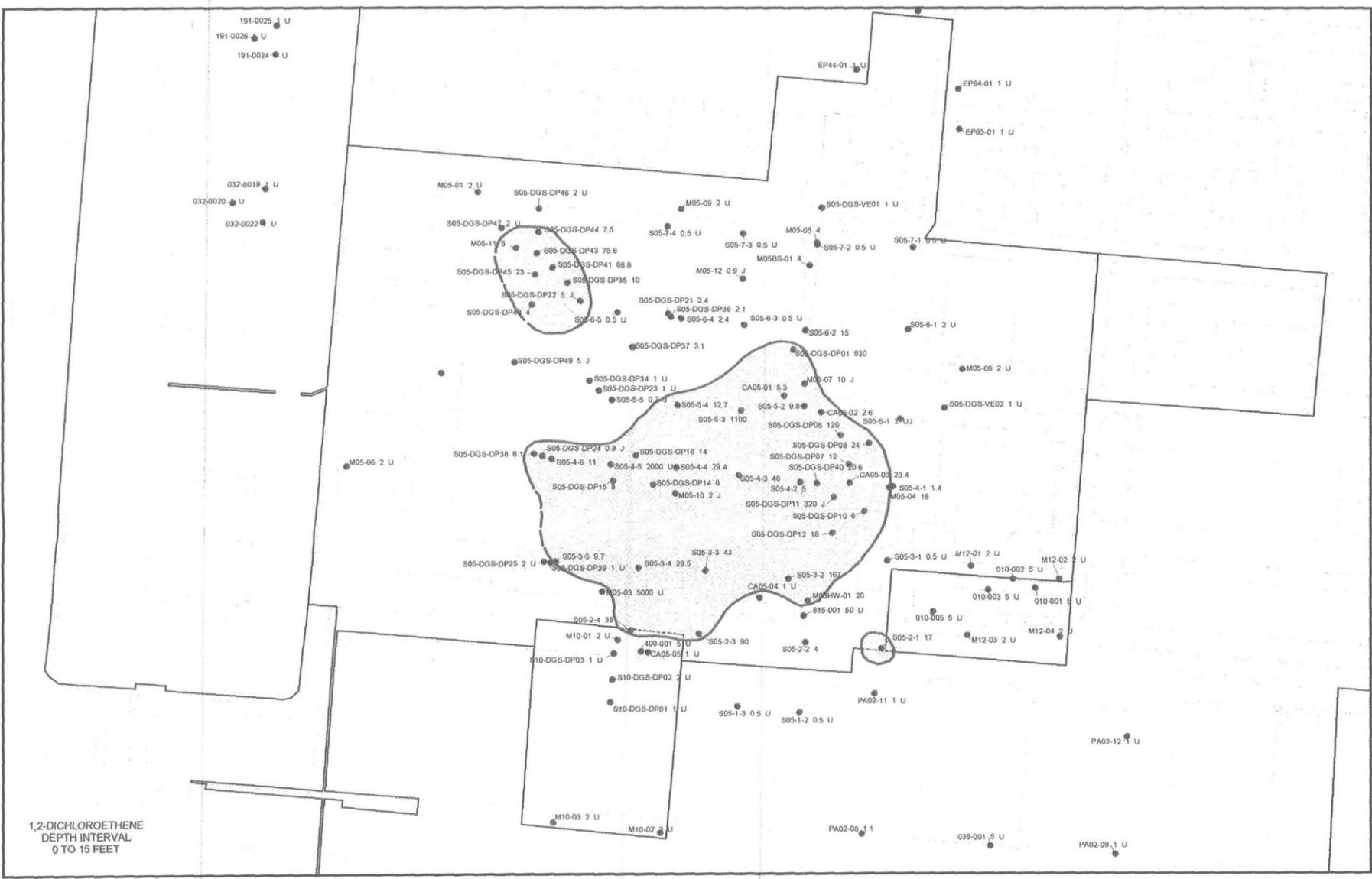


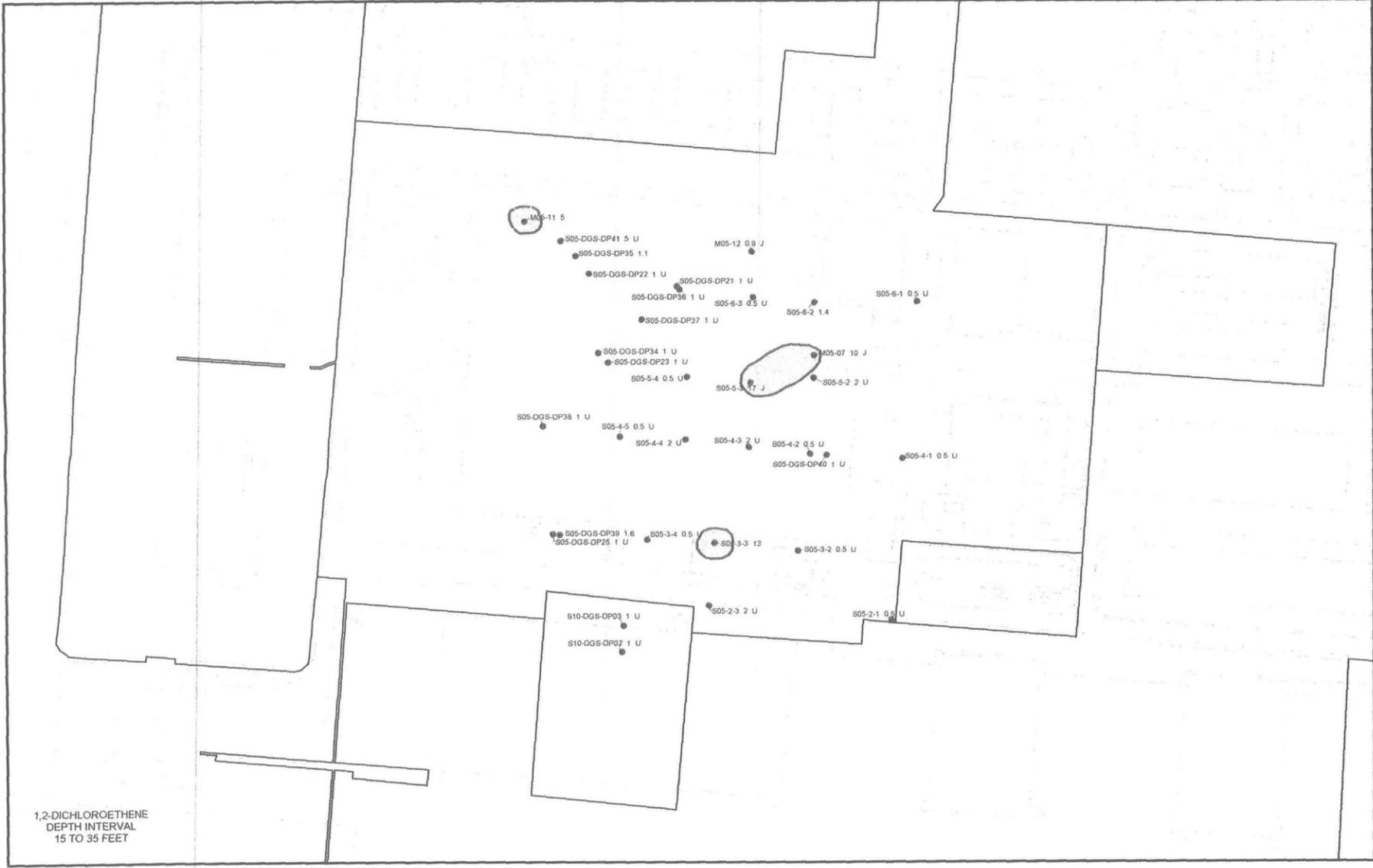
FIGURE 2.1-16  
GROUNDWATER CONTAMINATION PLUME DELINEATION  
TRICHLOROETHENE  
OPERABLE UNIT 2C, ALAMEDA POINT  
ALAMEDA, CALIFORNIA  
MAY, 2002

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1,2-DICHLOROETHENE  
DEPTH INTERVAL  
0 TO 15 FEET



1,2-DICHLOROETHENE  
DEPTH INTERVAL  
15 TO 35 FEET

- LEGEND**
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
  - SAMPLING LOCATIONS BELOW THE MCL
  - CERCLA SITE BOUNDARIES
  - LAND COVER
  - GROUNDWATER ABOVE MCL
  - ~ MCL LINE FOR 1,2-DICHLOROETHENE

**NOTE:**  
MAXIMUM CONTAMINANT LEVEL FOR  
1,2-DICHLOROETHENE = 6.0 ug/L  
ALL RESULTS ARE REPORTED IN ug/L

**QUALIFIERS**  
U - NON-DETECT  
J - ESTIMATED VALUE

POINT NAME	CONCENTRATION	QUALIFIER
S05-DGS-DP09	0.05	U

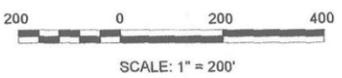
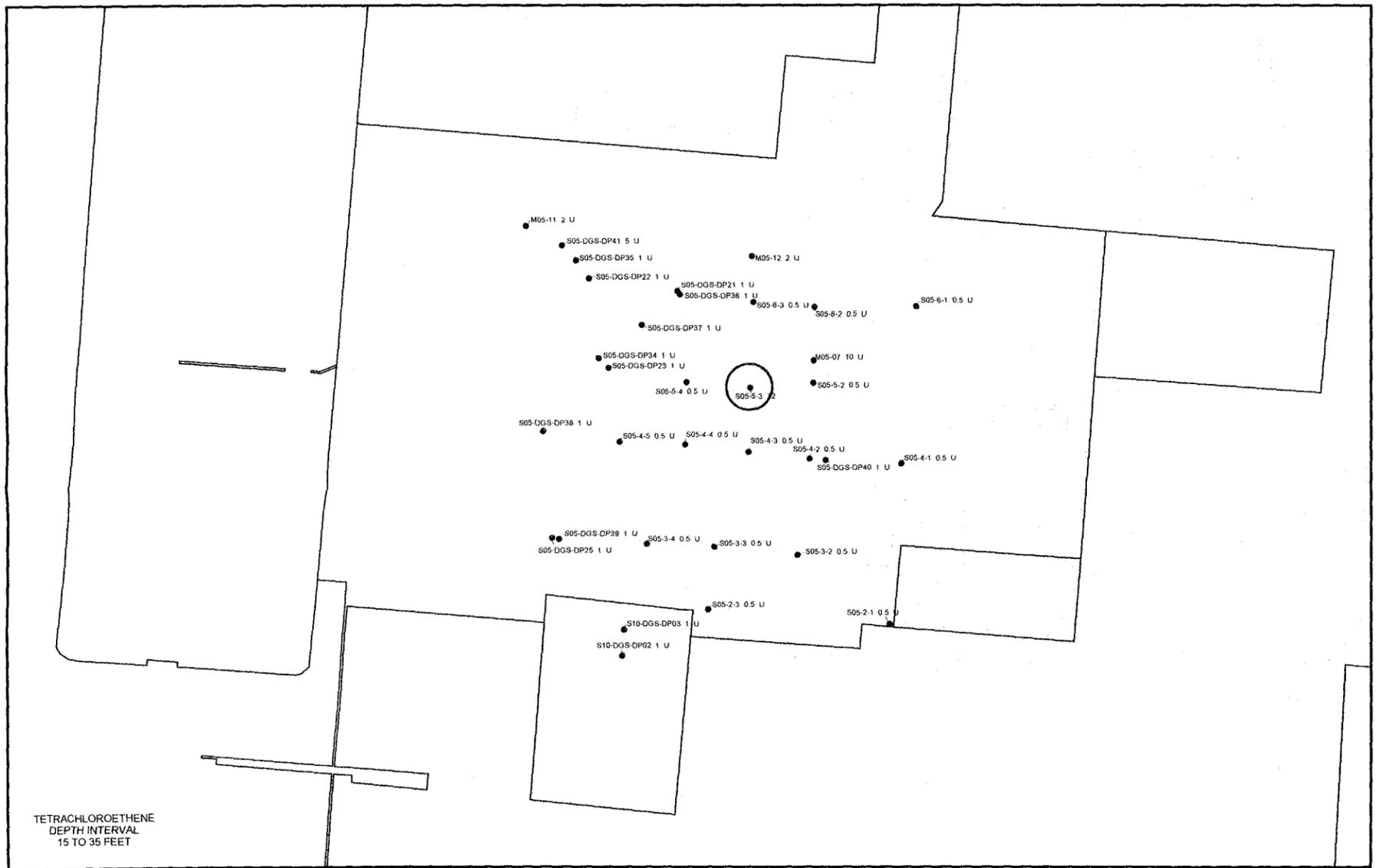
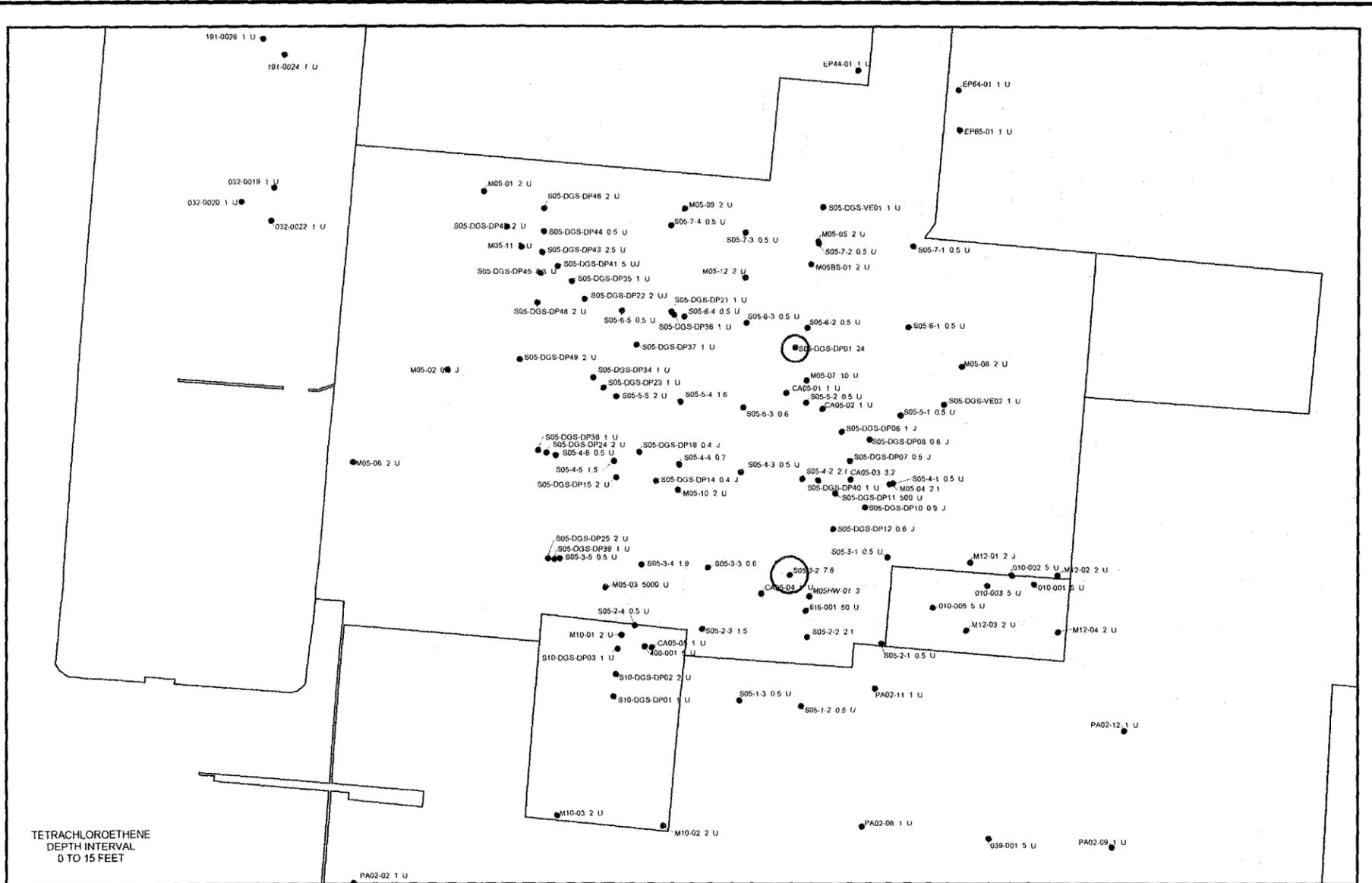


FIGURE 2.1-17  
GROUNDWATER CONTAMINATION PLUME DELINEATION  
1,2-DICHLOROETHENE  
OPERABLE UNIT 2C, ALAMEDA POINT  
ALAMEDA, CALIFORNIA  
MAY, 2002



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- LEGEND**
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
  - SAMPLING LOCATIONS BELOW THE MCL
  - CERCLA SITE BOUNDARIES
  - LAND COVER
  - GROUNDWATER ABOVE MCL
  - ∧ MCL LINE FOR TETRACHLOROETHENE

**NOTE:**  
MAXIMUM CONTAMINANT LEVEL FOR TETRACHLOROETHENE = 5.0 ug/L  
ALL RESULTS ARE REPORTED IN ug/L

**QUALIFIERS**  
U - NON-DETECT  
J - ESTIMATED VALUE

POINT NAME      CONCENTRATION  
S06-DGS-DP09    0.05 U

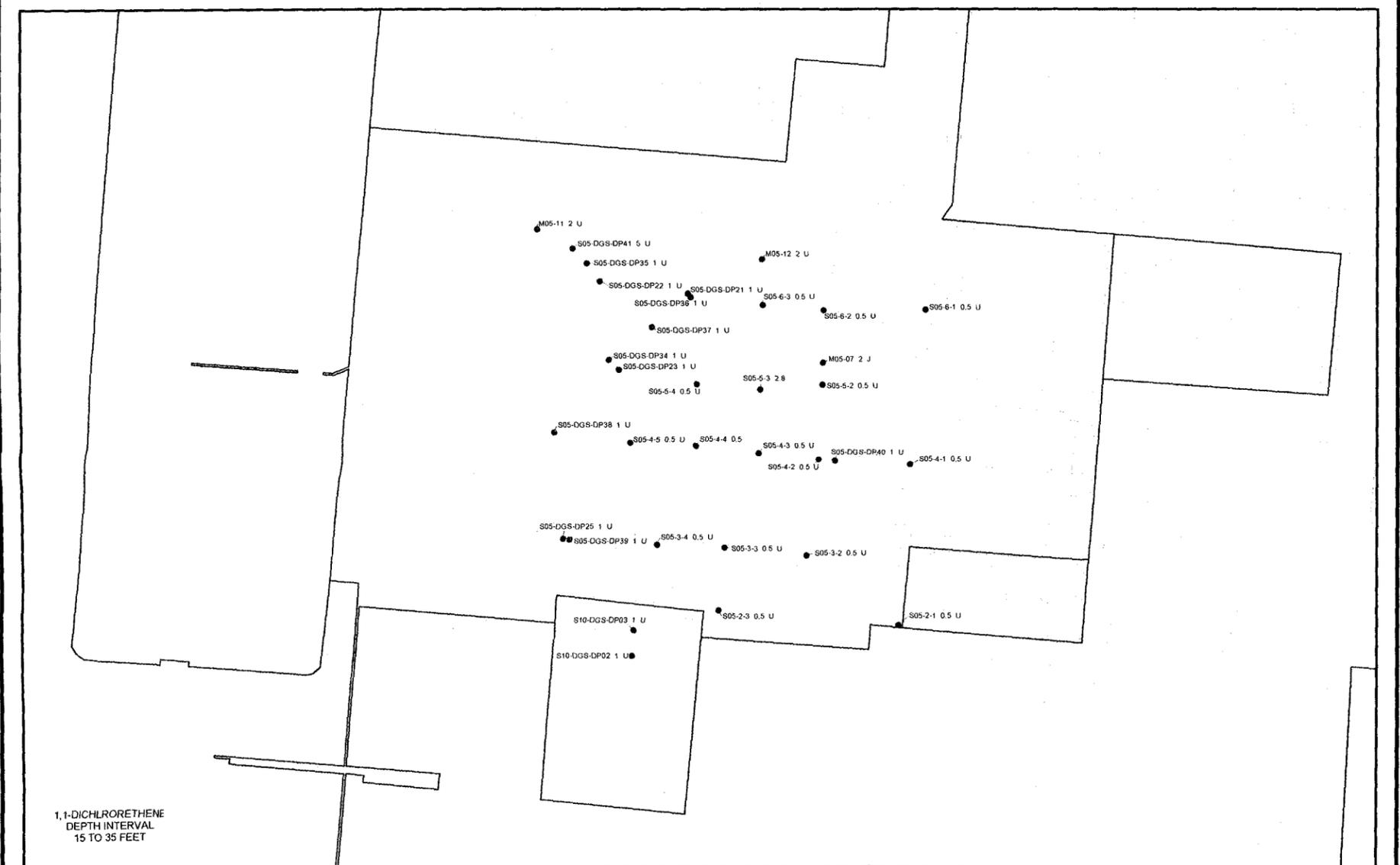
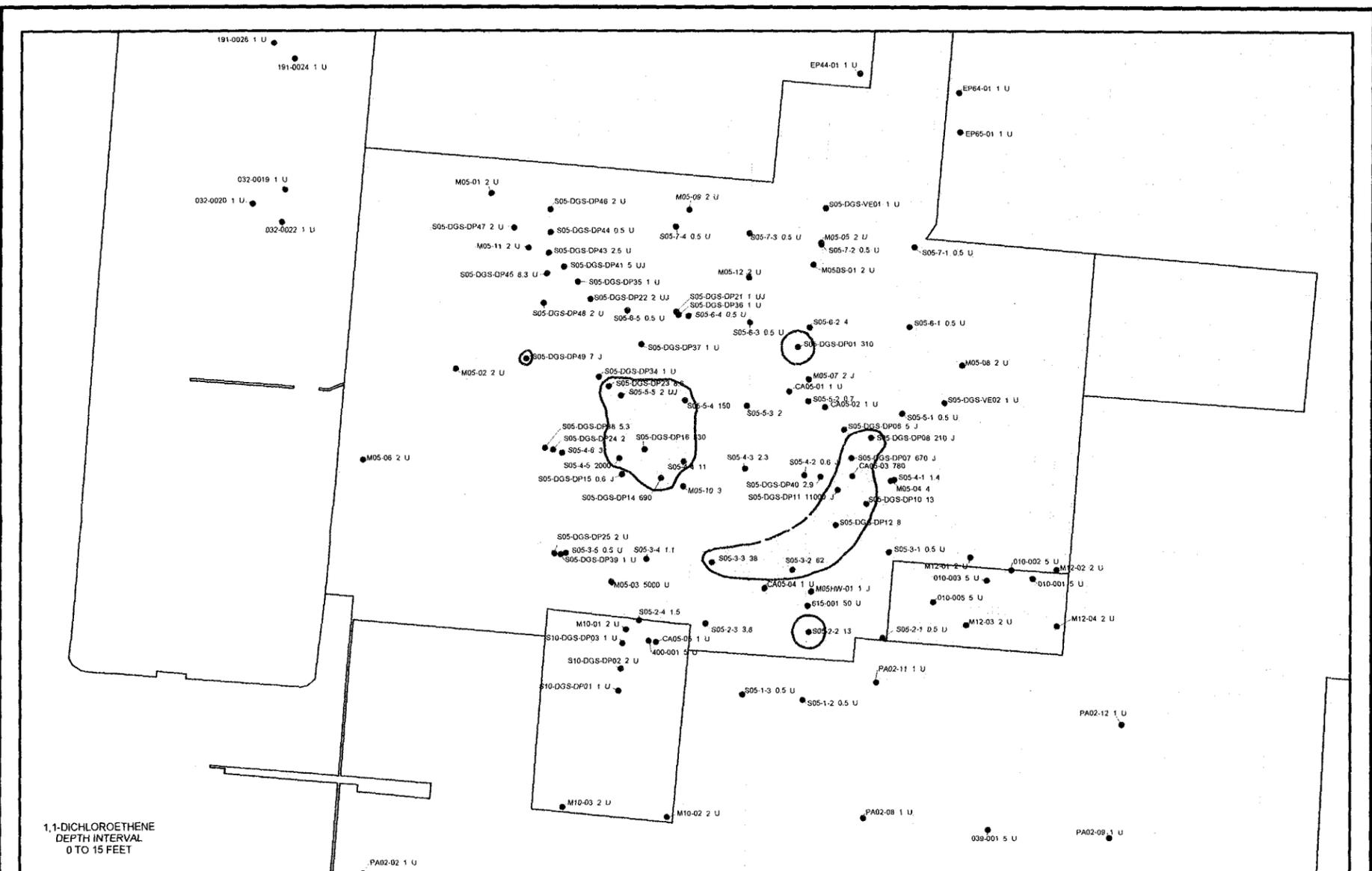


SCALE: 1" = 100'

FIGURE 2.1-18  
GROUNDWATER CONTAMINATION PLUME DELINEATION  
TETRACHLOROETHENE  
OPERABLE UNIT 2C, ALAMEDA POINT  
ALAMEDA, CALIFORNIA  
MAY, 2002



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**LEGEND**

- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
- SAMPLING LOCATIONS BELOW THE MCL
- CERCLA SITE BOUNDARIES
- LAND COVER
- GROUNDWATER ABOVE MCL
- ~ MCL LINE FOR 1,1-DICHLOROETHENE

**NOTE:**  
 MAXIMUM CONTAMINANT LEVEL FOR 1,1-DICHLOROETHENE = 6.0 ug/L  
 ALL RESULTS ARE REPORTED IN ug/L

**QUALIFIERS**  
 U - NON-DETECT  
 J - ESTIMATED VALUE

POINT NAME	CONCENTRATION	QUALIFIER
S06-DGS-DP09	0.05	U

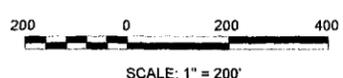
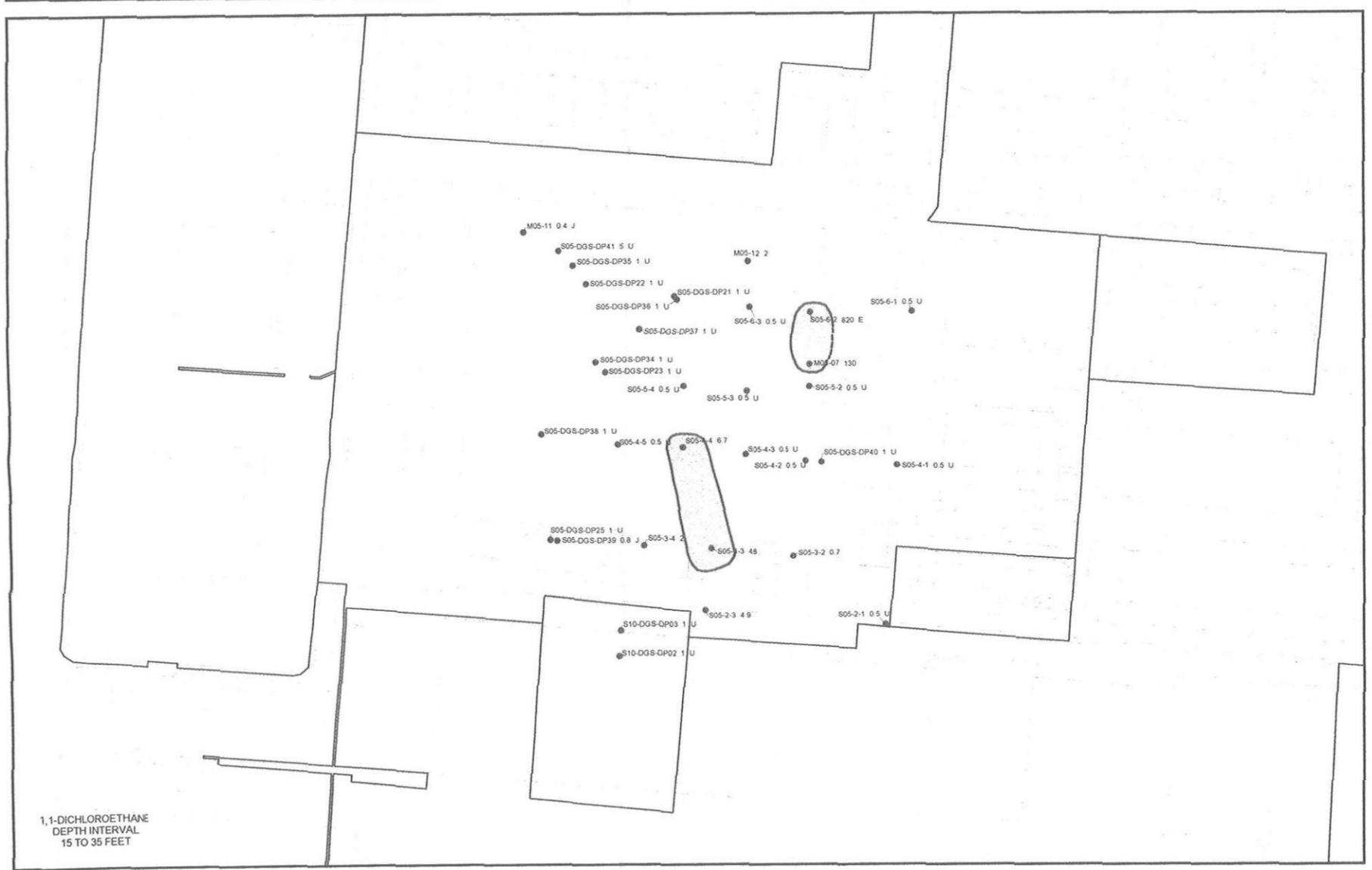
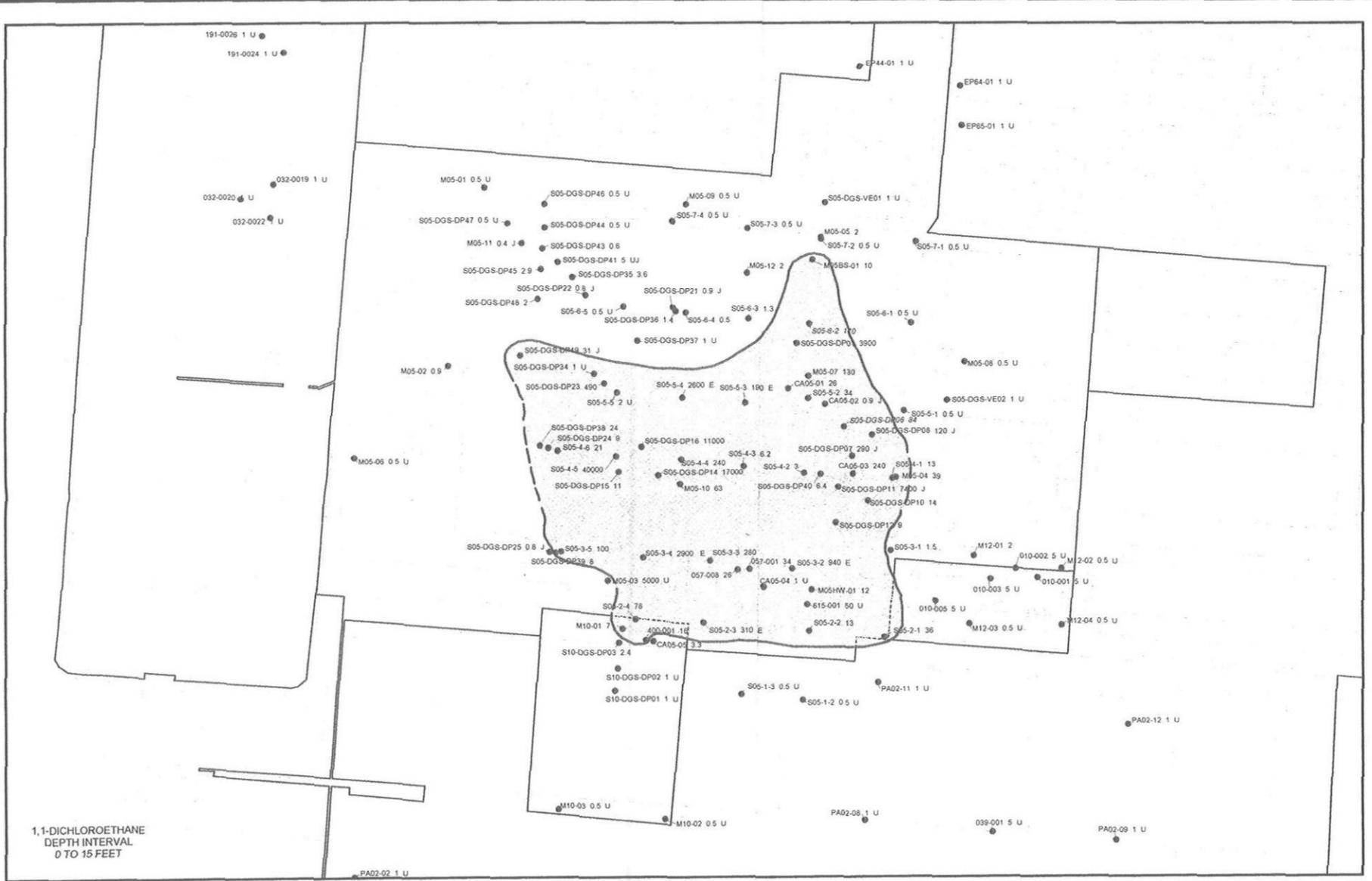


FIGURE 2.1-19  
 GROUNDWATER CONTAMINATION PLUME DELINEATION  
 1,1-DICHLOROETHENE  
 OPERABLE UNIT 2C, ALAMEDA POINT  
 ALAMEDA, CALIFORNIA  
 MAY, 2002



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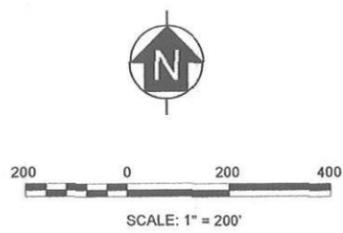


- LEGEND**
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
  - SAMPLING LOCATIONS BELOW THE MCL
  - CERCLA SITE BOUNDARIES
  - LAND COVER
  - GROUNDWATER ABOVE MCL
  - ∧ MCL LINE FOR 1,1-DICHLOROETHANE

**NOTE:**  
 MAXIMUM CONTAMINANT LEVEL FOR 1,1-DICHLOROETHANE = 5.0 ug/L  
 ALL RESULTS ARE REPORTED IN ug/L

**QUALIFIERS**  
 U- NON-DETECT  
 J- ESTIMATED VALUE

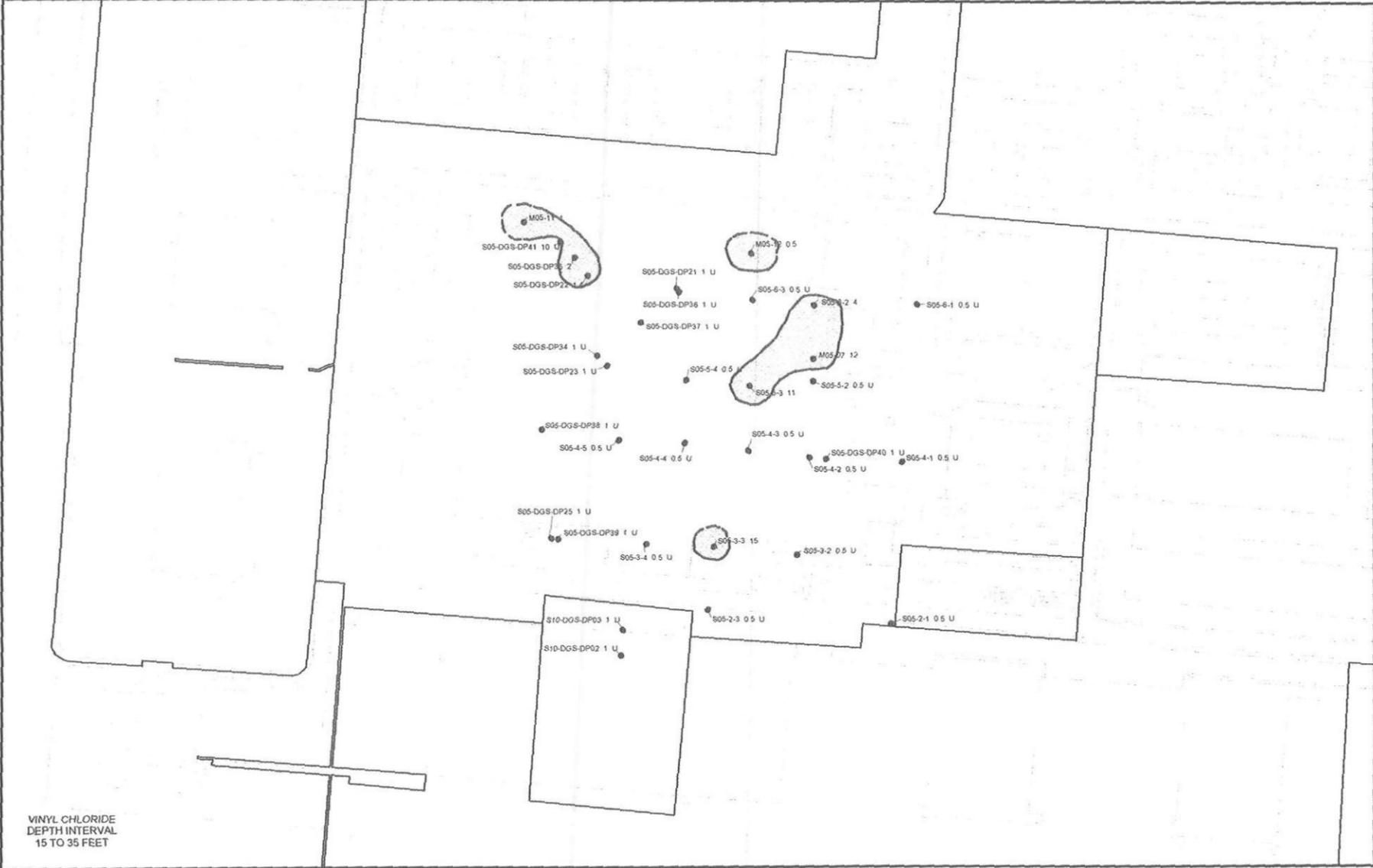
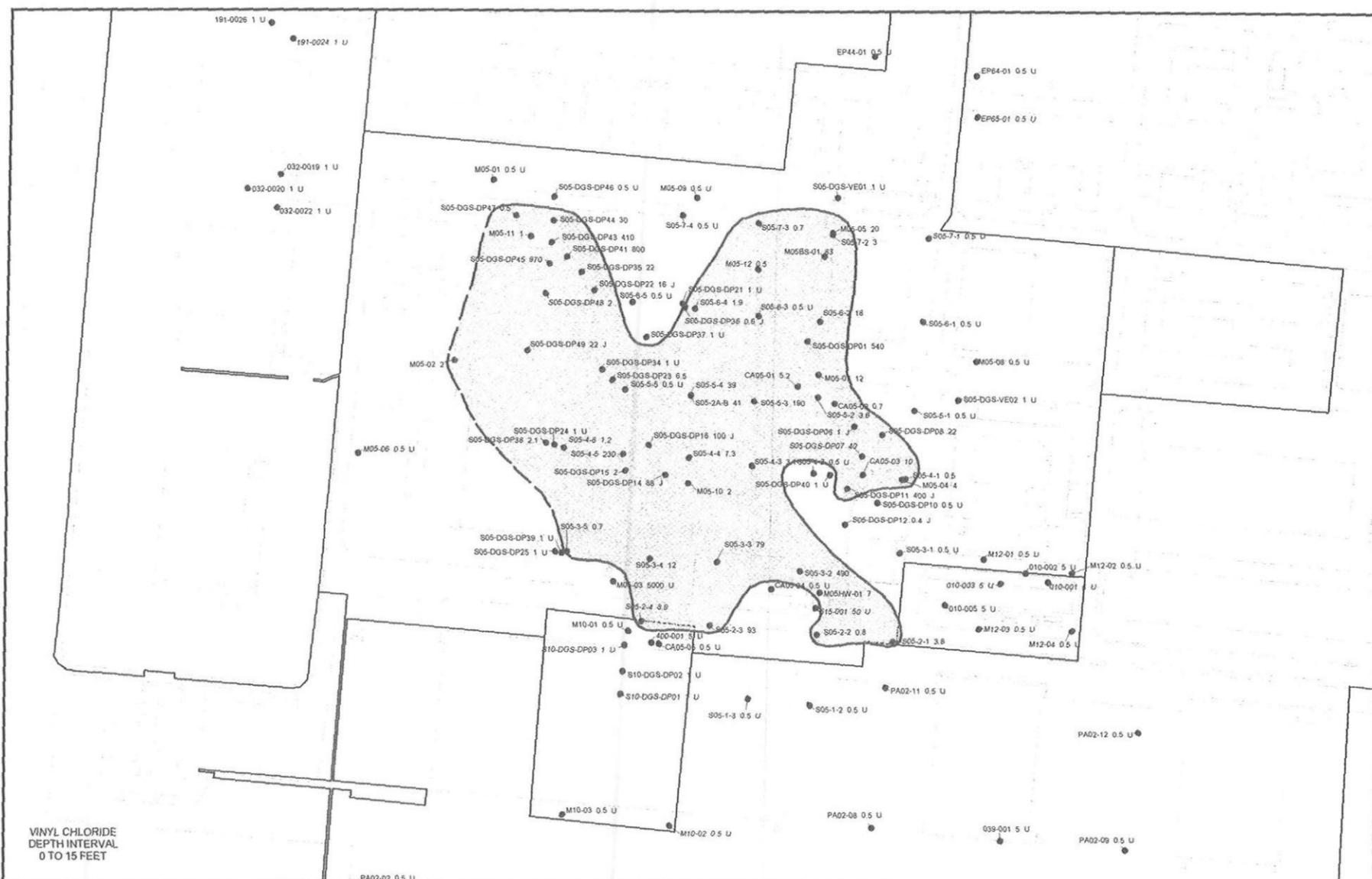
POINT NAME      CONCENTRATION  
 S06-DGS-DP09    0.05    U



**FIGURE 2.1-20**  
 GROUNDWATER CONTAMINATION PLUME DELINEATION  
 1,1-DICHLOROETHANE  
 OPERABLE UNIT 2C, ALAMEDA POINT  
 ALAMEDA, CALIFORNIA  
 MAY, 2002

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- LEGEND**
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
  - SAMPLING LOCATIONS BELOW THE MCL
  - CERCLA SITE BOUNDARIES
  - ▨ LAND COVER
  - ▭ GROUNDWATER ABOVE MCL
  - ⋈ MCL LINE FOR VINYL CHLORIDE

**NOTE:**  
 MAXIMUM CONTAMINANT LEVEL FOR VINYL CHLORIDE = 0.5 ug/L  
 ALL RESULTS ARE REPORTED IN ug/L

**QUALIFIERS**  
 U - NON-DETECT  
 J - ESTIMATED VALUE

POINT NAME      CONCENTRATION  
 QUALIFIER

S06-DGS-DP09 0.05 U

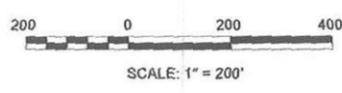
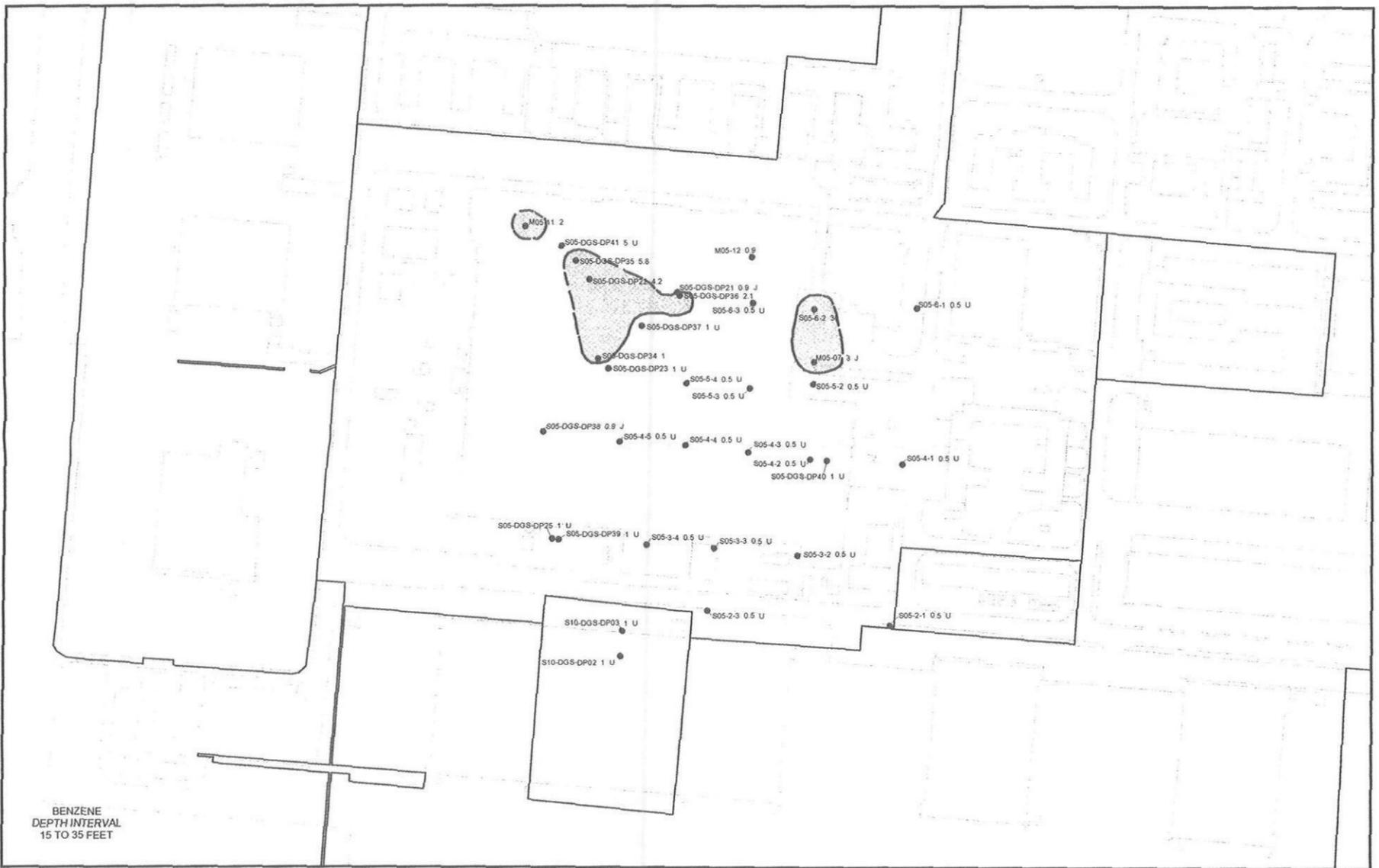
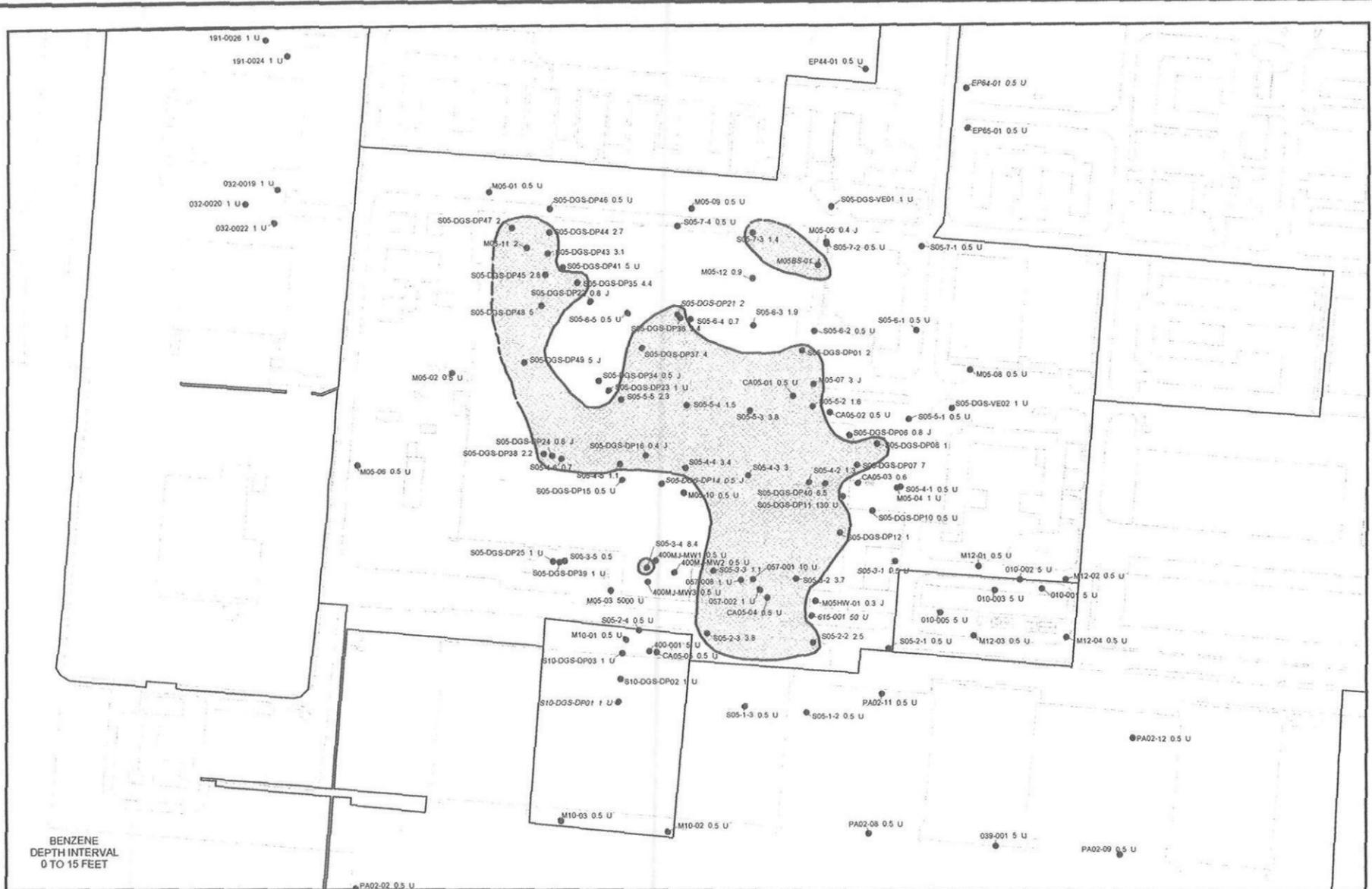


FIGURE 2.1-21  
 GROUNDWATER CONTAMINATION PLUME DELINEATION  
 VINYL CHLORIDE  
 OPERABLE UNIT 2C, ALAMEDA POINT  
 ALAMEDA, CALIFORNIA  
 MAY, 2002



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**LEGEND**

- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
- SAMPLING LOCATIONS BELOW THE MCL
- ▭ CERCLA SITE BOUNDARIES
- ▭ LAND COVER
- ▭ GROUNDWATER ABOVE MCL
- ▭ MCL LINE FOR BENZENE

NOTE:  
MAXIMUM CONTAMINANT LEVEL FOR  
BENZENE = 1.0 ug/L

ALL RESULTS ARE REPORTED IN ug/L

QUALIFIERS  
U - NON-DETECT  
J - ESTIMATED VALUE

POINT NAME	CONCENTRATION	QUALIFIER
S06-DGS-DP09	0.05	U



200 0 200 400

SCALE: 1" = 200'

FIGURE 2.1-22  
GROUNDWATER CONTAMINATION PLUME DELINEATION  
BENZENE  
OPERABLE UNIT 2C, ALAMEDA POINT  
ALAMEDA, CALIFORNIA  
MAY, 2002

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**LEGEND**

- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
- SAMPLING LOCATIONS BELOW THE MCL
- CERCLA SITE BOUNDARIES
- LAND COVER
- ▨ TOTAL VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
- GROUNDWATER ABOVE MCL
- ∧ MCL LINE FOR TOTAL TPH

NOTE:  
MAXIMUM CONTAMINANT LEVEL FOR  
TOTAL TPH = 1400.0 ug/L

ALL RESULTS ARE REPORTED IN ug/L

QUALIFIERS  
U - NON-DETECT  
J - ESTIMATED VALUE

POINT NAME	CONCENTRATION	QUALIFIER
S06-DGS-DP09	0.05	U

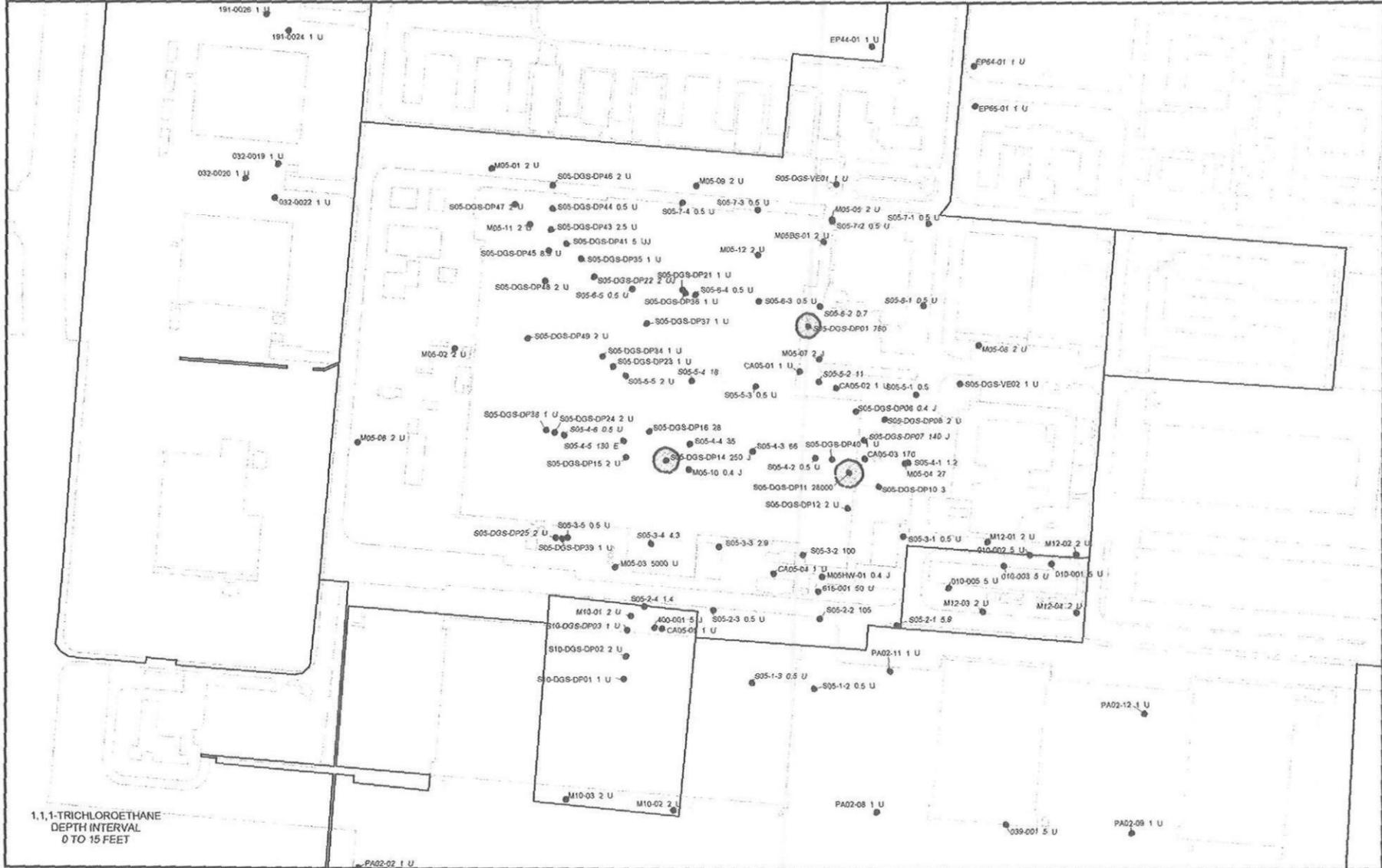


SCALE: 1" = 200'

FIGURE 2.1-23  
GROUNDWATER CONTAMINATION PLUME DELINEATION  
TOTAL TPH  
OPERABLE UNIT 2C, ALAMEDA POINT  
ALAMEDA, CALIFORNIA  
MAY, 2002

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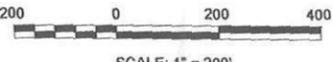
**LEGEND**

- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
- SAMPLING LOCATIONS BELOW THE MCL
- ▭ CERCLA SITE BOUNDARIES
- ▨ LAND COVER
- ▩ GROUNDWATER ABOVE MCL
- ▬ MCL LINE FOR 1,1,1-TRICHLOROETHANE

**NOTE:**  
 MAXIMUM CONTAMINANT LEVEL FOR 1,1,1-TRICHLOROETHANE = 200.0 ug/L  
 ALL RESULTS ARE REPORTED IN ug/L

**QUALIFIERS**  
 U - NON-DETECT  
 J - ESTIMATED VALUE

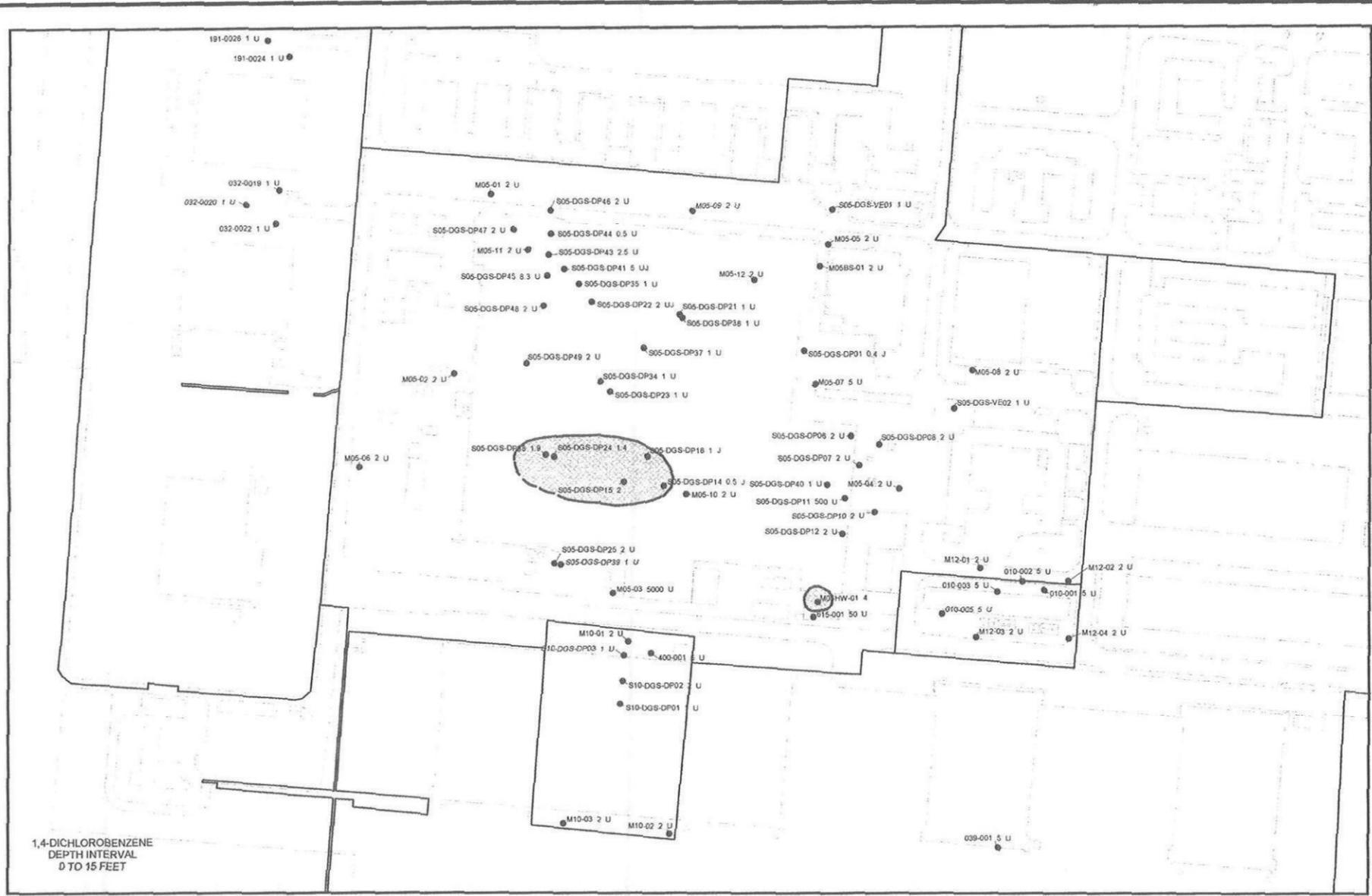
POINT NAME      CONCENTRATION QUALIFIER  
 S06-DGS-DP09    0.05 U



**FIGURE 2.1-24**  
 GROUNDWATER CONTAMINATION PLUME DELINEATION  
 1,1,1-TRICHLOROETHANE  
 OPERABLE UNIT 2C, ALAMEDA POINT  
 ALAMEDA, CALIFORNIA  
 MAY, 2002

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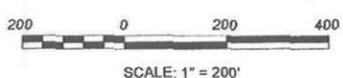
**LEGEND**

- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
- SAMPLING LOCATIONS BELOW THE MCL
- ▭ CERCLA SITE BOUNDARIES
- ▭ LAND COVER
- ▭ GROUNDWATER ABOVE MCL
- ▭ MCL LINE FOR 1,4-DICHLOROBENZENE

**NOTE:**  
 MAXIMUM CONTAMINANT LEVEL FOR 1,4-DICHLOROBENZENE = 0.5 ug/L  
 ALL RESULTS ARE REPORTED IN ug/L

**QUALIFIERS**  
 U - NON-DETECT  
 J - ESTIMATED VALUE

POINT NAME	CONCENTRATION	QUALIFIER
S06-DGS-DP09	0.05	U

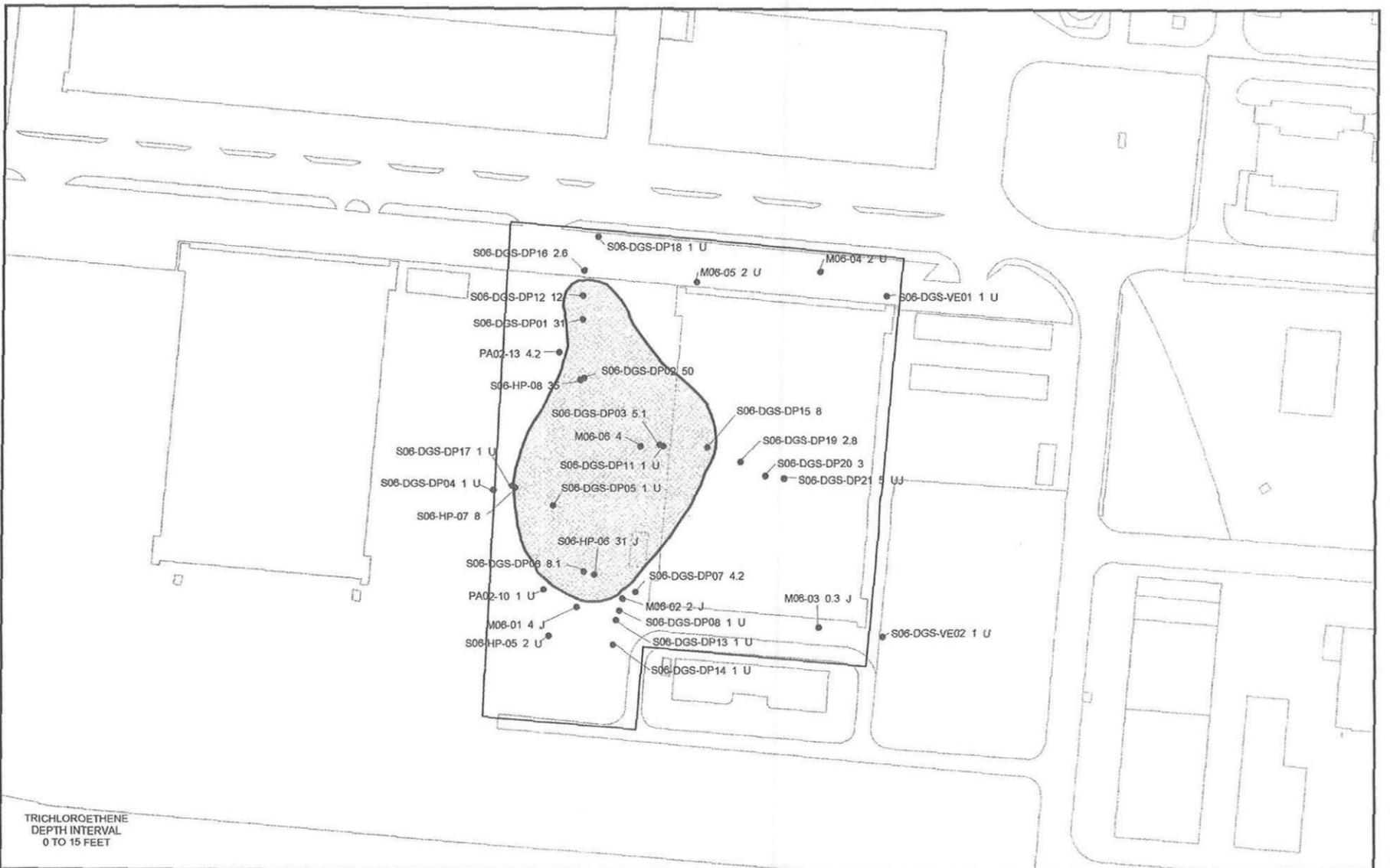


SCALE: 1" = 200'

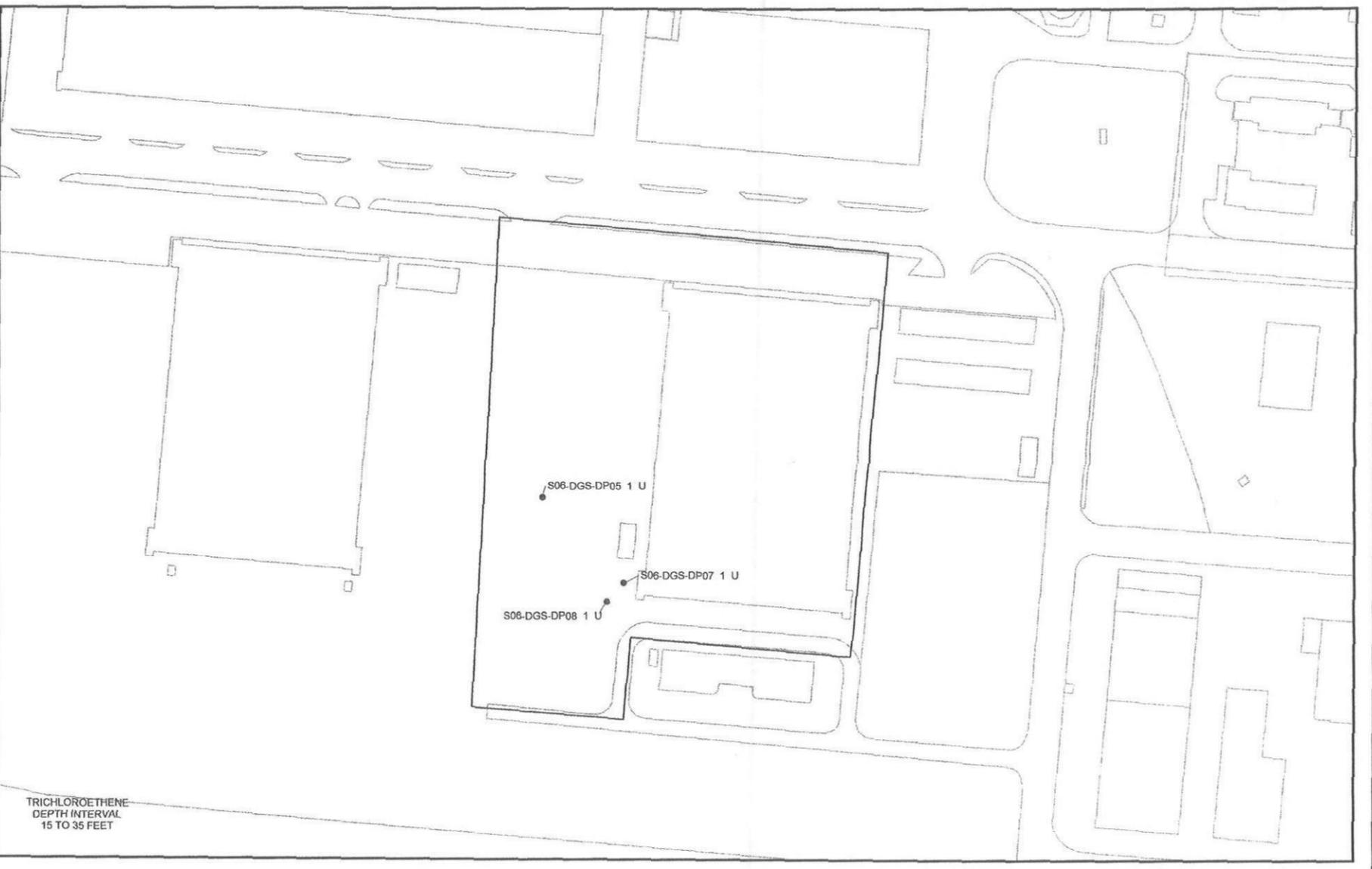
**FIGURE 2.1-25**  
 GROUNDWATER CONTAMINATION PLUME DELINEATION  
 1,4-DICHLOROBENZENE  
 OPERABLE UNIT 2C, ALAMEDA POINT  
 ALAMEDA, CALIFORNIA  
 MAY, 2002

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TRICHLOROETHENE  
DEPTH INTERVAL  
0 TO 15 FEET



TRICHLOROETHENE  
DEPTH INTERVAL  
15 TO 35 FEET

- LEGEND**
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
  - SAMPLING LOCATIONS BELOW THE MCL
  - CERCLA SITE BOUNDARIES
  - ▨ LAND COVER
  - ▩ GROUNDWATER ABOVE MCL
  - ~ MCL LINE FOR TRICHLOROETHENE

NOTE:  
MAXIMUM CONTAMINATE LEVEL FOR  
TRICHLOROETHENE = 5.0 ug/L  
ALL RESULTS ARE REPORTED IN ug/L

QUALIFIERS  
U- NON-DETECT  
J - ESTIMATED VALUE

POINT NAME	CONCENTRATION	QUALIFIER
S06-DGS-DP09	0.05	U

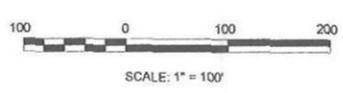
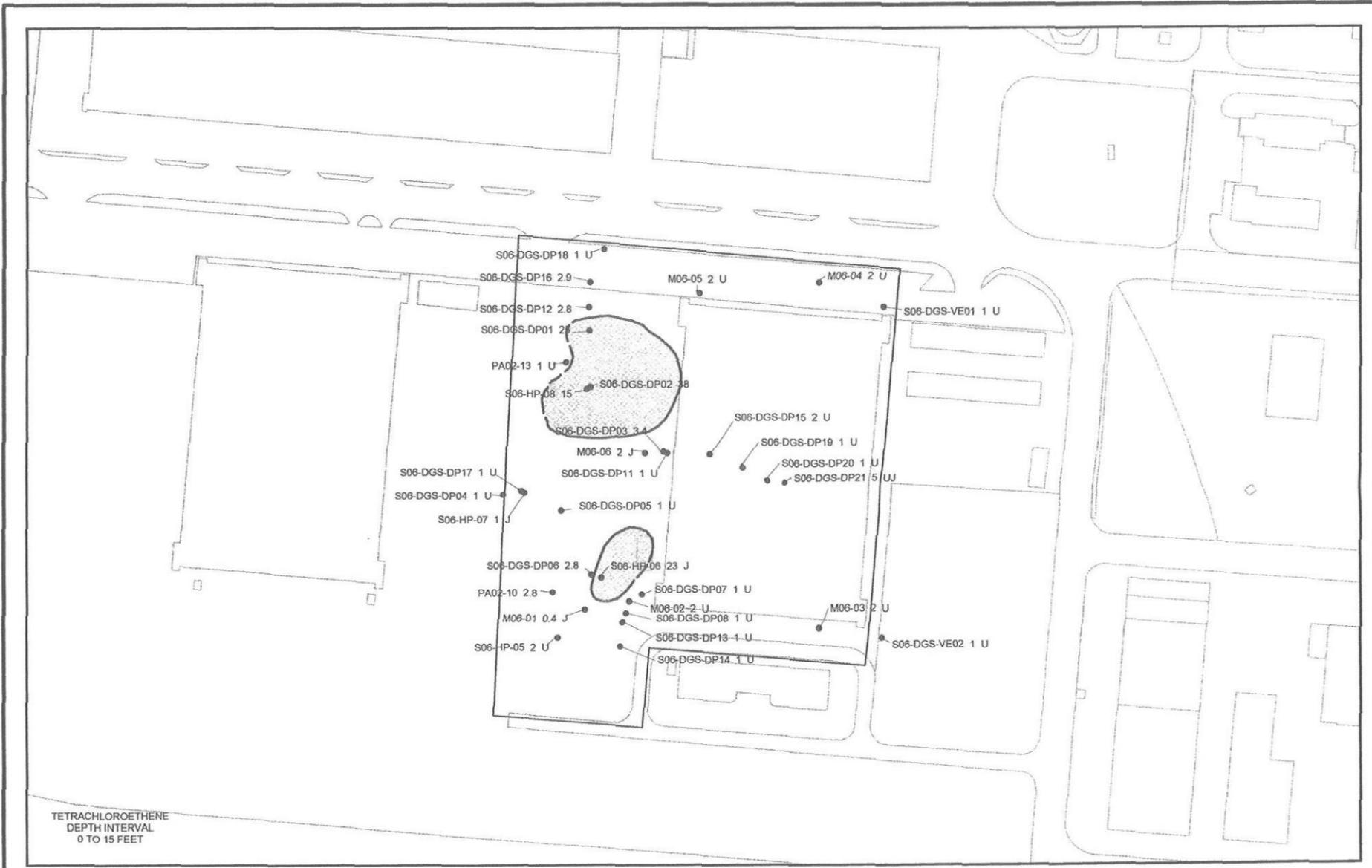


FIGURE 2.1-26  
GROUNDWATER CONTAMINATION PLUME DELINEATION  
TRICHLOROETHENE  
CERCLA SITE 6  
ALAMEDA, CALIFORNIA  
MAY, 2002

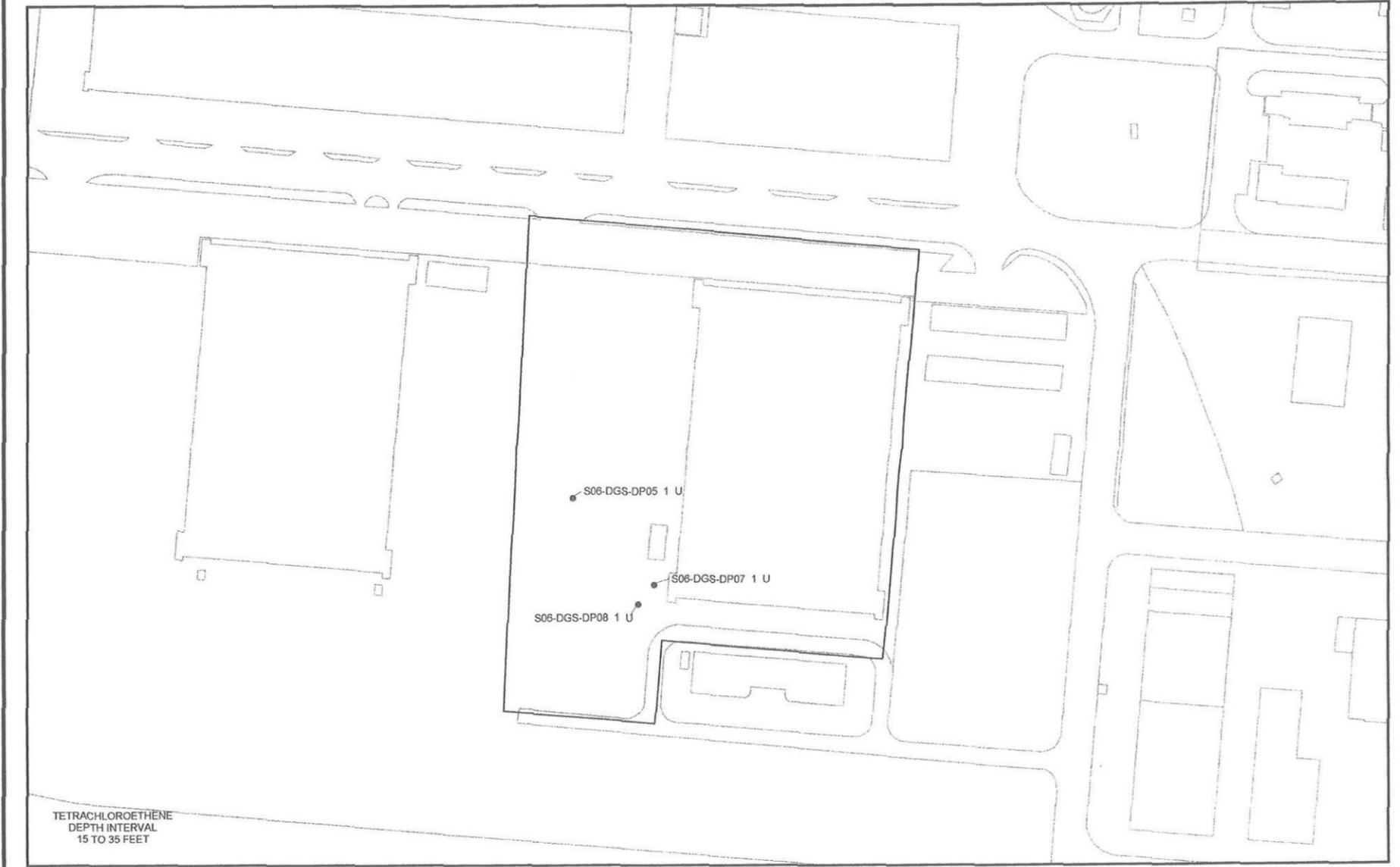


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TETRACHLOROETHENE  
DEPTH INTERVAL  
0 TO 15 FEET



TETRACHLOROETHENE  
DEPTH INTERVAL  
15 TO 35 FEET

- LEGEND**
- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
  - SAMPLING LOCATIONS BELOW THE MCL
  - ▭ CERCLA SITE BOUNDARIES
  - ▨ LAND COVER
  - ▩ GROUNDWATER ABOVE MCL
  - MCL LINE FOR TETRACHLOROETHENE

**NOTE:**  
MAXIMUM CONTAMINANT LEVEL FOR  
TETRACHLOROETHENE = 5.0 ug/L  
ALL RESULTS ARE REPORTED IN ug/L

**QUALIFIERS**  
U - NON-DETECT  
J - ESTIMATED VALUE

POINT NAME	CONCENTRATION	QUALIFIER
S06-DGS-DP09	0.05	U

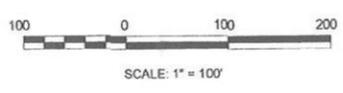
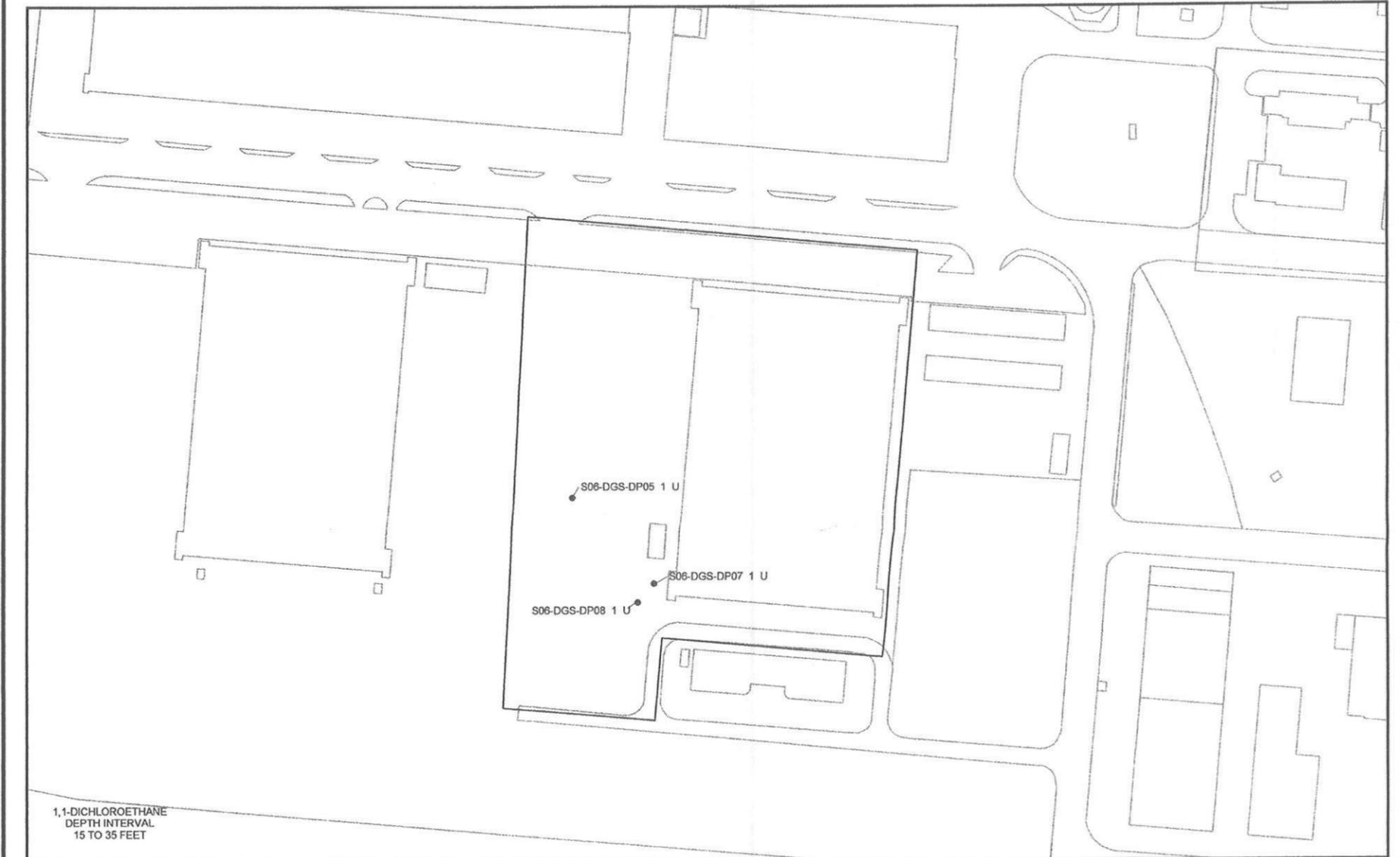
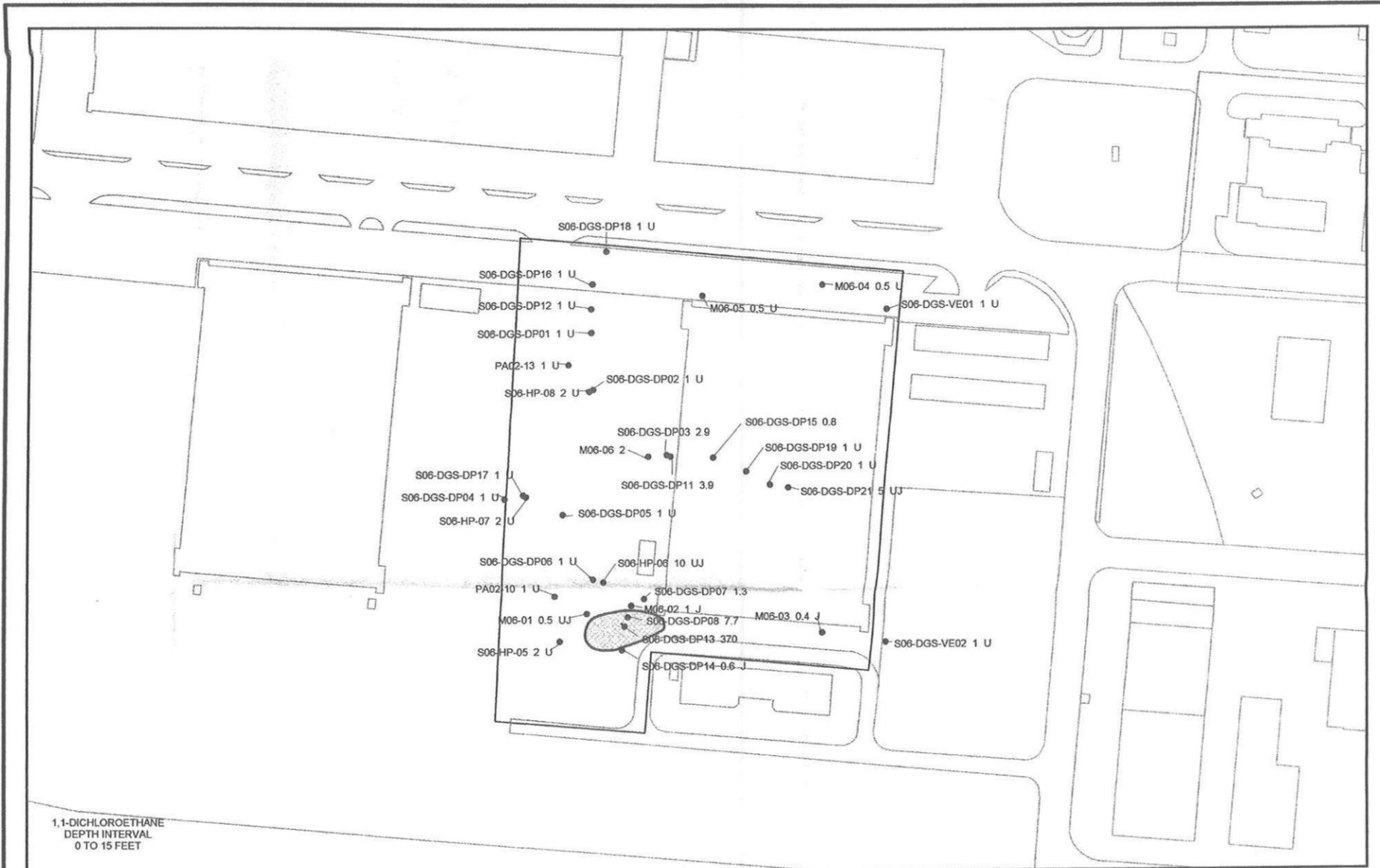


FIGURE 2-1-28  
GROUNDWATER CONTAMINATION PLUME DELINEATION  
TETRACHLOROETHENE  
CERCLA SITE 6  
ALAMEDA, CALIFORNIA  
MAY, 2002

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**LEGEND**

- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
- SAMPLING LOCATIONS BELOW THE MCL
- CERCLA SITE BOUNDARIES
- ▨ LAND COVER
- ▩ GROUNDWATER ABOVE MCL
- ~ MCL LINE FOR 1,1-DICHLOROETHANE

NOTE:  
MAXIMUM CONTAMINANT LEVEL FOR  
1,1-DICHLOROETHANE = 5.0 ug/L  
ALL RESULTS ARE REPORTED IN ug/L

QUALIFIERS  
U - NON-DETECT  
J - ESTIMATED VALUE

POINT NAME	CONCENTRATION	QUALIFIER
S06-DGS-DP09	0.05	U

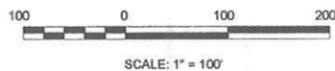
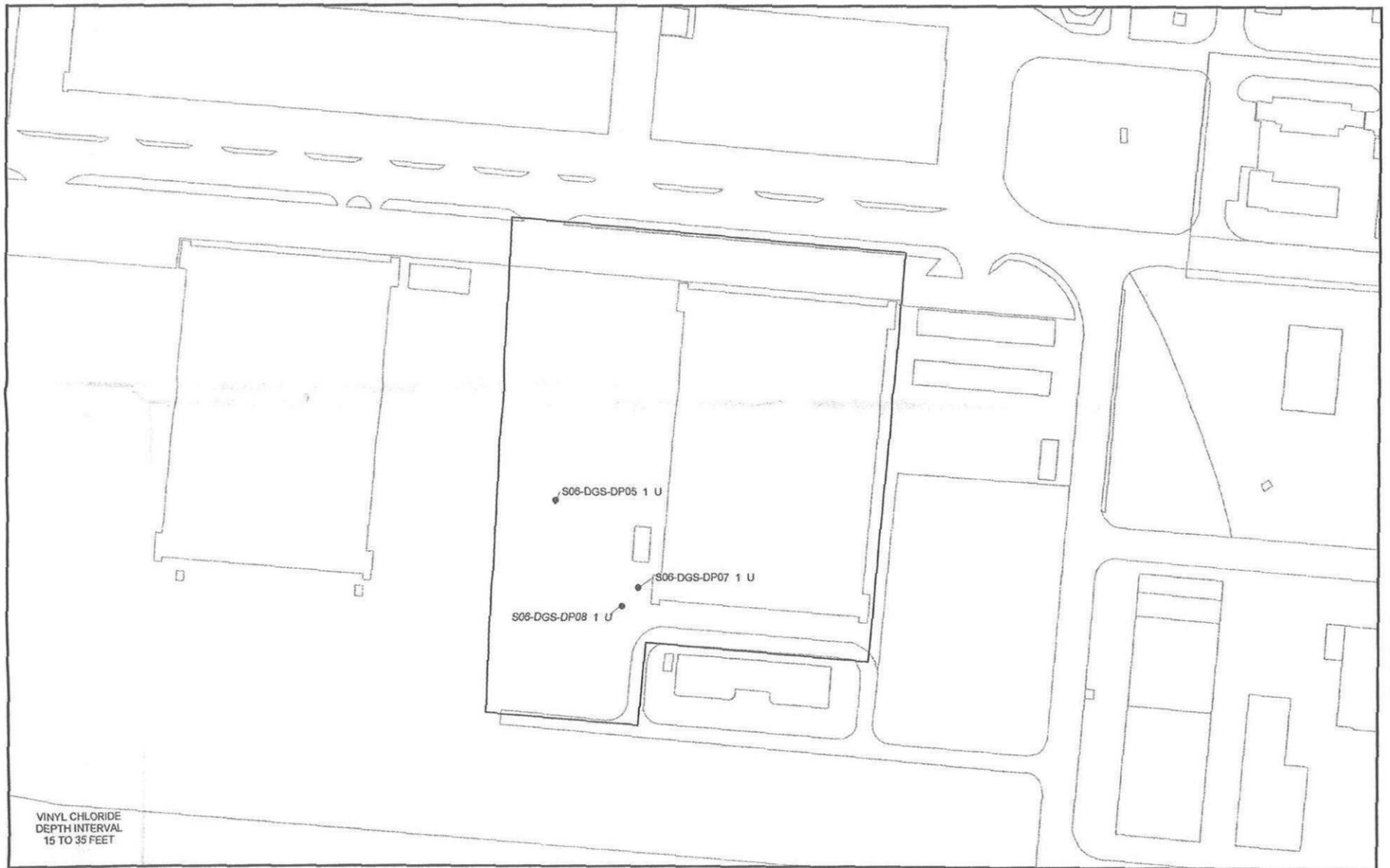
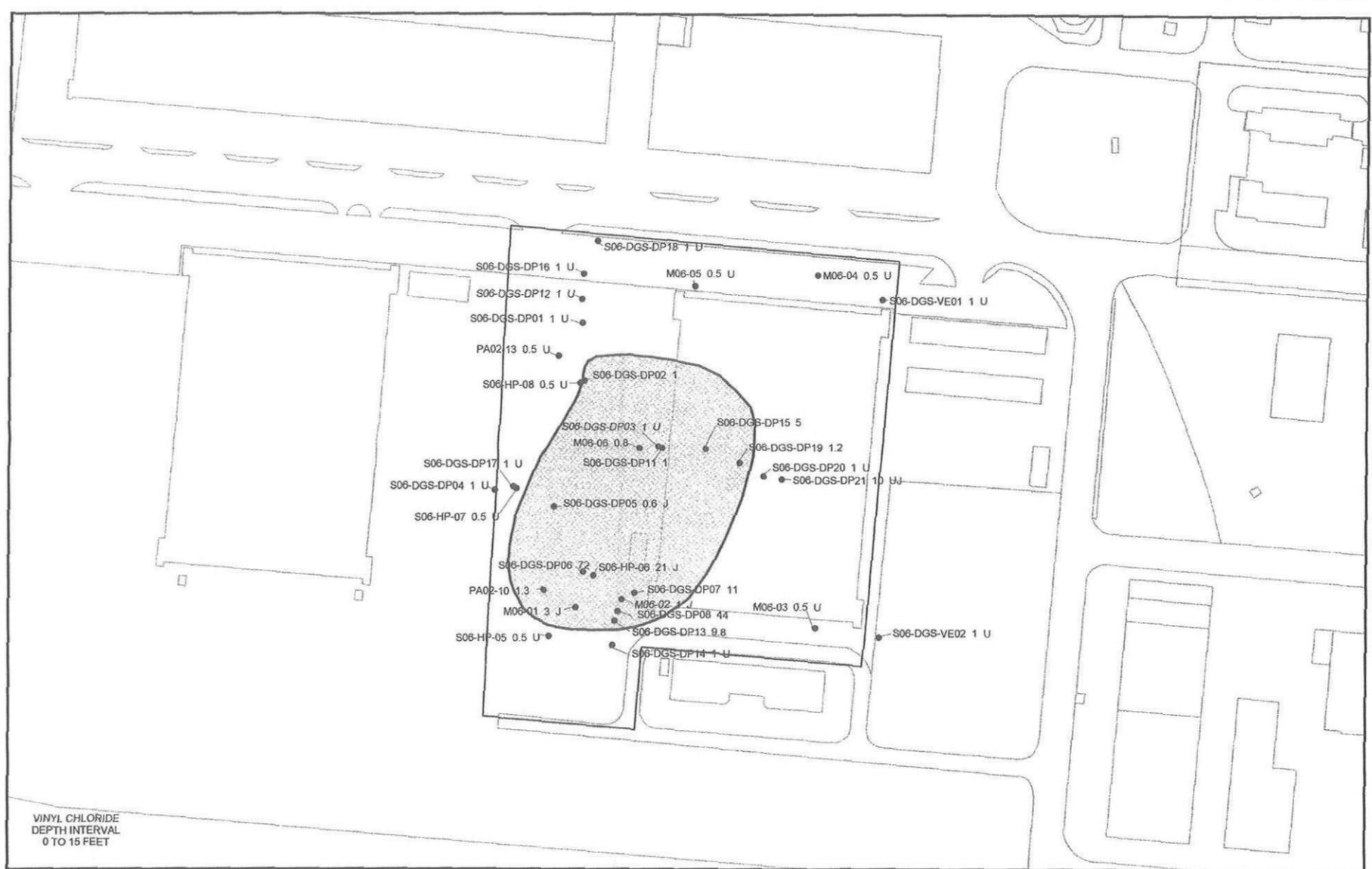


FIGURE 2.1-29  
GROUNDWATER CONTAMINATION PLUME DELINEATION  
1,1-DICHLOROETHANE  
CERCLA SITE 6  
ALAMEDA, CALIFORNIA  
MAY, 2002

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**LEGEND**

- SAMPLING LOCATIONS IN EXCEEDANCE OF THE MCL
- SAMPLING LOCATIONS BELOW THE MCL
- CERCLA SITE BOUNDARIES
- ▨ LAND COVER
- ▨ GROUNDWATER ABOVE MCL
- MCL LINE FOR VINYL CHLORIDE

NOTE:  
MAXIMUM CONTAMINANT LEVEL FOR  
VINYL CHLORIDE = 0.5 ug/L  
ALL RESULTS ARE REPORTED IN ug/L

QUALIFIERS  
U - NON-DETECT  
J - ESTIMATED VALUE

POINT NAME	CONCENTRATION	QUALIFIER
S06-DGS-DP09	0.05	U

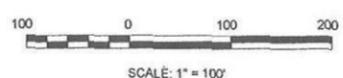


FIGURE 2.1-30  
GROUNDWATER CONTAMINATION PLUME DELINEATION  
VINYL CHLORIDE  
CERCLA SITE 6  
ALAMEDA, CALIFORNIA  
MAY, 2002

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