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Omega Chemical Superfund Site

FINAL-DRAFT
On-Site Soils Remedial Investigation/Feasibility Study Work Plan

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Submitted to:

U.S. Environmental Protection Agency
Region IX

Prepared for:

Omega Chemical Site
PRP Organized Group

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List of Acronyms

ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
bmp	below the measuring point
Cardinal	Cardinal Environmental Consultants
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm^2	centimeters squared
COPC	chemical of potential concern
CPT	cone penetrometer
CRDL	contract required detection limit
DNAPL	dense non-aqueous phase liquids
DOT	Department of Transportation
DQO	data quality objectives
DSR	Data Summary Report
ELAP	Environmental Laboratory Accreditation Program
England & Hargis	England & Associates and Hargis + Associates
ESA	Environmental Site Assessment
FSP	Field Sampling Plan
GC/MS	gas chromatography/mass spectrometry
gpm	gallon per minute
GRA	general response action
~~HBCG~~	~~health-based cleanup goal~~
LCS/LCSD	laboratory control sample/laboratory control sample duplicate
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
msl	mean sea level
MS/MSD	matrix spike/matrix spike duplicates

MTBE	methyl tertiary butyl ether
NELCO	New England Lead Burning Company
OPOG	Omega Chemical Site PRP Organized Group
OSHA	Occupational Safety and Health Administration
PARCCS	precision, accuracy, representativeness, completeness, comparability, and sensitivity
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PE	performance evaluation
PID	photoionization detector
ppbv/v	parts per billion volume / volume
PPE	personal protective equipment
PPM	parts per million
PRP	Potentially Responsible Party
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
RAO	remedial action objective
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SCEM	site conceptual exposure model
Site	Omega Chemical Superfund Site
SVE	soil vapor extraction
SVOC	semi-volatile organic compounds
TCA	1,1,1-trichloroethane
TCE	trichloroethene
TDS	total dissolved solids
TIC	tentatively identified compounds
TM	technical memorandum
USEPA	U.S. Environmental Protection Agency

UST	underground storage tank
VOC	volatile organic compound
1,2-DCA	1,2-dichloroethane
95UCL	95 percent upper confidence limit of the arithmetic mean
µg/L	micrograms per liter
%R	percent recovery

Section 1
Introduction

On behalf of the Omega Chemical Site Potentially Responsible Party (PRP) Organized Group (OPOG), CDM has prepared this Work Plan for the On-Site Soils Remedial Investigation/Feasibility Study (RI/FS) to be conducted at the Omega Chemical Superfund Site (Site). The Site is located at 12504 East Whittier Boulevard in Whittier, California (see Figures 1-1 and 1-2 for Site location and vicinity maps). This Work Plan was prepared in accordance with Task 2 of the Statement of Work for Consent Decree Tasks (U.S. Environmental Protection Agency [USEPA], February 28, 2001).

1.1 Project Objectives

The objective of this Work Plan is to present the rationale and methodology for conducting the On-Site Soils RI/FS and to provide the methodology for collecting physical and chemical data to support the RI/FS tasks. The RI/FS is being conducted to characterize the nature and extent of contamination in Site soils to the extent necessary to evaluate remedial alternatives, to assess the threat these contaminants pose to human health and the environment, and to evaluate remedial action alternatives to eliminate, reduce, or control risks to human health and the environment at the Site. Groundwater at the Site is currently being addressed under a separate program.

1.2 Scope of Work

The Work Plan was developed to be consistent with the USEPA "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA [Comprehensive Environmental Response, Compensation, and Liability Act]" (USEPA 1988). It contains recommended Work Plan elements, including rationale and methodology for conducting RI/FS tasks. It also contains a Field Sampling Plan (FSP) that details sample collection, sample handling, analytical, and other procedures. This Work Plan also includes a Quality Assurance Project Plan (QAPP), prepared based on USEPA guidance (USEPA 2001, 2000a, and 1988).

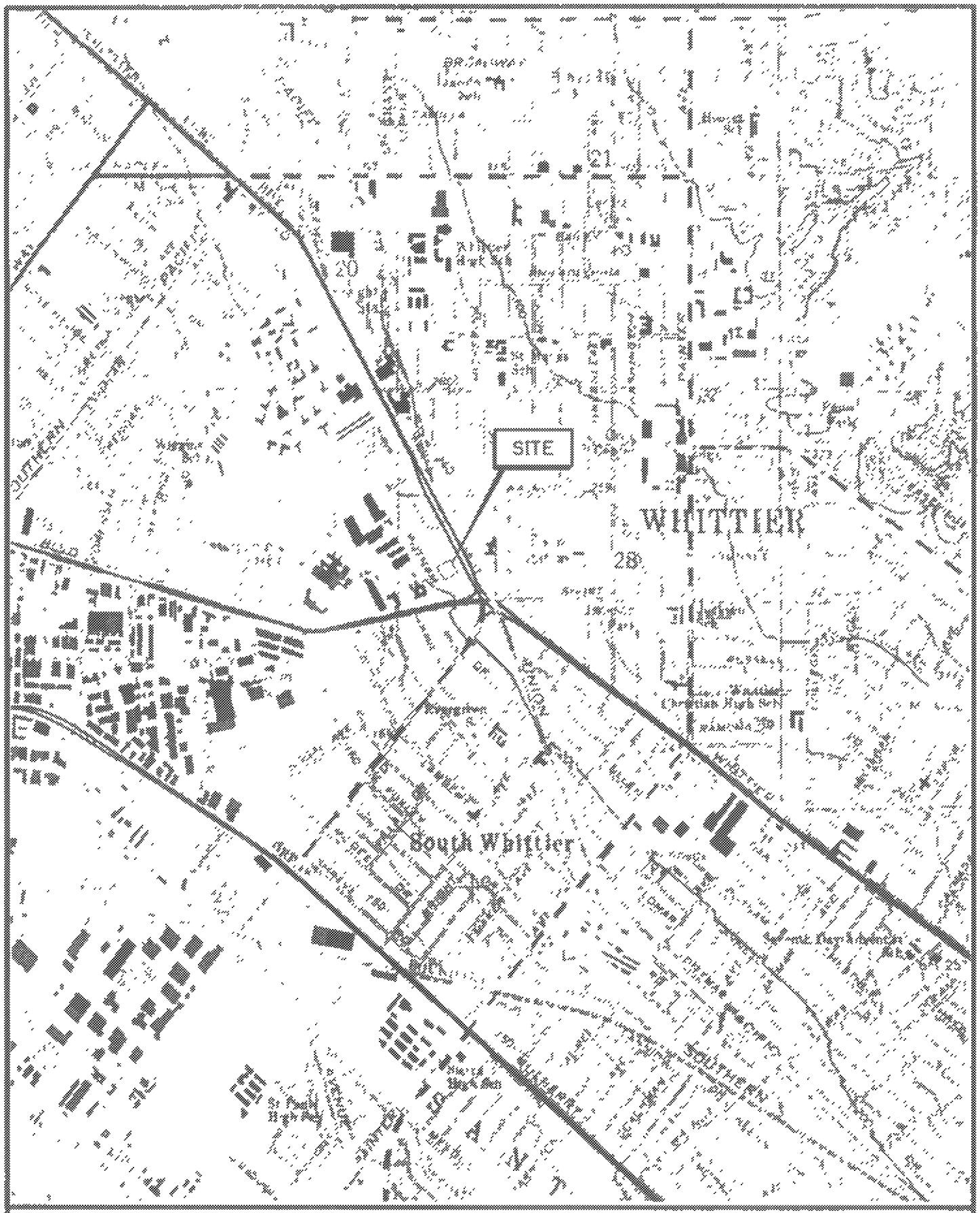
A considerable amount of investigative information has been collected for soils at the Site, as summarized in the Data Summary Report (DSR) for On-Site Soils (CDM, 2001a). The DSR identifies gaps in the available data needed to perform the RI/FS. In addition, the USEPA has published the "Presumptive Remedies: Site Characterization and Technology Selection for CERCLA Sites with Volatile Organic Compounds [*sic* VOCs] in Soils" (EPA 1993) and "User's Guide to the VOCs in Soils Presumptive Remedy" (USEPA 1996). The USEPA guidance discusses the data necessary for implementation of USEPA presumptive remedies. Work Plan activities are streamlined as much as possible to focus on data gaps identified in the DSR and requirements of the presumptive remedies.

1.3 Work Plan Organization

This Work Plan is organized into eight sections and four appendices, as follows:

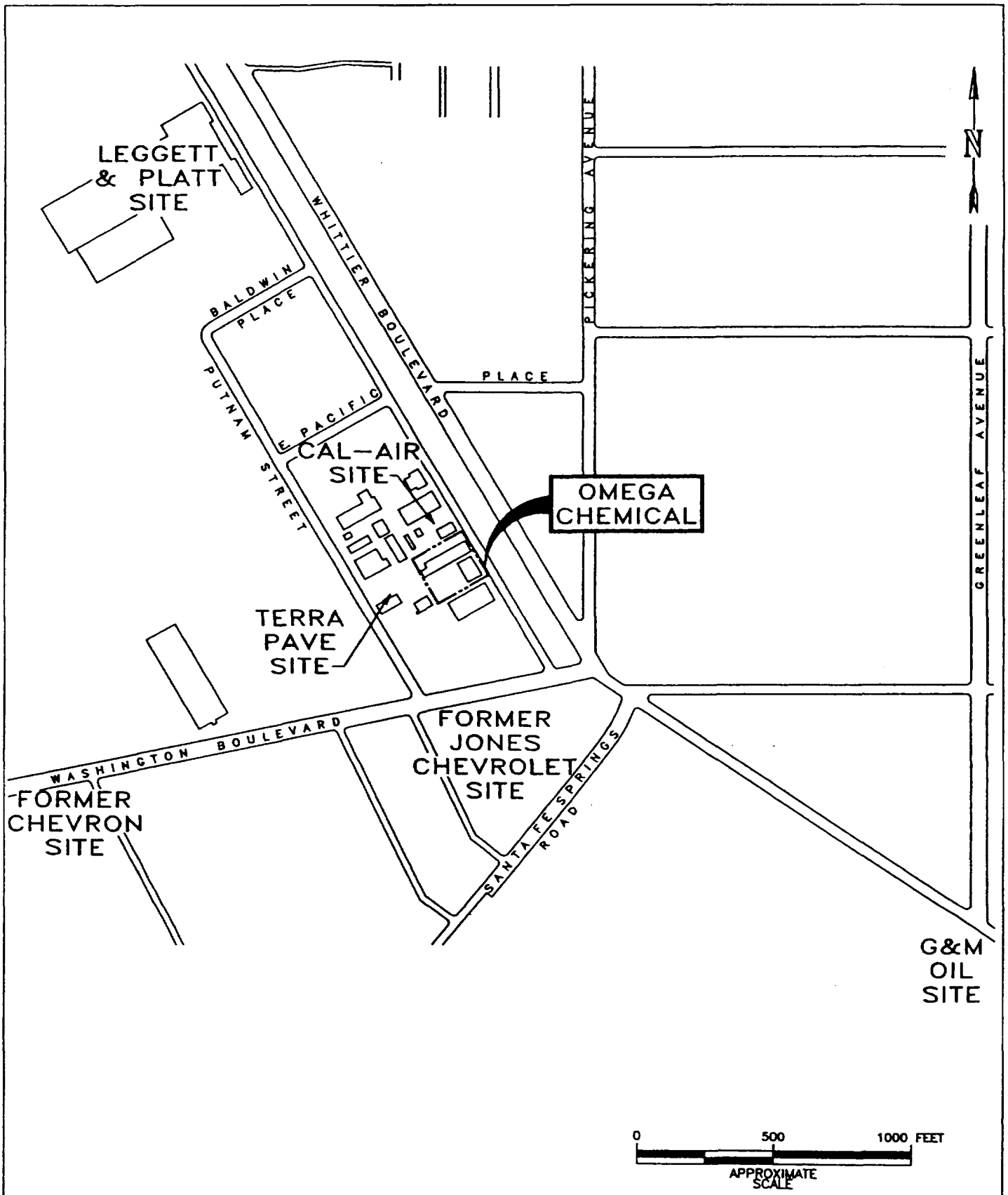
- Section 1 – Introduction
- Section 2 – Site Background and Conditions
- Section 3 – Initial Evaluation
- Section 4 – Work Plan Rationale
- Section 5 – Remedial Investigation/Feasibility Study Tasks
- Section 6 – FSP
- Section 7 – QAPP
- Section 8 – References
- ~~Appendix A – Screening Level Calculations~~
- Appendix ~~B~~A – Health and Safety Plan
- Appendix B~~C~~ – Standard Operating Procedures
- Appendix C~~D~~ – Field Forms
- Appendix D~~E~~ – Equipment Operation and Calibration Procedures

Figures and tables presented in this Work Plan are provided at the end of each section where they are first discussed.



CDM

SITE LOCATION MAP



SOURCE: England & Associates and Hargis + Associates, Inc.

OMEGA CHEMICAL

VICINITY MAP

CDM
environmental engineers, scientists, planners, & management consultants

Figure 1-2

FIG_1-1 12/15/98 09:48:52 2:28:08

Section 2
Site Background and Conditions

The following sections present information regarding Site history, known historical chemical use at and in the vicinity of the Site, and Site conditions. Information is summarized from the DSR (CDM 2001a).

2.1 History of Site

2.1.1 Owners and Operations

The Site was developed in 1951 and occupies Los Angeles County Assessor Tract No. 13486, Lots 3 and 4. The Site is approximately 41,000 square feet in area (200 feet wide x 205 feet long), which is equal to about 1 acre. Two structures are located on the Site – an approximate 140 by 50 foot warehouse and approximate 80 by 30 foot administrative building. These buildings comprise about one-quarter of the Site. A loading dock is attached to the rear of the warehouse. The Site is paved with concrete and secured with a 7-foot high perimeter fence and locking gate. The fence is topped with razor wire. Prior to construction of the Site buildings in July 1951, the Site was used for agriculture.

A summary of property owners/operators is provided below:

- Late 1930s – property was undeveloped or used for agricultural purposes.
- 1951 – property developed, office and warehouse are constructed for Sierra Bullets. During operation of the Sierra Bullet facility, a 500-gallon underground storage tank (UST) was utilized for storage of kerosene.
- 1963 through 1966 - property purchased and occupied by Fred R. Rippy, Inc.
- 1966 through 1971– property used to convert vans to ambulances.
- 1971 through 1976 – property occupied by Bachelor Chemical.
- 1976 – Omega Chemical (Mr. Dennis O'Meara) purchases Bachelor Chemical Processing (northwestern half) and assumes the property lease from Rippy.
- 1987 – Omega Chemical purchases the leased parcel and adjoining southeastern section from Rippy.
- April 11, 1991 – Omega ordered by the Superior Court of the County of Los Angeles to cease operation, remove all hazardous wastes, and close the facility.
- September 1991 – Omega files Chapter 11 bankruptcy, which was dismissed on September 7, 1993.

The Omega facility provided treatment of commercial and industrial solid and liquid wastes and a transfer station for storage and consolidation of wastes for shipment to other treatment and or disposal facilities. According to the October 29, 1990 Operation Plan for Hazardous Waste Recovery Facility, the Omega Facility maintained eleven treatment units comprised of distillation columns, reactors, wipe film processor, liquid extractor, and a solid waste grinder. The facility also maintained 22-stainless steel tanks with capacities ranging from 500 to 10,000 gallons, and 5 carbon steel tanks with capacities of 5,000 gallons.

Two inactive sumps are located in the warehouse loading dock area. One sump is rectangular (19 feet long x 5.5 feet wide x 5 feet deep) and the second sump is square (6 feet long x 6 feet wide x 6 feet deep). The roof in the loading dock area is in poor repair, allowing rainwater to collect in both sumps. A composite aqueous sample was collected from the sumps on July 11, 2000. Based on analytical results from the sample, the accumulated rainwater (945 gallons) was removed from the sumps on August 23, 2000 using a vacuum truck. The sumps were pressure washed and fluids were transported under Non-Hazardous Waste Manifest to the Demenno/Kerdoon facility in Compton, California for recycling. In order to prevent future accumulation of rainwater in the sumps, both sumps were backfilled with a sand slurry concrete mix.

From approximately 1999 through 2001, the warehouse was leased by a tenant (Mr. Nicholas Stymuiank) who occupied the warehouse and stored miscellaneous equipment and materials in the warehouse and service yards. The warehouse ~~is currently being~~ was recently converted for use by a new tenant (Star City Auto Body) for auto body repair. ~~It is CDM's understanding that e~~Exterior areas ~~will be~~are currently being used by a third party (Southeast Electric) for vehicle and miscellaneous storage.

2.1.2 Review of Historical Aerial Photographs

An Aerial Photographic Analysis of the Site was completed in April 2000 (USEPA, 2000b). A total of 13 dates of aerial photographs for the years from 1928 to 1994 were reviewed. The objective of the analysis was to document features and activities of environmental significance including surface morphology, property use, and evidence of hazardous waste disposal at the Site in support to the Site investigation. Site observations discussed in the review are summarized below. Figure 2-1 identifies features tentatively identified in the photographic review. Locations of former tanks and the former UST are also identified in the figure.

The Site was used for agricultural purposes as an orchard between 1928 and 1946. The 1956 photograph shows the Site developed with the warehouse and office building. Spillage or other surface discoloration was noted in the unpaved yard south of the warehouse (hereinafter referred to as the "southern yard"). The yard north of the warehouse (hereinafter referred to as the "northern yard") appears to have been paved and was used for parking. In the 1959 photograph, spillage and/or surface staining was again noted in the unpaved southern yard. An area of mounded earthen

material was also observed within the southern yard. Staining was also observed in the 1956 and 1959 photographs at nearby properties to the northwest of the Site.

The spillage and staining observed at the Site in 1956 and 1959 was not noted in the 1963 photograph. The 1966 photograph shows some surface staining, a small access road leading ~~offsite~~off-site and mottled-toned surface coloration typical of vegetation stress. The 1970 photograph shows at least half of the southern yard to be paved, with possible disturbed ground in the rear portion of the Site. In 1972, paving was observed throughout the Site. In addition, a number of vehicles and/or containers were observed in both the northern and southern yards.

The 1978 photograph shows the initial evidence of chemical use on the Site. Five vertical tanks were observed in the northwestern corner of the property, and stacked drums and small areas of spillage were noted in the northern yard. Two notable areas of staining and/or spillage were observed emanating from both the northwestern and southwestern side of the office building toward the center of the southern yard. The soil within the western portion of the southern yard appears to be exposed with locations of mounded material (possible excavation).

In 1984, a total of nine vertical and two horizontal tanks were observed in the northwestern portion of the Site. The northern yard appears to be full of drums and small storage containers. A large stain and/or spillage was observed close to the center of the western side of the office building. A bulldozer and various toned materials suggestive of earthmoving activities were noted in the southwestern portion of the Site. The earthmoving activities may have been in preparation for the installation of six vertical tanks observed in this area in the 1989 photograph. The resolution of this photograph was poor; however, up to 12 additional vertical tanks were noted in the northwest corner and stacked rectangular objects were observed in the central portion of the southern yard.

In 1993, seven of the vertical tanks and the two horizontal tanks observed in the northwest corner of the Site were no longer present. Instead, five vertical tanks (two different sizes) were located in the northern yard along with stacked crates. The six vertical tanks located within the southwest portion of the Site were still present in both the 1993 and 1994 photographs. In 1994, two additional vertical tanks were observed in the northwest portion of the Site. The yards still contain stacked crates. The 1994 photo was the final year included in the aerial photographic analysis.

2.1.3 Facility Processes and Chemical Usage

Limited information regarding volumes and types of wastes handled by the Omega Chemical Corporation was available for review. A Phase II Close Out Report, prepared by England & Associates and Hargis + Associates (England & Hargis) in 1996, summarized available Site information for the period from 1985 through mid-1996, as well as background information (ownership and operational history, geology, hydrogeology, etc).

According to the Phase II Close Out Report, Omega Chemical Corporation operated the facility for recycling and treatment of spent solvent and refrigerant. Drums and bulk loads of waste solvents and chemicals (primarily chlorinated hydrocarbons and chlorofluorocarbons) from various industrial activities were processed to form commercial products which were returned to generators or sold in the marketplace. An Operation Plan, prepared by Omega Chemical Corporation in 1990 for proposed expansion of the facility, provided a summary of current and proposed facility processes, tank capacities, incoming and facility-generated waste stream characteristics and handling practices, etc.

Eleven treatment facilities were present in 1990. The majority of these treatment units were located in the general area of the warehouse loading dock. The Operation Plan listed the following storage facilities:

- Storage Tanks A through F – 6 stainless steel tanks with 10,000-gallon storage capacity per tank.
- Miscellaneous Named Tanks – 16 stainless steel tanks (Heidi, Jenny, Elaine, Amy, etc.) with the following storage capacities: 1 x 5,000 gallon, 1 x 3,500 gallon, 4 x 2,000 gallon, 1 x 1,300 gallon, 1 x 1,200 gallon, 3 x 750 gallon, 1 x 650 gallon, and 4 x 500 gallon.
- Storage Tanks 1 through 5 – 5 carbon steel tanks with 5,000-gallon capacity per tank.

The combined storage capacity of the 27 tanks present at the facility in 1990 was 109,400 gallons. Storage tanks A through F were arranged in an L-shaped pattern in the southern corner of the Site. Storage tanks 1 through 5 were located in the northern yard, and were arranged in a linear pattern along the side of the warehouse. The locations of the smaller storage tanks were not indicated in the Operation Plan. According to the Operation Plan, the 5,000 and 10,000 gallon storage tanks were used to store solvent wastes prior to distillation. Distillation units had a total treatment capacity of 1,500 gallons per hour. The wiped film evaporation units had a design treatment capacity of 200 gallons per hour.

Wastes accepted by Omega Chemical Corporation for recycling were broadly characterized as organic solvents and chemicals, and aqueous wastes with organic waste constituents. Sources of the incoming waste were generated by a wide assortment of manufacturing and industrial processes (petroleum refining, rubber and plastics, chemicals, paper and allied products, furniture and fixture products, lumber and wood products, printing and publishing, textile mill products, food and kindred products, etc.).

Typical types and volumes of wastes generated by Omega Chemical Corporation were discussed in Section V of the Operation Plan. Typical Omega-generated waste consisted of the following: C6 to C11 aliphatics (43.4%), xylene (16%), toluene (7.2%), C9 to C10 alkyl benzenes (5.2%), isopropyl alcohol (5.1%), and a variety of other

compounds. Hazardous wastes manifested off-Site from the Omega facility during 1989 consisted of the following: 19,300 gallons of aqueous solutions with total organic residues less than 10% (DHS Code 134); 1,600 gallons of halogenated solvents (DHS Code 211); 47,245 gallons of still bottoms with halogenated organics (DHS Code 251); 665,000 gallons of other bottom wastes (DHS Code 252); and 120 tons of other organic solids (DHS Code 352).

2.2 Adjacent and Nearby Properties

One commercial property (Skateland) and two industrial properties (the former Cal-Air facility, now owned by Medlin & Sons, and Terra Pave) are located immediately adjacent to the Site (southeastern, northwestern, and southwestern boundaries, respectively). These properties are paved with concrete and asphalt. The northeastern boundary of the Site is bordered by Whittier Boulevard and a frontage road. The properties adjacent to and nearby the Site are discussed in the following sections.

2.2.1 Skateland

Skateland is located at 12520 Whittier Boulevard, adjacent to the southeastern boundary of the Site. The property consists of an indoor roller-skating rink that is currently in operation and open to the general public. Review of the aerial photographs indicates that the property was used for agricultural purposes in 1946. The building presently occupying the property was observed on the 1956 photo. There were no environmental documents or reports available for review for the Skateland property.

2.2.2 Terra Pave

The Terra Pave, Inc. facility is located at 12511 East Putnam Street, adjacent to the southwestern boundary of the Site. The DSR (CDM 2001a) reviewed a Phase 1 Environmental Site Assessment (ESA) for information regarding historical activities at the Terra Pave property (Cardinal Environmental Consultants [Cardinal] 1991).

The Phase I ESA Report was prepared for the New England Lead Burning Company (NELCO), which operated the Site beginning in the mid-1950's. According to the Phase I ESA, the property was unoccupied during a September 1991 Site visit by Cardinal staff. The Phase I ESA indicated that NELCO purchased lead in sheet, pipe and solid rods and fabricated the desired product by burning (welding) the lead to the required shape. The welding was performed in the building located along the northeastern portion of the property (Building 2), adjacent to the Site. The type of work performed in the remaining building (Building 1) was primarily carpentry work and did not involve lead welding. Building 1 was also used for offices and warehousing. The exterior of the property was used for storage of equipment and loading materials or finished goods for shipment. The report noted that the undeveloped portions of the property consisted of exposed soil and miscellaneous rubble. Drainage patterns incised in the soil were observed trending in a southerly direction towards Putnam Street.

The Phase I ESA briefly discussed the findings of environmental investigations performed between 1989 and 1991 to evaluate the property for the presence of residual lead. To mitigate this concern, NELCO subcontracted Vector Three Environmental Inc. of Brea, California, to clean the interior of all facilities and remove superficial lead from the topsoil. Removal activities were monitored by Cardinal staff and they indicated that remaining lead levels were extremely low, based on results of confirmatory dust wipe and soil samples. Information regarding lead levels prior to and after removal activities and the depth of the soils removal was not provided. The building where lead welding took place is located directly adjacent to the Site and lead welding occurred prior to the time when the Site was paved. It is possible that lead in airborne particulates from the Terra Pave facility was deposited onto surface soils of the Site.

CDM implemented the Phase 1a field investigation during June and July 1999 to evaluate the extent of groundwater contamination at and immediately downgradient of the Site. As part of the Phase 1a field investigation, monitoring well OW-1b was installed on Terra Pave property. Soil samples collected during the drilling of this monitoring well indicated the presence of VOC contamination in the vadose zone. PCE was the compound most frequently detected in soil samples collected from monitoring well OW-1b; PCE concentrations ranged from 4.7 micrograms per kilogram (µg/kg) at a depth of 120 feet bgs to 3,300 µg/kg at a depth of 70 feet bgs. The source of this contamination has not been determined.

2.2.3 Former Cal-Air Facility

The former Cal-Air facility, now owned by Medlin & Sons, is located at 12484 Whittier Boulevard, adjacent to the northwestern boundary of the Site. The DSR reviewed a Phase I ESA prepared by Centec Engineering (1997) for information regarding the former Cal-Air property. The report was prepared for Maple Brothers Industrial, Inc. According to the report, a machine shop and office were constructed at the property in 1954. The property was occupied by Accessory Products, Inc. until approximately early 1976. In September 1976, Cal-Air Conditioning Company added three new offices and occupied the property until 1996. The building on the property consists of a conglomeration of structural types, representing many additions and expansions during the years the property was occupied. A below-grade room and "test tunnel" is reportedly located along the southern side of the building. According to a City Building Department document, the test tunnel was to be used for non-hazardous test work on government projects. At the time of the assessment, the property was unoccupied and access to the test tunnel access was blocked by a heavy metal door and a large amount of water in the vault of the front entrance.

In October 1987, four USTs used to contain gasoline and diesel fuels were removed from the property by Toxguard Systems, Inc. Laboratory analytical results indicated 72 parts per million hydrocarbons in one of the soil samples collected from under the USTs, with no detectable concentrations in the remaining seven samples submitted for analysis. The Phase I ESA noted significant surficial staining on the wall and floor in the extreme northwest portion of the warehouse. ~~The Cal-Air facility appears to~~

~~have released contaminants (i.e., Freon 113) to soil at the Site.~~Freon 113 and Freon 11 vapors appear to extend from the Medlin & Sons site across the center of the Omega site in the 6 foot and 12 foot bgs soil gas samples. The former Cal-Air facility is known to have handled these materials (England & Associates and Hargis &Associates, 1996). Results of sampling proposed in this Work Plan will help evaluate whether the former Cal-Air facility is a source of contamination to the Site.

2.2.4 Nearby Properties

The Phase II Close Out Report provided information on four nearby properties located within an approximate one-half mile radius of the Omega Site. Fuel hydrocarbons (aromatic organics, total petroleum hydrocarbons, etc.) were detected in the groundwater underlying a former Chevron Station site located approximately 1,500 feet southwest (downgradient) of the Site. Fuel hydrocarbons were also detected in soil samples collected from a gasoline service station (G&M Oil Company) located approximately 2,300 feet southeast (cross-gradient) of the Site. Napthalene, trichloroethene (TCE), tetrachloroethene (PCE), and other fuel hydrocarbons have been detected at a Leggett & Platt furniture manufacturing facility approximately 2,000 feet northwest (upgradient) of the Site.

At a former automobile dealership (Jones Chevrolet) located 800 feet south of the Site, a variety of contaminants (fuel hydrocarbons, chlorinated organics, freons, methyl tertiary butyl ether [MTBE], aromatic organics, etc.) have been detected in groundwater underlying the property.

In mid-2000, USEPA initiated an assessment of historical and current properties downgradient of the Omega Site and upgradient of water supply well 30R3. This work is intended to identify potential sources of contamination downgradient of the Omega Site. Due to the industrial and commercial nature of the study area, it is likely that the assessment will identify additional potential contributors to observed groundwater contamination downgradient of the Omega Site. In addition, it is possible that these facilities may be a source or are contributing to the soil gas and soil contamination at the Site. The findings of the assessment are currently pending.

2.3 Site Conditions

2.3.1 Climate

The climate of the area is characterized as semi-arid, with an average annual precipitation of approximately 16 inches. Precipitation occurs mainly during the winter and spring months.

2.3.2 Surface Topography

The Site is relatively flat and is situated at an approximate elevation of 220 feet above mean sea level. Currently, an office building and warehouse occupy the Site, with concrete paving covering exterior areas. Aerial photographic review (see Section 2.1.2) indicated that exterior areas were primarily unpaved until approximately 1972.

2.3.3 Regional Geology and Hydrogeology

The Site is located in the Montebello Forebay area of the Central Groundwater Basin of the Coastal Plain of Los Angeles. The Montebello Forebay is an important area of groundwater recharge. Groundwater flow in the area is generally towards the southwest, originating in an area of recharge and flowing toward an area of discharge.

The Site is underlain by low permeability silty and clayey soils of the upper Pleistocene Lakewood Formation. The Lakewood Formation is locally derived from erosion of the Puente Hills to the northeast, and may be overlain by a thin cover of Holocene slopewash and alluvium that can be difficult to distinguish from the Lakewood Formation on the basis of lithology. Furthermore, local merging and interfingering of geologic units near the basin margin makes positive identification of individual geologic units encountered in borings problematic. The uppermost aquifer in the Site vicinity, probably the Gage aquifer in the lower portion of the Lakewood Formation, does not occur directly beneath the Site.

The direction of regional groundwater flow is generally to the southwest. The nearest active downgradient water supply wells are located more than one mile from the Site. The closest active well (well 30R3) is located on Dice Road by Burke Street, approximately 1.25 miles downgradient of the Site. This well is screened from 200 to 900 feet bgs and at least two aquitards appear to be present between the shallowest aquifer and the top of the well screen.

2.3.4 Local Geology and Hydrogeology

This discussion of local geology and hydrogeology, summarized from the DSR, is based on an evaluation of lithologic logs from borings and wells advanced at the Site and at properties downgradient of the Site. It is necessary to understand the nature of subsurface materials underlying and in proximity to the Site to gain an understanding of the potential for contaminant migration. Therefore, detailed descriptions of subsurface materials noted during prior investigations at the Site and in the vicinity of the Site are provided below.

Subsurface Materials Immediately Underlying the Site

The Site is underlain by low permeability silty and clayey soils of the upper Pleistocene Lakewood Formation, probably representing the Bellflower aquiclude (England & Hargis 1996), to a depth of at least 120 feet bgs. Note that the term "aquiclude" is used in the published literature, but "aquitard" is a more accurate description of this stratigraphic unit. No transmissive aquifer was found immediately beneath the facility during field investigations performed by Omega Chemical or OPOG.

During the 1999 investigation, groundwater was measured in on-Site well OW-1 at an approximate depth of 70 feet below ground surface (bgs). The well is screened in low permeability silts and clays. A coarser-grained sandy layer, probably representing the

Gage aquifer, was encountered southwest of the facility along and downgradient of Putnam Street, but was not detected beneath the Site. The following discussion includes detailed descriptions of subsurface materials obtained from lithologic logs from on- and off-Site borings.

Numerous soil borings (S-1 through S-5 and S-1A, B-1 through B-3, and BMW-2) were advanced across the Site and one well (BMW1) was installed in the northwestern corner of the Site during investigations conducted in 1985 and 1988. Shallow soils (i.e., soils found at depths less than 10 feet) consisted primarily of fine-grained materials (e.g., clayey silts and silty clays). The deeper borings (B-1 through B-3 and BMW-2) ranged in depth from 20.5 to 60 feet bgs and also consisted primarily of fine-grained materials. Boring BMW-2 was intended for completion as a groundwater monitoring well; however, groundwater was not encountered during drilling and the boring was terminated at a depth of 60 feet bgs.

Lithologic materials at the location of well BMW-1 were predominately fine-grained above a depth of 57 feet bgs. Materials observed in the interval from 57 to 73 feet bgs consisted of a combination of silty clayey sand and silty sandy clay. In the interval from 73 to 110 feet bgs, coarser-grained materials (silty clayey sands) were observed. During drilling and well installation, groundwater was encountered at a depth of 75 feet bgs. The well was completed to a depth of 100 feet bgs with the installation of 90 feet of blank casing and 10 feet of perforated casing. No surface expression of the well remains and no plugging and abandonment record could be found. Attempts made by OPOG in 1995 to confirm the location of this well were unsuccessful.

Additional shallow soil borings (SB-1 through SB-15) were advanced at the Site in late 1995. The borings were relatively shallow (i.e., they reached maximum depths of 6.5 to 6.7 feet bgs), therefore, boring logs were not prepared. Technical Memorandum (TM) No. 4, included in the Phase II Close Out Report, summarized the results of the shallow soil investigation and described the lithologic materials as consisting of clay with some sand and trace gravel.

In early 1996, OPOG advanced numerous deep (85 to 124 feet bgs) soil borings at the Site using a cone penetrometer (CPT) rig (H-1 through H-4/H-4A). One boring (H-5) was also advanced at an off-Site location on Putnam Street. Shallower soil borings (C-1 through C-3, and C-7/C-7A) were advanced to depths ranging from 15 to 75 feet bgs using a Geoprobe rig. The borings were located in the northern and southern yards. Based on soil samples and lithologic interpretations provided by the on-board CPT logging software, subsurface soils at all but one of the locations (C-3) were observed to be fine-grained (clayey silts, silts, silty clay, and clay). A coarser-grained material (silty sand) was observed in a sample collected from the bottom of the boring (75 feet bgs) at soil boring C-3, located in the northern yard. As discussed in the Close-Out Report, this sample may be consistent with the silty and clayey sands encountered at location BMW-1 in the interval from 73 to 110 feet bgs.

Several months later, OPOG advanced a deep soil boring (SB-4) and installed a groundwater monitoring well (OW-1) in the southern yard. Monitoring well OW-1 is adjacent to the fence separating the Site from the Terra Pave facility. The soil and well borings were advanced to 75 and 80 feet bgs, respectively. Lithologic logs for both indicated that the subsurface materials were predominately fine-grained (silts and clays).

Nine soil samples were collected from boring SB-4 and submitted for analysis of geotechnical properties. All nine of the samples were submitted for moisture content and dry density analyses, with selected samples analyzed for grain size distribution, specific gravity, total organic carbon (TOC), effective porosity, and hydraulic conductivity. Moisture content ranged from 15 to 25%, total porosity ranged from 37.5 to 39.4%, effective porosity ranged from 14.3 to 16.2%, TOC ranged from 0.12 to 0.38%, and hydraulic conductivity ranged from 3.6×10^{-6} to 3.4×10^{-8} cm/sec.

Subsurface Materials In the Vicinity of the Site

In mid-1996, OPOG performed an off-Site investigation and advanced eight CPT borings (H-6 through H-13) in the vicinity of the Site. Four additional off-Site CPT (H-14 through H-17) borings were advanced in March 1997. Subsurface materials in off-Site areas generally consisted (with one exception discussed below) of fine-grained silts and clays comparable to those found underlying the Site.

The off-Site investigation revealed the presence of a coarser-grained unit consisting of silty sand, gravelly sand, and sand. At some locations (e.g., H-6 and H-9), this unit was found interbedded with silt. This unit was first encountered at depths ranging from approximately 30 feet bgs (H-16) to 60 feet bgs (H-7). The thickness of the unit ranged from approximately 11 feet (H-11) to 31 feet (H-6). This sandy unit was also encountered during investigations conducted by others at nearby sites (e.g., Leggett-Platt and Jones Chevrolet). The Close Out Report indicated that this sandy unit was assumed to be continuous in areas downgradient of the Site. The unit apparently pinched out northeast of Putnam Street because it was not observed at the location of the well or deep borings advanced at the Site (OW-1 and H-1 through H-4/4A) or upgradient of the Site (H-2). Borings advanced through this sandy unit encountered underlying finer-grained materials.

Three off-Site monitoring wells were installed by OPOG a short distance downgradient of the Site during an investigation completed in 1999. Well OW-1b (screened from 110 to 120 feet bgs) was designed as a deeper companion well to on-site well OW-1 (screened from 62.5 to 77.5 feet bgs). Well OW-1b was installed on Terra Pave property and wells OW-2 and OW-3 were installed on Putnam Street.

The subsurface materials at location OW1b were very uniform and consisted of fine-grained materials (silty clays) throughout the entire drilled depth of the boring (131.5 feet bgs). Some gravel imbedded in the silty clay matrix was observed in the interval from 125 to 130 feet bgs. At locations OW-2 and OW-3, the subsurface materials also consisted of silty clays to a depth of 55 and 50 feet bgs, respectively.

At location OW-2, silty sand was observed in the interval from 60 to 75 feet bgs, with clayey sand observed from 80 to 85 feet bgs. Sand was observed at location OW-3 in the interval from 50 to 60 feet bgs, with clayey gravel observed from 70 to 75 feet bgs. At both locations, silty clay was observed underlying these coarser-grained materials.

The depth and thickness of the silty sand unit observed at locations OW-2 and OW-3 is comparable to the silty sand unit observed at CPT borings advanced in 1996 at off-Site boring locations. The subsurface materials observed at the three off-Site monitoring well locations supports the earlier finding that the silty sand unit is continuous downgradient of the Site (the unit was observed at locations OW-2 and OW-3) and pinches out northeast of Putnam Street (the unit was not observed at location OW-1b). As was observed during the 1996 investigation, silty clay was also observed above and below the silty sand unit at locations OW-2 and OW-3.

A geotechnical investigation for proposed additions at the nearby Presbyterian Intercommunity Hospital was performed during late 1999 (Law/Crandall, December 30, 1999). The hospital is located approximately 1,500 feet west of the Site. Four soil borings ranging in depth from approximately 40 to 50 feet bgs and two CPT borings to depths of 50 and 75 feet were advanced during the geotechnical investigation. The Presbyterian Hospital site was found to be almost entirely underlain by clay and silt with some localized layers of silty sand, sand and gravel, to the depths explored.

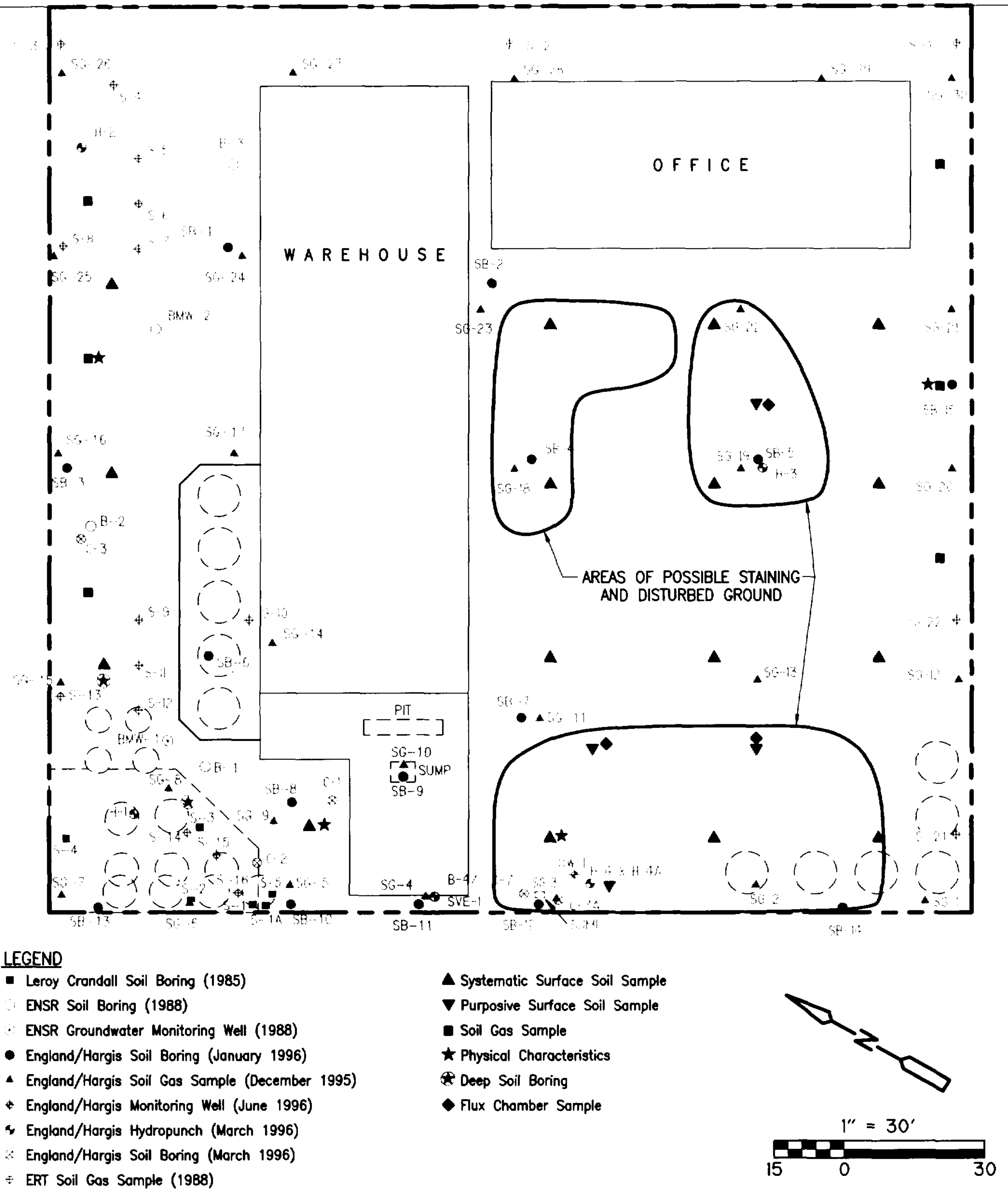
Local Groundwater Flow and Aquifer Parameters

In September 1994, water levels were measured during a four-day period at three nearby properties (Leggett & Platt, Jones Chevrolet, and former Chevron Station). Based on these measurements, the direction of groundwater flow in the vicinity of the Site was determined to be generally towards the southwest at a gradient of 0.007 (vertical feet/horizontal feet). In September 1999, based on water level measurements collected from wells OW-1 through OW-3, the direction of shallow groundwater flow was towards southwest at a gradient of 0.009 vertical feet/ horizontal feet).

The depth to water in on-Site well OW-1 was measured at 71.42 feet below the measuring point (bmp) during the 1999 investigation. The depth to water in deeper well OW-1b was measured at 72.58 feet bmp. Corresponding groundwater elevations for the shallow and deeper well pair were 138.99 and 132.40 feet below mean sea level (msl), respectively. Therefore, there was a 6.48 feet difference in groundwater elevation between the two wells. This head difference suggests that some degree of hydraulic separation exists between the shallow and deeper zones. The head difference also indicates a downward hydraulic gradient at that location, suggesting that there is a potential for contaminants to migrate downward towards the deeper zone. Water quality results for samples collected from the two wells support the assumption that hydraulic separation between the two zones limits downward vertical migration. VOC concentrations detected in deeper well OW-IB were approximately two orders of magnitude lower than VOC concentrations detected in shallow well OW-1. ~~Water quality results for samples collected during 1999 from the~~

~~two wells also indicate hydraulic separation between the two zones. VOC concentrations detected in shallow well OW-1b were approximately two orders of magnitude lower than VOC concentrations detected in deeper well OW-1.~~

Slug testing performed in on-Site well OW-1 during 1996 indicated a horizontal hydraulic conductivity of 0.61 feet per day. In 1999, step-drawdown testing was performed in off-Site well OW-2. Off-Site wells OW-1b and OW-3 were unable to sustain a pumping rate of one gallon per minute (gpm); therefore, step-drawdown testing was not performed at these two locations. Well OW-2 was able to sustain a maximum pumping rate of approximately 5 gpm. Step-drawdown testing results indicated a transmissivity of 15.3 to 29.1 feet ^{2}/day and horizontal hydraulic conductivity of 0.8 to 1.6 feet/day for the shallow aquifer at the location of well OW-2. It was concluded that these low hydraulic conductivities will limit the migration of VOCs laterally away from the Site.



Note: All locations approximate. Features based on Oct. 28, 1984 aerial photo and Figure 1 of England/Hargis Phase II Close Out Report

OMEGA CHEMICAL

Potential Source Areas Observed in Historical Photographs

CDM

Figure 2-1

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Section 3
Initial Evaluation

3.1 Previous Investigations

Previous Site investigations are discussed below. Figure 3-1, located at the end of this section, illustrates the approximate locations of all historical sampling locations. Tables 3-1 and 3-2 provide soil gas analytical results for past investigations. Soil analytical results from previous investigations are provided in Tables 3-3 through 3-7 and groundwater analytical results are provided in Tables 3-8 through 3-12.

Previously conducted investigations at the Site may be divided into three categories, as follows: 1) preliminary work performed from 1985 through 1988, 2) detailed and focused Phase II investigation work performed by England/Hargis and C_2Rem from 1995 through 1997, and 3) Phase 1a pre-design investigation performed by CDM during 1999. Investigations categorized as preliminary work are included in the following summaries. However, insufficient information was presented in the historical reports for investigations performed from 1985 through 1988 to evaluate the quality of the data. For this reason, data from preliminary investigations were not included in the project database.

LeRoy Crandall and Associates, 1985. Investigation of Subsurface Soil Contamination at Tank Farm, Omega Chemical Corporation, June 26.

A total of six borings (Borings S-1, S-1a, and S-2 through S-5) were advanced by hand auger in the tank farm area in the western corner of the Site to depths of six and seven feet bgs between April and May 1985. The investigation was performed to address the violation notice issued April 5, 1985 by the Los Angeles County Department of Health Services to Omega Chemical to assess the extent of contamination observed at the tank farm. Results of the investigation showed concentrations of methylene chloride, 1,1,1-trichloroethane (TCA), TCE, PCE, and 1,2-dichloroethane (1,2-DCA) in the soil. However, the highest concentrations appeared to be limited to the upper 3 feet of each boring.

Leighton and Associates, Inc., 1987. Results of Laboratory Analysis Performed on Soil Samples Collected after the Removal of an Underground Tank Located on the Fred Rippy Trust Property, August 26.

On August 8, 1987, one 500-gallon UST was removed from the Site. The tank was located adjacent to and west of the chemical recycle/loading dock area. The bottom of the tank was approximately eight feet below grade. During excavation of the tank, it was observed that the roof of the west end of the tank was badly corroded and a strong solvent odor was also noted. Two soil samples were collected from 10 and 12 feet below grade (E-1 and E-2, respectively) and three soil samples were collected from the stockpiled soils (SP-1, SP-2A, and SP2-B). Elevated levels of VOCs, including acetone, TCA, PCE, and methylene chloride, were detected at the 12 foot depth in sample E-2. Additional investigation to evaluate the lateral and vertical extent of soil contamination was recommended.

ERT, 1988. Report on Soil Vapor Survey of Fred R. Rippy Trust Real Estate Property, February 2.

In January 1988, a soil vapor survey consisting of eighteen sample points (S1 through S16, and S21 and S22) was completed throughout the Site. Hydrocarbon vapors were detected in most of the samples, with the exception of the northeastern side of the Site, along Whittier Boulevard. The report recommended additional investigation and the collection of soil samples for laboratory analysis to evaluate the lateral and vertical extent of contamination. Sample analysis was performed in the field using a portable gas chromatograph, with results reported as "total readings" which did not indicate the unit of measurement. These results, therefore, are considered "qualitative" and not "quantitative". The 1988 soil gas sampling results, therefore, were not included in the Omega database or summarized in Tables 3-1 or 3-2. The majority of these sampling points were resampled during a 1996 soil gas investigation at the Site (see Phase II Close Out Report and TM2 discussion below).

ENSR, 1988. Report on Site Assessment Investigations at Omega Recovery Facility, October 14.

As a result of the 1988 soil vapor survey, four soil borings (B-1 through B-3 and BMW-2) were advanced and one groundwater monitoring well (BMW-1) was constructed at the Site in March and June 1988. This investigation was intended to evaluate the presence of impacted soil and groundwater. PCE, methylene chloride, TCE, Freon 113, and a number of other VOCs were detected in the soil and groundwater samples. Concentrations of methylene chloride, PCE and Freon 113 were detected above drinking water maximum contaminant levels (MCLs).

England and Associates and Hargis + Associates, Inc, 1996. Phase II Close Out Report, Omega Chemical Site, October 1.

The Phase II Close Out Report summarizes the results of various investigations completed by OPOG between December 1995 and September 1996 to fulfill the requirements of USEPA Administration Order 95-15. A summary of the field activities and the results of the individual tasks performed as part of the Phase II Investigation were summarized within TM Nos. 1 through 9, which are included in the Close Out Report. Brief descriptions of each TM and submittal dates are provided below:

TM No.	Date	Description
1	12/1/95	Attempted location of monitoring well BMW-1
2	12/6/95	Results of Soil Gas Survey (SG-1 though SG-31).
3	1/19/96	Surface dewatering procedures/collection of surface water samples.
4	1/22/96	Results of shallow soil sampling (SB-1 through SB-15).
4A	1/25/96	Proposed supplemental shallow soil sampling/on and off-Site CPT.
5	2/22/96	Removal/treatment contaminated material (loading dock sump).
5A	6/26/96	Excavation/removal of loading dock sump materials.
6	3/6/96	Results of on-Site CPT/Hydropunch investigation (H-1 through H-4, C-C1 through C-3 and C-7A) and proposal for additional investigation.
6A	7/8/96	Procedures for proposed testing of vapor extraction well (VES-1).
7	3/26/96	Modification to frequency of progress reports.
8	6/26/96	Results of soil boring (B-4), well OW-1 (installation/slug testing) and VES-1, and proposal for off-Site groundwater investigation.
9	9/24/96	Plan for removal/off-Site disposal of investigation derived waste.

The Phase II Investigation concluded that the principal contaminants at the Site were VOCs, primarily PCE and related compounds, which were detected in soil and groundwater. In on-Site soil gas samples, the primary VOCs detected were Freon 113, Freon 11, PCE and TCA. ~~Freon 113 was apparently derived from the adjacent Cal-Air property.~~ As stated in the Phase II Investigation, Freon 113 and Freon 11 vapors appear to extend from the former Cal-Air site across the center of the Omega site at the 6 foot and 12 foot bgs soil gas samples. The former Cal-Air facility is known to have handled these materials. The freon concentrations in three deeper samples decreased by one to more than two orders of magnitude. No dense non-aqueous phase liquids (DNAPLs) were identified at any of the historical sampling locations.

The highest VOC concentrations were detected in the soil and soil gas within the soil-filled loading dock sump. Total VOCs were greater than 3,000 milligrams per kilogram (mg/kg). Soil gas concentrations decreased rapidly with distance from the sump. Approximately 8 cubic yards of soil contained within the loading dock sump were excavated and disposed of at an EPA-approved facility. Elsewhere on the Site, concentrations of PCE within the vadose zone ranged from 0.01 to 510 mg/kg.

C_2 Rem, 1997. Technical Memorandum No. 11A, Results of Offsite CPT/Groundwater Investigation, Omega Chemical Site, April 30.

C_2 Rem was retained to perform an off-Site CPT/Hydropunch investigation. The purpose of the proposed investigation was to verify groundwater modeling results which indicated that VOC concentrations in groundwater were expected to decrease~~d~~ to below the MCLs at a distance of approximately 3,000 feet downgradient from the Site. In-situ groundwater samples were collected from four locations (H-14 through H-17). In addition, water levels were measured and existing on-Site well OW-1 was sampled. Results of the investigation, performed in March 1997, were documented in TM11A. The TM concluded that the direction of groundwater flow was generally towards the west/southwest and that elevated levels of VOCs were present further downgradient than predicted by groundwater modeling.

Camp Dresser & McKee Inc., 1999. Draft Phase 1a Pre-Design Field Investigation Report, Omega Chemical Superfund Site, October 13.

During June and July 1999, CDM implemented the Phase 1a field investigation to evaluate the extent of groundwater contamination at and immediately downgradient of the Site. Three wells (OW-1b, OW-2 and OW-3) were installed and developed. Water table wells OW-2 and OW-3 were installed on Putnam Street, and deeper well OW-1b was installed on the adjacent Terra Pave facility. Well OW-1b was designed as a deeper companion well to on-Site well OW-1.

Soil samples for laboratory analysis were collected from all three monitoring well borings during drilling. In addition, soil gas samples for laboratory analysis were also collected during drilling at location OW-1b. All samples were submitted for VOC analysis plus analysis for acetone and Freon 113. Reporting of any tentatively identified compounds (TICs) was also requested.

Several VOCs (PCE, TCE, TCA, 1,1-DCE, chloroform, Freon 113 and Freon 11) were detected in the soil gas samples. PCE concentrations generally increased with depth and ranged from 150,000 parts per billion volume / volume (ppbv/v) at a depth of 10 feet bgs to 6,100,000 ppbv at 60 feet bgs. Concentrations were generally significantly lower in the interval from 10 to 30 feet bgs than in the interval from 40 to 60 feet bgs, ~~and appeared to be~~suggesting the variation is related to proximity to groundwater.

PCE was the compound most frequently detected in soil samples collected during the investigation, and ranged in concentration at location OW-1b from 4.7 µg/kg at a depth of 120 feet bgs to 3,300 µg/kg at a depth of 70 feet bgs. A significant decline (i.e., one to two orders of magnitude) was observed in soil samples collected below a depth of 90 feet bgs. At off-Site location OW-2, PCE concentrations were significantly lower and ranged from 4.8 µg/kg (80 feet bgs) to 92 µg/kg (60 feet bgs). PCE concentrations were also significantly lower at off-Site location OW-3, ranging from 2.9 to 80 µg/kg at depths of 50 and 40 feet bgs, respectively. As was noted above for soil gas concentrations, elevated VOC concentrations in the soil appeared to be related to proximity to groundwater.

Step-drawdown testing to a maximum rate of 5.5 gallons per minute (gpm) was performed on well OW-2. Wells OW-1b and OW-3 were not capable of sustaining a minimal pumping rate of one gpm, therefore, they were not step-drawdown tested. VOC concentrations in deeper well OW-1b (screened from 110 to 120 feet bgs) compared to water table well OW-1 were generally two orders of magnitude lower in comparison to the concentrations detected in water table well OW-1 (screened from 62.5 to 77.5 feet bgs).

3.2 Nature and Extent of Contamination

3.2.1 Nature of Contamination

The Omega facility provided treatment of commercial and industrial solid and liquid wastes and a transfer station for storage and consolidation of wastes for shipment to other treatment and/or disposal facilities. These activities have released chemicals to soil, soil gas, and groundwater at the Site, as evidenced by the results of previous investigations. Adjacent facilities, including the Terra Pave facility and the former Cal-Air facility, may have also released contaminants to Site media. A removal action was performed at Terra Pave to address lead contamination in soil. It is possible that lead in airborne particulates from Terra Pave were deposited onto surface soils at the Site. Freon 113 results from the portion of the Omega Site nearest the former Cal-Air facility suggest the possibility of an off-site source. Data generated by field activities proposed in this Work Plan will help evaluate this possibility. ~~The Cal-Air facility appears to have released contaminants such as freons to Site soils, soil gas, and groundwater.~~

The principal VOCs detected in the soil gas at the Omega site and at the highest concentrations were Freon 113, Freon 11, 1,1,1-TCA and PCE. The most prevalent contaminants detected in soil and groundwater are VOCs, primarily PCE and related compounds, TCA, and freons. Chlorinated methane compounds, including methylene chloride and chloroform, as well as acetone and toluene, are also detected at the downgradient Site boundary and off-Site. No indications of DNAPLs were identified in vadose zone soil; although groundwater concentrations are indicative of either a NAPL or residual saturation with VOCs within or above the capillary fringe.

Material found within the loading dock sump contained the highest concentrations of VOCs found anywhere on-site~~on-Site~~. All loading dock sump material was excavated, transported to an EPA-approved off-Site disposal facility, incinerated, and disposed. No other exposed or near-surface grossly contaminated materials were identified.

3.2.2 Extent of Contamination

Soil gas samples showed the highest PCE and TCA concentrations near the south end of the loading dock. Concentrations decreased with distance from that area. PCE concentrations increased with depth from 10 to 60 feet bgs. Freon vapors appear to extend from the adjacent ~~Cal-Air~~Medlin & Sons site across the center of the Site in the 6 and 12 foot bgs soil gas samples. Soil gas concentrations of freons drop by one to more than two orders of magnitude at sample depths greater than 12 feet bgs.

PCE was the most prevalent VOC in shallow soil samples, with every collected soil sample containing PCE. As with the soil gas, PCE concentrations were highest near the south end of the loading dock, in the vicinity of sampling location SB-9 (refer to Figure 3-1). Concentrations in other areas of the Site were relatively low. PCE in soil extends to ~~wards~~ the water table.

PDCE was detected in on- and off-Site groundwater samples at concentrations that suggest that PCE may be present in DNAPL phase. The dissolved-phase PCE plume extends from the Site over 1,700 feet southwest. Off-Site samples show a rapid drop in PCE concentrations with increasing depth below first groundwater.

Freon 113 and Freon 11 were detected in all but the shallowest sample from on-Site CPT/Hydropunch sample H-4. Methylene chloride, chloroform, TCA, and toluene were detected only in some groundwater samples collected along the downgradient boundary of the Site and in some off-Site samples collected downgradient of Terra Pave. Methylene chloride, chloroform, acetone, and toluene appear to be from a different, downgradient source.

3.3 Site Conceptual Exposure Model

Information on Site contaminants, affected media, known and potential routes of migration, and known or potential human and environmental receptors is used to develop a conceptual understanding of the Site. This conceptual understanding, graphically presented as a site conceptual exposure model (SCEM) in Figure 3-2, aids in evaluating potential risks to human health and the environment. The SCEM also assists in identifying locations where sampling is necessary and in identifying potential remedial technologies.

The SCEM evaluates routes of chemical migration, potentially exposed populations, and exposure pathways for the Site. Risks will be characterized based on potential current and future exposure scenarios at and near the Omega Facility. An exposure scenario consists of a potentially exposed population and one or more exposure pathways by which the receptor population may contact contaminants associated with a site. An exposure pathway is defined by the following four elements:

- A source and mechanism of release of chemicals to the environment
- A transport medium for the released chemical
- An exposure route (e.g., inhalation, ingestion)
- An exposure point (the point of potential contact between receptor and medium)

If one or more of these elements are missing, the pathway is incomplete. Incomplete pathways are not evaluated. Potentially complete pathways that are unlikely to contribute significantly to overall exposure are also not evaluated.

The SCEM (Figure 3-2) identifies exposure pathways for soils. Chemical migration from soil to groundwater and subsequent exposure of people to chemicals in groundwater is not addressed in Figure 3-2. Groundwater exposure scenarios are being addressed by OPOG under USEPA's oversight through a separate but parallel engineering evaluation/cost analysis action.

3.3.1 Potentially Exposed Populations

The overall scope of the analysis is graphically illustrated in the SCEM for soils at the Omega Facility (Figure 3-2). The SCEM includes theoretically feasible exposures and provides a basis for discussing the likelihood and importance of potential exposure pathways at the Site. Site characteristics such as land use (industrial), location (urban), and setting (exterior paved with concrete) preclude the presence of ecological receptors. Therefore, ecological risks will not be evaluated in the risk assessment report. As illustrated in the SCEM, the following populations are quantitatively evaluated:

- Current and future ~~onsite~~on-site commercial/industrial workers at the Omega Facility
- Current and future ~~offsite~~off-site commercial/industrial workers
- Future construction workers at the Omega Facility
- Current and future ~~offsite~~off-site recreational visitors (e.g., Skateland)
- Future ~~onsite~~on-site residents

USEPA guidance indicates that remedial action objectives developed during the RI/FS should reflect the reasonably anticipated future land use (USEPA, 1995). On-site residential development is a very unlikely land use for the foreseeable future. Although residential development is not expected to occur, the future residential scenario will be evaluated at the request of USEPA to provide the risk manager with additional information regarding site risks. Hypothetical future residential exposures and risks will be quantified, to the extent possible, in an appendix to the human health risk assessment report.

~~-~~Some off-site residential areas exist near the Site. Off-site r~~R~~esidents could theoretically be exposed to dust from the Site in the future, if, for example, existing pavement is removed. Exposure to dust is evaluated for ~~onsite~~on-site commercial/industrial workers, however, and exposure for residents, if any, is expected to be much smaller than that for ~~onsite~~on-site workers~~. This assumption is supported by screening level calculations presented in Appendix A~~. Evaluation of off-site residential risks ~~is not necessary~~ will not be performed for the RI.

Potential exposure pathways for the above populations are discussed in more detail in the following sections.

3.3.2 Potential Exposure Pathways

This section selects exposure pathways for quantitative evaluation. Only pathways that are potentially complete and may be significant are quantitatively evaluated.

3.3.2.1 Incidental Ingestion of Surface Soils, Dermal Contact with Surface Soils, and Inhalation of Particulates Released from Surface Soils

Soils at the Omega Facility are contaminated as a result of past disposal practices at the Site. Currently, surface soils at the Facility are not exposed because the entire Site is covered with concrete (building floors and foundations) and pavement. Direct contact with contaminants in surface soils is therefore not currently possible.

Redevelopment of the Omega Facility in the future could occur. If the concrete and pavement at the Facility are removed during construction, contaminated soils may be uncovered. Future ~~onsite~~on-site construction workers may incidentally ingest and dermally contact contaminants in surface soils and may inhale particulates released from surface soils into ambient air. Although these exposures are unlikely to be significant given the duration of construction activities, they will be evaluated to provide the risk manager with additional information.

If areas with contaminated surface soils are left uncovered following theoretical future redevelopment, future ~~onsite~~on-site commercial/industrial workers and future on-site residents may contact surface soils. Although this is not expected to occur, the potential will be evaluated to provide the risk manager with additional information. Potentially complete and significant pathways through which future ~~onsite~~on-site commercial/industrial workers and future residents may contact surface soils consist of incidental ingestion, dermal contact, and inhalation of particulates released from surface soils into ambient air.

3.3.2.2 Incidental Ingestion of Subsurface Soils, Dermal Contact with Subsurface Soils, and Inhalation of Particulates Released from Subsurface Soils

If the Omega Facility is redeveloped in the future, future ~~onsite~~on-site construction workers may contact contaminated subsurface soils. Workers may incidentally ingest and dermally contact contaminants in subsurface soils and may inhale particulates released from subsurface soils into ambient air. These exposures are unlikely to be significant given the duration of exposure; however, these pathways are evaluated to provide the risk manager with additional information. Future construction workers are expected to be the only human populations with potential exposure to subsurface soils.

3.3.2.3 Inhalation of Vapors Released from Subsurface Soils to Ambient Air

VOCs in soils may be released as vapors into ambient air and be inhaled by people present in areas of such releases. Receptor populations who could theoretically be exposed to contaminants in ambient air include current and future on-site and off-site commercial/industrial workers, future on-site residents, future on-site construction workers, and current and future recreational visitors at Skateland.

Release of vapors does not require excavation or exposure of contaminated soils to air. Vapors may migrate through the vadose zone to the surface and be released as a

consequence of barometric pumping and diffusion. However, experience at other sites indicates that ambient vapor concentrations will be significantly (i.e., orders of magnitude) lower than indoor vapor concentrations because vapors emitted from soil will be trapped and concentrated in the indoor environment compared to their dispersion and dilution in the outdoor environment. Conclusions developed for indoor exposure to vapors should be protective of ambient exposure to vapors. However, exposure to vapors in ambient air will be evaluated at the request of USEPA to confirm the validity of the assumptions regarding ambient air concentrations. Ambient air exposure will be evaluated for current and future on- and off-site commercial/industrial workers, future on-site residents, future on-site construction workers, and current and future off-site recreational visitors. Flux chamber data will be used in conjunction with mixing zone and dispersion assumptions to estimate VOC concentrations in ambient air.

~~VOCs in soils may be released as vapors into ambient air and be inhaled by people present in areas of such releases. Receptor populations who could theoretically be exposed to contaminants in ambient air include current and future onsite and offsite commercial/industrial workers, future onsite construction workers, and current and future recreational visitors at Skateland.~~

~~Release of vapors does not require excavation or exposure of contaminated soils to air. Vapors may migrate through the vadose zone to the surface and be released as a consequence of barometric pumping and diffusion. However, ambient vapor concentrations are expected to be significantly (i.e., orders of magnitude) lower than indoor vapor concentrations because vapors emitted from soil will be trapped and concentrated in the indoor environment compared to their dispersion and dilution in the outdoor environment. Conclusions developed for indoor exposure to vapors would be protective of ambient exposure to vapors. Therefore, exposure to vapors in ambient air will not be evaluated for on- or off-Site commercial/industrial workers or recreational visitors. Exposure to vapors in ambient air will be evaluated for the future construction worker scenario.~~

3.3.2.4 Inhalation of Vapors Released from Subsurface Soils to Indoor Air

Contaminants released from soils into soil gas may migrate below buildings and be released indoors through foundation cracks. People working or recreating indoors in these buildings may inhale contaminants in indoor air. Because dilution of air inside buildings occurs less rapidly than that in ambient air, some accumulation of contaminants is possible where high concentrations of VOCs are present in the subsurface below buildings.

The indoor air pathway is theoretically complete for current and future commercial/ industrial workers and future residents at the Omega Facility. Because contaminants in soil gas may migrate horizontally, volatile contaminants may also migrate ~~offsite~~off-site and be released to indoor air at properties adjacent to the Omega Facility. Available data indicate that VOC concentrations in soil gas are highest in the area of the loading dock and rapidly decrease with distance from that area. However,

air impacts are theoretically possible for Skateland, a skating rink located immediately adjacent to the Omega Facility, and for the ~~Cal-Air~~ Medlin & Sons and Terra Pave commercial/industrial properties.

3.3.3 Summary of Pathways to be Quantitatively Evaluated

3.3.3.1 Current and Future ~~Onsite~~On-site Commercial/Industrial Workers

The following exposure pathways will be evaluated for current and future ~~onsite~~on-site commercial/industrial workers:

- Inhalation of VOCs released from soils to indoor air and ambient air
- Incidental ingestion of surface soils, dermal contact with surface soils, and inhalation of particulates released from surface soils (future scenario only)

3.3.3.2 Current and Future ~~Offsite~~Off-site Commercial/Industrial Workers

For current and future ~~offsite~~off-site commercial/industrial workers, the following exposure pathway will be evaluated:

- Inhalation of volatiles released from soils to indoor air

3.3.3.3 Future ~~Onsite~~On-site Construction Workers

The following exposure pathways will be evaluated for future ~~onsite~~on-site construction workers:

- Incidental ingestion of surface soils, dermal contact with surface soils, and inhalation of particulates and vapors released from surface soils
- Incidental ingestion of subsurface soils, dermal contact with subsurface soils, and inhalation of particulates and vapors released from subsurface soils

3.3.3.4 Current and Future ~~Offsite~~Off-site Recreational Visitors

The following exposure pathway will be evaluated for current and future ~~offsite~~off-site recreational visitors:

- Inhalation of volatiles released from soils to indoor air

3.3.3.5 Future On-site Residents

The following exposure pathway will be evaluated for future on-site residents:

- Incidental ingestion of and dermal contact with surface soils and inhalation of particulates released from surface soils
- Inhalation of vapors released from subsurface soils to indoor air and ambient air

3.4 Data Gaps

Data gaps were identified based on evaluation of the following:

- Observations noted in USEPA's review of historical aerial photographs
- Exposure pathways to be quantitatively evaluated
- Data needed to implement USEPA presumptive remedies for sites with VOC compounds in soils (USEPA 1993, 1996)
- Site lithology
- Data needed to further evaluate off-site sources of contamination.

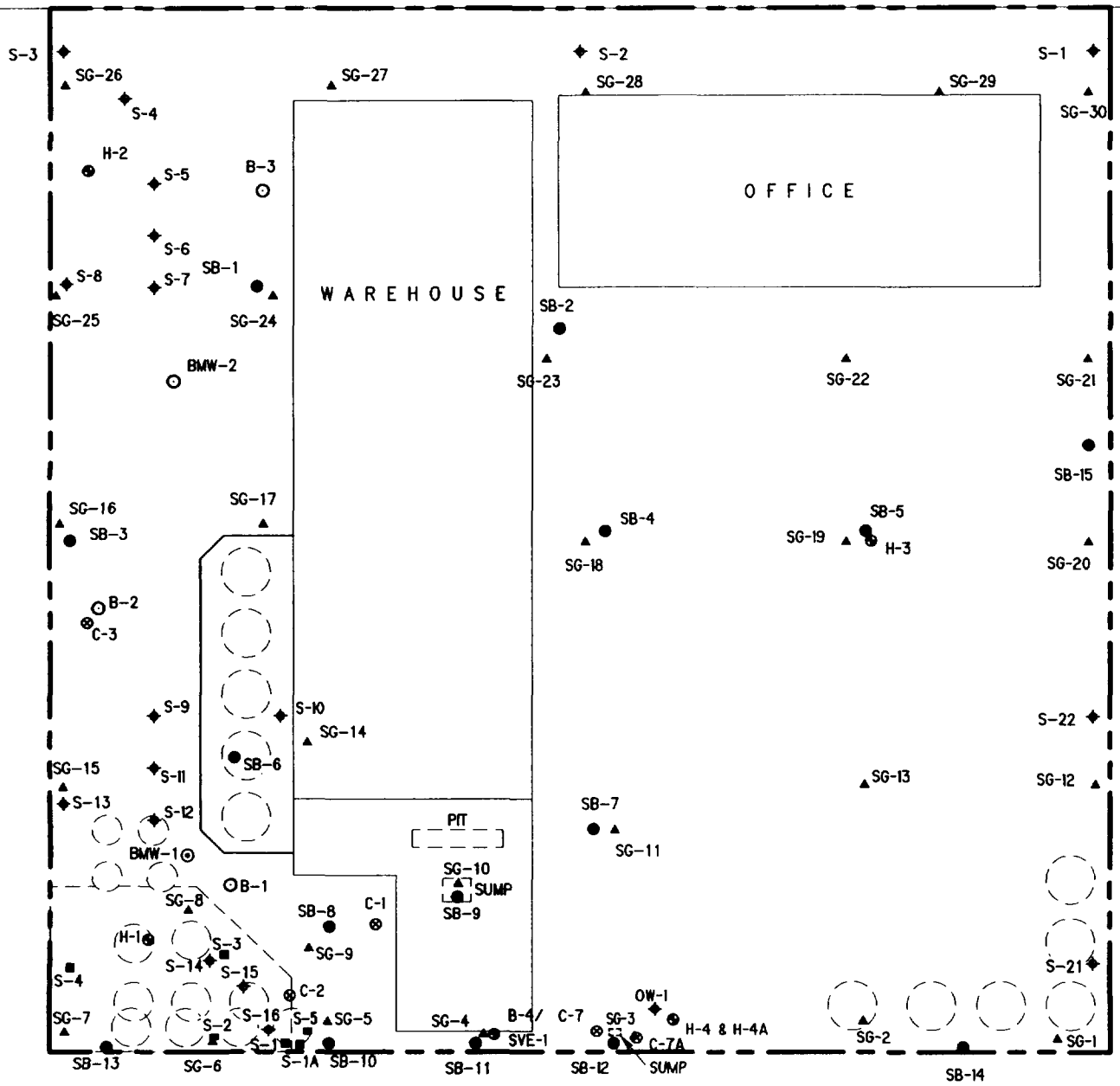
The following data were identified for collection as part of the On-Site Soils RI/FS:

- Soil gas samples from Site boundaries. Soil gas data will be used in the risk assessment.
- Soil gas samples from the area of the former Cal-Air facility. These data will be used to help determine whether the former Cal-Air facility was a source of contamination to the subsurface, both at the former Cal-Air facility and the Site.~~Soil gas samples from the area of the former Cal-Air facility. These data will be used to help determine whether the former Cal-Air facility was a source of contamination to the Site.~~
- ~~Vapor~~ Flux chamber samples from potential release areas identified in historical aerial photographs. ~~Vapor~~ Flux chamber data will be used to evaluate potential source areas and to assist in characterization of exposure to vapors in indoor and ambient air.
- Surface soil samples from potential release areas identified in historical aerial photographs.
- Surface soil samples (i.e., six inch depth). Exposure to surface soil was identified as a potentially complete future pathway; however, data are not available for soils at depths of six inches or less. These samples will be used in risk assessment.
- Supplemental surface and subsurface samples of soil physical characteristics. These will be collected in the western corner of the Site to address the extent of the sandy unit, as well as in other areas of the Site to address risk assessment and presumptive remedy data requirements.
- Indoor air samples will be collected from existing buildings on the Omega property, as well as from Skateland, the former Cal Air facility, and the Terra Pave facility. Data from these samples will be evaluated to ensure that current activities

are not contributing to chemical concentrations that may be detected in the samples. If appropriate, these ~~these~~ data will be used in the risk assessment.

- Ambient air samples will be collected from the Site, as well as from locations upwind. Upwind locations will provide non-site related chemical concentrations in ambient air.

Data requirements for risk assessment and remedial alternatives evaluation are discussed in detail in Section 4.1.



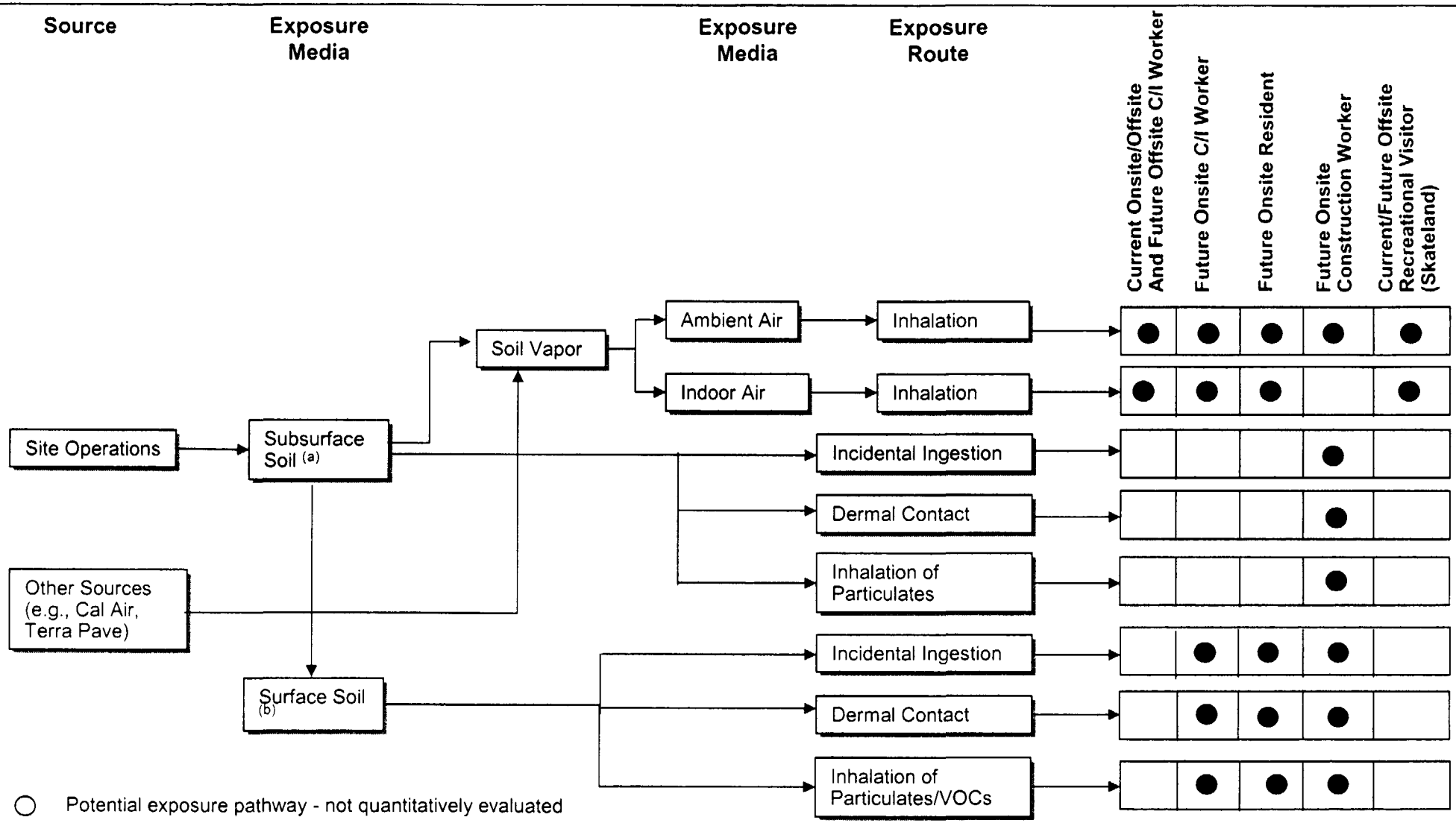
Note: All locations approximate. Features based on Oct. 28, 1984 aerial photo and Figure 1 of England/Hargis Phase II Close Out Report

OMEGA CHEMICAL

CDM
environmental engineers, scientists, planners, & management consultants

Historical Sample Locations

Figure 3-1



C/I - Commercial/Industrial

(a) Contaminants in subsurface soil may migrate to groundwater. Groundwater exposure scenarios are being addressed by OPOG under USEPA's oversight through a separate but parallel engineering evaluation/cost analysis action.

(b) If subsurface soil is left exposed at the surface following construction

Figure 3-2
Site Conceptual Exposure Model
Omega Chemical Site

CDM

Table 3-1
Omega Chemical Superfund Site
Chlorinated VOCs Analytical Summary
Soil Gas Analytical Results

Borehole ID	Sample Depth (ft)	Sample Date	PCE	TCE	1,1,1-TCA	1,1,2-TCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	1,1-DCA	1,2-DCA	DFM	CFM	MCL	Freon 113	Freon 11	VC
SG-1	6	11/13/95	0	0	0		0	0	0	0	0	0	0	0	0	0	
	12	11/13/95	0	0	0		0	0	0	0	0	0	0	0	0	0	
SG-2	6	11/13/95	82509	10046	53973		16594	2909	0	14303	0	0	3417	0	92209	34934	
	12	11/13/95	50663	7123	62969		12136	1770	866	8242	1503	4764	3216	16678	92209	45415	
SG-3	6	11/13/95	120145	1114	10435		718	0	0	0	0	0	0	0	15368	3144	
	12	11/13/95	448733	2557	19790		2724	0	965	461	606	4764	1628	537	49947	15721	
SG-3D	6	11/13/95	101327	1187	10435		867	0	0	0	0	0	0	0	14088	2096	
SG-4	6	11/13/95	188179	13516	269865		56966	0	5196	6303	13576	0	2814	18940	550694	36681	
	12	11/13/95	202654	12968	269865		81734	0	3216	5091	7030	0	4422	14134	832444	45415	
	16.7	11/13/95	0	0	0		0	0	0	0	0	0	0	0	0	0	
SG-5	6	11/13/95	99879	21918	287856		79257	0	2722	6303	19152	0	5628	0	473853	36681	
	12	11/13/95	91194	17717	287856		101548	0	2722	8000	16727	0	5829	0	563501	47162	
SG-6	6	11/13/95	43426	2740	43178		32198	0	0	1455	0	0	945	0	71718	13450	
	12	11/13/95	37636	3470	61169		71827	0	0	2255	0	0	1990	0	166489	24454	
SG-7	6	11/13/95	11435	2374	16732		47059	0	0	630	0	0	643	0	111419	33188	
	12	11/13/95	15923	3470	25187		94118	0	0	1236	0	0	1467	0	230523	59389	
SG-8	6	11/13/95	0	0	0		0	0	0	0	0	0	0	0	0	0	
	12	11/13/95	6659	1352	25187		34675	0	841	2424	0	0	342	0	117823	36681	
SG-9	6	11/13/95	108565	15525	305847		195666	0	2969	23758	10667	2779	4824	0	653148	143231	
	12	11/13/95	111460	18265	269865		185759	0	2004	19394	12364	0	4824	0	589114	131004	
SG-9D	12	11/13/95	121592	19178	287856		210526	0	1682	19879	13818	0	5628	0	653148	134498	
SG-10	6	11/13/95	303981	347032	0		297214	0	0	0	196364	694789	136683	0	0	0	

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Soil Gas Analytical Results

Borehole ID	Sample Depth (ft)	Sample Date	PCE	TCE	1,1,1-TCA	1,1,2-TCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	1,1-DCA	1,2-DCA	DFM	CFM	MCL	Freon 113	Freon 11	VC
SG-10R	6	11/13/95	104222	584475	011994		1040248	0	2301031	630303	1187879	8535980	180905	38162544	)7577375	3427948	
SG-11	6	11/13/95	133172	7854	91754		76780	0	1163	2012	0	0	2010	0	397012	174672	
	12	11/13/95	144753	12968	152924		118885	0	2722	4121	0	0	1930	0	768410	366812	
SG-11D	12	11/13/95	107117	10776	136732		106502	0	0	2255	0	0	1869	0	729989	366812	
SG-12	6	11/13/95	0	438	0		0	0	0	0	0	1806	0	311	896	489	
	12	11/13/95	2171	384	5937		23529	0	0	291	0	0	0	0	166489	71616	
SG-13	6	11/13/95	60796	8402	57571		128793	461	0	6788	0	0	3015	0	704376	192140	
	12	11/13/95	23160	4201	30585		66873	0	0	2909	0	0	3618	0	320171	76856	
SG-14	6	11/13/95	2316	237	720		768	0	0	0	0	0	0	0	3842	1450	
	12	11/13/95	52111	11324	44978		113932	0	2449	3152	364	1092	1206	0	614728	262009	
SG-15	6	11/13/95	0	0	0		0	0	0	0	0	0	0	0	0	0	
	12	11/13/95	0	0	0		0	0	0	0	0	0	0	0	0	0	
SG-16	6	11/13/95	13028	8037	7016		99071	0	3464	2667	242	2382	1286	0	1152615	174672	
	12	11/13/95	14475	9132	5757		79257	0	619	0	0	2779	1045	0	934899	153712	
	24	11/13/95	709	493	720		5697	0	0	0	0	0	0	0	69157	17467	
SG-17	6	11/13/95	18818	7489	8996		91641	0	0	1018	0	4764	844	0	960512	171179	
	12	11/13/95	20265	7854	9715		89164	0	1039	291	0	3970	744	0	832444	144978	
SG-18	6	11/13/95	31846	7123	17631		113932	0	0	315	0	0	0	0	1011740	279476	
	12	11/13/95	4632	1479	5577		39628	0	0	0	0	0	0	0	320171	92576	
SG-19	6	11/13/95	12304	5297	13673		101548	0	0	3879	0	0	0	0	665955	122271	
	12	11/13/95	18818	10959	32384		205573	0	0	3636	0	0	302	0	1536820	349345	
	24	11/13/95	0	0	612		3220	0	0	0	0	0	0	0	34578	7336	

Table 3-1
Omega Chemical Superfund Site
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Soil Gas Analytical Results

Borehole ID	Sample Depth (ft)	Sample Date	PCE	TCE	1,1,1-TCA	1,1,2-TCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	1,1-DCA	1,2-DCA	DFM	CFM	MCL	Freon 113	Freon 11	VC
SG-19D	24	11/13/95	0	0	702		3220	0	0	0	0	0	0	0	34578	6987	
SG-20	6	11/13/95	5790	3288	8096		76780	0	0	2279	0	0	0	0	384205	122271	
	12	11/13/95	0	0	378		1090	0	0	0	0	0	0	0	1921	0	
SG-20D	12	11/13/95	1592	457	2339		27988	0	0	0	0	0	0	0	192102	36681	
SG-21	6	11/13/95	854	1662	2879		29721	0	0	0	0	0	0	0	435432	6812	
	12	11/13/95	2606	5845	26987		61920	0	816	630	703	0	0	0	1011740	125764	
SG-22	6	11/13/95	2461	4018	8276		54489	0	0	921	0	0	0	0	832444	134498	
	12	11/13/95	2171	2557	1493		6935	0	0	0	0	0	0	0	94771	8734	
SG-23	6	11/13/95	5790	3470	4138		39628	0	0	0	0	0	0	0	1011740	127511	
	12	11/13/95	941	639	720		6935	0	0	0	0	0	0	0	179296	20961	
SG-24	6	11/13/95	7527	5114	1259		29721	0	0	0	0	933	261	0	922092	96070	
	12	11/13/95	7382	4932	1079		29721	0	0	0	0	1092	241	0	870864	99563	
SG-25	6	11/13/95	767	0	558		0	0	0	0	0	0	0	0	0	0	
	12	11/13/95	232	0	0		0	0	0	0	0	0	0	0	0	0	
SG-26	6	11/13/95	579	0	0		916	0	0	0	0	0	0	0	112700	8035	
	13	11/13/95	0	0	0		0	0	0	0	0	0	0	0	26894	2620	
SG-26D	13	11/13/95	0	0	0		248	0	0	0	0	0	0	0	26254	2096	
SG-27	6	11/13/95	0	0	0		0	0	0	0	0	0	0	0	6403	0	
	12	11/13/95	0	0	3778		0	0	0	0	0	0	0	2827	8068	4192	
SG-28	6	11/13/95	565	0	0		693	0	0	0	0	0	0	0	217716	12751	
	12	11/13/95	0	0	0		0	0	0	0	0	0	0	0	39701	4017	
SG-29	6	11/13/95	0	0	0		1511	0	0	0	0	0	0	0	106297	8908	

Table 3-1
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Chlorinated VOCs Analytical Summary
Soil Gas Analytical Results

Borehole ID	Sample Depth (ft)	Sample Date	PCE	TCE	1,1,1-TCA	1,1,2-TCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	1,1-DCA	1,2-DCA	DFM	CFM	MCL	Freon 113	Freon 11	VC
SG-29	12	11/13/95	622	694	3238		1214	0	272	0	0	0	0	2290	81964	9258	
SG-30	6	11/13/95	0	402	0		2279	0	0	0	0	0	0	0	294557	36681	
	12	11/13/95	0	0	0		0	0	0	0	0	0	0	0	2049	0	
SG-31	3.5	11/13/95	0	0	0		0	0	0	0	0	0	0	0	0	0	
OW1b	10	06/16/99	150000	9100	1900	1700 U	19000	1700 U	1700 U	1700 U	1700 U	1700 U	3000	1700 U	60000	9700	1700 U
	20	06/16/99	240000	9200	3600 U	3600 U	18000	3600 U	3600 U	3600 U	3600 U	3600 U	5500	3600 U	51000	7000	3600 U
	30	06/16/99	360000	10000	5000	3600 U	23000	3600 U	3600 U	3600 U	3600 U	3600 U	11000	3600 U	28000	4500	3600 U
	40	06/16/99	2800000	40000	58000	18000 U	130000	18000 U	18000 U	18000 U	18000 U	18000 U	59000	18000 U	130000	19000	18000 U
	50	06/16/99	2500000	24000	44000	18000 U	64000	18000 U	18000 U	18000 U	18000 U	18000 U	44000	18000 U	34000	18000 U	18000 U
	60	06/16/99	6100000	72000 U	190000	72000 U	170000	72000 U	72000 U	72000 U	72000 U	72000 U	72000 U	72000 U	130000	72000 U	72000 U

Notes:

Concentrations are reported in ppb (v/v).
Only chlorinated compounds detected in one or more soil gas samples are reported.
Samples collected in 1999 were analyzed by EPA Method TO-14. Unknown method used for samples analyzed in 1995.

U = Not detected at a concentration greater than the reporting limit shown.
If left blank, analyte was either not reported or not analyzed.

PCE = Tetrachloroethene; TCE = Trichloroethene; TCA = Trichloroethane; DCE = Dichloroethene; DCA = Dichloroethane; DFM = Dichlorofluoromethane; CFM = Chloroform; MCL = Methylene chloride; Freon 113 = 1,1,2-Trichloro-1,2,2-trifluoroethane; Freon 11 = Trichlorofluoromethane; and VC = Vinyl chloride.

Table 3-2
Omega Chemical Superfund Site
Aromatic and Other VOCs Analytical Summary
Soil Gas Analytical Results

Borehole ID	Sample Depth	Sample Date	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	Total Xylenes	Acetone
SG-1	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-2	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-3	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-3D	6	11/13/95	0	0	0	0	0		
SG-4	6	11/13/95	430	0	0	0	294		
	12	11/13/95	492	339	362	475	1107		
	16.7	11/13/95	0	0	0	0	0		
SG-5	6	11/13/95	430	0	0	249	0		
	12	11/13/95	522	0	0	0	0		
SG-6	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-7	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-8	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-9	6	11/13/95	676	0	0	362	0		
	12	11/13/95	676	0	0	249	0		
SG-9D	12	11/13/95	830	0	0	294	0		
SG-10	6	11/13/95	7990	70358	1107	3390	678		
SG-10R	6	11/13/95	0	39088	0	0	0		
SG-11	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-11D	12	11/13/95	0	0	0	0	0		
SG-12	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-13	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-14	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-15	6	11/13/95	0	0	0	0	0		

Table 3-2
Omega Chemical Superfund Site
Aromatic and Other VOCs Analytical Summary
Soil Gas Analytical Results

Borehole ID	Sample Depth	Sample Date	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	Total Xylenes	Acetone
SG-15	12	11/13/95	0	0	0	0	0		
SG-16	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
	24	11/13/95	0	0	0	0	0		
SG-17	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-18	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-19	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
	24	11/13/95	0	0	0	0	0		
SG-19D	24	11/13/95	0	0	0	0	0		
SG-20	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-20D	12	11/13/95	0	0	0	0	0		
SG-21	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-22	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-23	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-24	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-25	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-26	6	11/13/95	0	0	0	0	0		
	13	11/13/95	0	0	0	0	0		
SG-26D	13	11/13/95	0	0	0	0	0		
SG-27	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-28	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-29	6	11/13/95	0	0	0	0	0		

Table 3-2
Omega Chemical Superfund Site
Aromatic and Other VOCs Analytical Summary
Soil Gas Analytical Results

Borehole ID	Sample Depth	Sample Date	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	Total Xylenes	Acetone
SG-29	12	11/13/95	0	0	0	0	0		
SG-30	6	11/13/95	0	0	0	0	0		
	12	11/13/95	0	0	0	0	0		
SG-31	3.5	11/13/95	0	0	0	0	0		
OW1b	10	6/16/99	1700 U	1700 U	1700 U			1700 U	8700 U
	20	6/16/99	3600 U	3600 U	3600 U			3600 U	18000 U
	30	6/16/99	3600 U	3600 U	3600 U			3600 U	18000 U
	40	6/16/99	18000 U	18000 U	18000 U			18000 U	90000 U
	50	6/16/99	18000 U	18000 U	18000 U			18000 U	90000 U
	60	6/16/99	72000 U	72000 U	72000 U			72000 U	360000 U

Notes:

Concentrations are reported in ppb (v/v).
Only chlorinated compounds detected in one or more soil gas samples are reported.
Samples collected in 1999 were analyzed by EPA Method TO-14. Unknown method used for samples analyzed in 1995.

U = Not detected at a concentration greater than the reporting limit shown.
If left blank, analyte was either not reported or not analyzed.

Table 3-3
Omega Chemical Superfund Site
Chlorinated VOCs Analytical Summary
Soil Analytical Results

Borehole ID	Sample Depth (ft)	Sample Date	Sample Type	PCE	TCE	1,1,1-TCA	1,1,2-TCA	1,1-DCE	trans-1,3-DCP	1,2-DCA	CFM	MCL	Freon 113	Freon 11
PIT-0.5	0.5	9/12/96	ORIG	7.8	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
PIT-5.0	5	9/12/96	ORIG	6.6	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
SUMP-0.5	0.5	9/12/96	ORIG	9.1	0.5 U	0.95	0.5 U	0.5 U	0.5 U	1.6	0.5 U	0.5 U	1 U	0.5 U
SUMP-5	5	9/12/96	ORIG	11	1 U	1 U	1 U	1 U	1 U	1	1 U	1 U	2 U	1 U
B-4	5	5/23/96	ORIG	510	50 U	15	50 U	50 U	50 U	50 U	50 U	50 U	100 U	50 U
	10	5/23/96	ORIG	1.9	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	15	5/23/96	ORIG	9.8	0.5 U	1.2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	20	5/23/96	ORIG	11	0.5 U	1.1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	30	5/23/96	ORIG	5.2	0.5 U	0.85	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	45	5/23/96	ORIG	8.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	55	5/23/96	ORIG	56	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	5 U	3 U
	65	5/23/96	ORIG	27	1 U	1.5	1 U	1 U	1 U	1 U	1 U	1.4	2 U	1 U
	70	5/23/96	ORIG	11	0.5 U	0.67	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4.2	1 U	0.5 U
	75	5/23/96	ORIG	16	0.54	0.96	0.5 U	0.99	0.5 U	0.5 U	0.5 U	2.4	0.98	0.5 U
C-1	15	1/30/96	ORIG	0.45	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.15	0.03 U	0.03 U	0.05 U	0.03 U
	30	1/30/96	ORIG	1.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	45	1/30/96	ORIG	2.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
C-2	15	1/30/96	ORIG	3.4	0.5 U	0.6	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	30	1/30/96	ORIG	1.4	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	45	1/30/96	ORIG	6.9	0.5 U	0.77	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U

Table 3-3
Omega Chemical Superfund Site
Chlorinated VOCs Analytical Summary
Soil Analytical Results

Borehole ID	Sample Depth (ft)	Sample Date	Sample Type	PCE	TCE	1,1,1-TCA	1,1,2-TCA	1,1-DCE	trans-1,3-DCP	1,2-DCA	CFM	MCL	Freon 113	Freon 11
C-2	53	1/30/96	ORIG	8.1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
C-3	15	2/1/96	ORIG	0.15	0.024 U	0.005 U	0.0069	0.0074	0.024	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
	30	2/1/96	ORIG	0.17	0.03	0.03 U	0.03 U	0.035	0.03 U	0.03 U	0.03 U	0.03 U	0.078	0.046
	45	2/1/96	ORIG	0.81	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	60	2/1/96	ORIG	0.15	0.024	0.013	0.005 U	0.12	0.005 U	0.005 U	0.005 U	0.012	0.01 U	0.005 U
	75	2/1/96	ORIG	0.033	0.014	0.005 U	0.005 U	0.013	0.005 U	0.005 U	0.005 U	0.005 U	0.15	0.037
C-7	15	2/1/96	ORIG	6.2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
C-7A	15	2/1/96	ORIG	0.79	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	30	2/1/96	ORIG	2.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	45	2/1/96	ORIG	7.2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.54	0.5 U	0.5 U	1 U	0.5 U
	52	2/1/96	ORIG	37	1 U	1 U	1 U	1 U	1 U	2.1	1 U	1 U	2 U	1 U
OW1b	35	6/16/99	ORIG	2.1	0.02 U	0.02 U	0.02 U	0.05 U	0.02 U	0.02 U	0.043	0.2 U	0.05 U	0.05 U
	45	6/16/99	ORIG	0.83	0.02 U	0.02 U	0.02 U	0.05 U	0.02 U	0.053	0.043	0.2 U	0.05 U	0.05 U
	55	6/16/99	ORIG	2.1	0.02 U	0.04	0.02 U	0.05 U	0.02 U	0.19	0.062	0.2 U	0.05 U	0.05 U
	60	6/16/99	ORIG	0.33	0.0054	0.0079	0.002 U	0.005 U	0.002 U	0.14	0.02	0.02 U	0.005 U	0.005 U
	65	6/16/99	ORIG	1.7	0.1 U	0.1 U	0.1 U	0.25 U	0.1 U	0.73	0.1 U	1 U	0.25 U	0.25 U
	70	6/16/99	ORIG	3.3	0.1 U	0.1 U	0.1 U	0.25 U	0.1 U	0.39	0.1 U	1 U	0.25 U	0.25 U
	75	6/16/99	ORIG	2	0.1 U	0.14	0.1 U	0.25 U	0.1 U	0.1 U	0.1 U	1 U	0.25 U	0.25 U
	80	6/16/99	ORIG	0.71	0.02 U	0.029	0.02 U	0.05 U	0.02 U	0.03	0.02 U	0.2 U	0.05 U	0.05 U
	90	6/16/99	ORIG	0.85	0.049	0.038	0.02 U	0.05 U	0.02 U	0.073	0.051	0.2 U	0.05 U	0.05 U

Table 3-3
Omega Chemical Superfund Site
Chlorinated VOCs Analytical Summary
Soil Analytical Results

Borehole ID	Sample Depth (ft)	Sample Date	Sample Type	PCE	TCE	1,1,1-TCA	1,1,2-TCA	1,1-DCE	trans-1,3-DCP	1,2-DCA	CFM	MCL	Freon 113	Freon 11
OW1b	100	6/18/99	ORIG	0.02	0.002 U	0.002 U	0.002 U	0.005 U	0.002 U	0.003	0.002 U	0.02 U	0.005 U	0.005 U
	110	6/18/99	ORIG	0.012	0.002 U	0.002 U	0.002 U	0.005 U	0.002 U	0.002 U	0.002 U	0.02 U	0.005 U	0.005 U
	120	6/18/99	ORIG	0.0047	0.002 U	0.002 U	0.002 U	0.005 U	0.002 U	0.002 U	0.0023	0.02 U	0.005 U	0.005 U
OW2	45	6/17/99	ORIG	0.047	0.0042	0.002 U	0.002 U	0.006	0.002 U	0.002 U	0.002 U	0.02 U	0.005 U	0.005 U
	60	6/17/99	ORIG	0.092	0.0072	0.0032	0.002 U	0.021	0.002 U	0.002 U	0.002 U	0.02 U	0.005 U	0.005 U
	80	6/17/99	ORIG	0.0048	0.002 U	0.002 U	0.002 U	0.005 U	0.002 U	0.002 U	0.002 U	0.02 U	0.016	0.005 U
OW3	40	6/15/99	ORIG	0.08	0.0073	0.0025	0.002 U	0.014	0.002 U	0.002 U	0.002 U	0.02 U	0.005 U	0.005 U
	50	6/15/99	ORIG	0.0029	0.002 U	0.002 U	0.002 U	0.005 U	0.002 U	0.002 U	0.002 U	0.02 U	0.005 U	0.005 U
	75	6/15/99	ORIG	0.079	0.011	0.0024	0.002 U	0.09	0.002 U	0.002 U	0.002 U	0.02 U	0.066	0.026
H-1	55	1/31/96	ORIG	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.51 B	1 U	0.5 U
	69	1/31/96	ORIG	3.2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
H-2	79	1/30/96	ORIG	0.0098	0.0056	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.078	0.013
H-4	57	1/30/96	ORIG	11	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U
	67	1/30/96	ORIG	22	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U
	75	1/30/96	ORIG	9.3	4.2	3.1	0.5 U	1.3	0.5 U	5	2	4.1	1 U	0.5 U
	110	1/30/96	ORIG	1 U	1 U	1 U	1 U	1 U	1 U	1 U	3	15	2 U	1 U
SB-1	3	12/12/95	ORIG	0.01	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.005 U
	6.5	12/12/95	ORIG	0.017	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.005 U
SB-2	1.8	12/11/95	ORIG	0.036	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.005 U
	6.5	12/11/95	ORIG	0.0091	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.005 U

Table 3-3
Omega Chemical Superfund Site
Chlorinated VOCs Analytical Summary
Soil Analytical Results

Borehole ID	Sample Depth (ft)	Sample Date	Sample Type	PCE	TCE	1,1,1-TCA	1,1,2-TCA	1,1-DCE	trans-1,3-DCP	1,2-DCA	CFM	MCL	Freon 113	Freon 11
SB-3	1.7	12/12/95	ORIG	0.098	0.026	0.005 U	0.005 U	0.0072	0.005 U	0.005 U	0.005 U	0.005 U	0.0072	0.005 U
	6.6	12/12/95	ORIG	0.069	0.012	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0085	0.005 U
SB-4	1.6	12/11/95	ORIG	1.3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	6.6	12/11/95	ORIG	0.057	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.005 U
SB-5	1.8	12/11/95	ORIG	0.68	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	6.5	12/11/95	ORIG	0.032	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.005 U
SB-6	2.1	12/12/95	ORIG	1.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	6.5	12/12/95	ORIG	0.11	0.0076	0.0078	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.005 U
SB-7	1.7	12/11/95	ORIG	1.2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	6.6	12/11/95	ORIG	0.11	0.005 U	0.011	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.005 U
SB-8	2.1	12/12/95	ORIG	1.2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	6.6	12/12/95	ORIG	0.79	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
SB-9	1.8	12/13/95	ORIG	1300	98	970	50 U	60	50 U	50 U	50 U	59	420	160
	5.9	12/13/95	ORIG	1100	140	1200	50 U	50 U	50 U	50 U	50 U	100	590	220
SB-10	2.2	12/14/95	ORIG	6.6	0.5 U	1.2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	6.5	12/14/95	ORIG	4.1	0.5 U	0.74	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
SB-11	1.8	12/14/95	ORIG	99	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	10 U
	6.5	12/14/95	ORIG	260	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U	50 U	30 U
SB-12	1.7	12/11/95	ORIG	7.1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	6.5	12/11/95	ORIG	1.7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U

Table 3-3
Omega Chemical Superfund Site
Chlorinated VOCs Analytical Summary
Soil Analytical Results

Borehole ID	Sample Depth (ft)	Sample Date	Sample Type	PCE	TCE	1,1,1-TCA	1,1,2-TCA	1,1-DCE	trans-1,3-DCP	1,2-DCA	CFM	MCL	Freon 113	Freon 11
SB-13	1.8	12/12/95	ORIG	1.1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	0.5 U
	6.7	12/12/95	ORIG	0.13	0.0069	0.0081	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.005 U
SB-14	1.8	12/11/95	ORIG	0.039	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.005 U
	6.6	12/11/95	ORIG	0.041	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.005 U
SB-15	1.7	12/11/95	ORIG	0.033	0.028	0.0082	0.005 U	0.036	0.005 U	0.005 U	0.005 U	0.005 U	0.057	0.018
	6.7	12/11/95	ORIG	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.005 U

Notes:

Concentrations are reported in micrograms per kilogram (ug/kg),
Only chlorinated compounds detected in one or more soil samples are reported.
Samples analyzed by EPA Method 8260B or EPA Method 8240.

U = Not detected at a concentration greater than the reporting limit shown.
B = Possible laboratory contamination.

Sample Type:
DUP = Duplicate sample
ORIG = Original sample

PCE = Tetrachloroethene; TCE = Trichloroethene; TCA = Trichloroethane; DCE = Dichloroethene; DCA = Dichloroethane; DCP = Dichloropropene; CFM = Chloroform; MCL = Methylene chloride; Freon 113 = 1,1,2-Trichloro-1,2,2-trifluoroethane; and Freon 11 = Trichlorofluoromethane.

Table 3-4
Omega Chemical Superfund Site
Aromatic and Other VOCs Analytical Summary
Soil Analytical Results

Borehole ID	Sample Depth	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	Total Xylenes	Acetone	THF
PIT-0.5	0.5	9/12/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
PIT-5.0	5	9/12/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
SUMP-0.5	0.5	9/12/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
SUMP-5	5	9/12/96	ORIG	1 U	1 U	1 U			2 U	34	
B-4	5	5/23/96	ORIG	50 U	50 U	50 U			200 U	1000 U	
	10	5/23/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	15	5/23/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	20	5/23/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	30	5/23/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	45	5/23/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	55	5/23/96	ORIG	3 U	3 U	3 U			10 U	50 U	
	65	5/23/96	ORIG	1 U	1 U	1 U			4 U	20 U	
	70	5/23/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	75	5/23/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
C-1	15	1/30/96	ORIG	0.03 U	0.03 U	0.03 U			0.1 U	0.5 U	
	30	1/30/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	45	1/30/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
C-2	15	1/30/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	30	1/30/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	45	1/30/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	52.5	1/30/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
C-3	15	2/1/96	ORIG	0.005 U	0.005 U	0.01 U			0.02 U	0.1 U	
	30	2/1/96	ORIG	0.03 U	0.03 U	0.03 U			0.1	0.3 U	
	45	2/1/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	60	2/1/96	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
	75	2/1/96	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
C-7	15	2/1/96	ORIG	0.5 U	0.3 U	0.5 U			2 U	10 U	
C-7A	15	2/1/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	30	2/1/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	45	2/1/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	52	2/1/96	ORIG	1 U	1 U	1 U			4 U	20 U	
OW1b	35	6/16/99	ORIG	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U		0.1 U	
	45	6/16/99	ORIG	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U		0.1 U	

Table 3-4
Omega Chemical Superfund Site
Aromatic and Other VOCs Analytical Summary
Soil Analytical Results

Borehole ID	Sample Depth	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	Total Xylenes	Acetone	THF
OW1b	55	6/16/99	ORIG	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U		0.1 U	
	60	6/16/99	ORIG	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.01 U	0.22
	65	6/16/99	ORIG	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U		0.5 U	
	70	6/16/99	ORIG	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U		0.95	
	75	6/16/99	ORIG	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U		0.5 U	
	80	6/16/99	ORIG	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U		0.1 U	
	90	6/16/99	ORIG	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U		0.1 U	
	100	6/18/99	ORIG	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.01 U	
	110	6/18/99	ORIG	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.01 U	
	120	6/18/99	ORIG	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.01 U	
OW2	45	6/17/99	ORIG	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.01 U	
	60	6/17/99	ORIG	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.01 U	
	80	6/17/99	ORIG	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.01 U	
OW3	40	6/15/99	ORIG	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.01 U	
	50	6/15/99	ORIG	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.01 U	
	75	6/15/99	ORIG	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U		0.01 U	
H-1	55	1/31/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	69	1/31/96	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
H-2	79	1/30/96	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
H-4	57	1/30/96	ORIG	3 U	3 U	3 U			10 U	30 U	
	67	1/30/96	ORIG	3 U	3 U	3 U			10 U	50 U	
	75	1/30/96	ORIG	0.5 U	14	0.5 U			2	10 U	
	110	1/30/96	ORIG	1 U	1 U	1 U			4	20 U	
SB-1	3	12/12/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
	6.5	12/12/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
SB-2	1.8	12/11/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
	6.5	12/11/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
SB-3	1.7	12/12/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
	6.6	12/12/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
SB-4	1.6	12/11/95	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	6.6	12/11/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
SB-5	1.8	12/11/95	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	6.5	12/11/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	

Table 3-4
Omega Chemical Superfund Site
Aromatic and Other VOCs Analytical Summary
Soil Analytical Results

Borehole ID	Sample Depth	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	Total Xylenes	Acetone	THF
SB-6	2.1	12/12/95	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	6.5	12/12/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
SB-7	1.7	12/11/95	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	6.6	12/11/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
SB-8	2.1	12/12/95	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	6.6	12/12/95	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
SB-9	1.8	12/13/95	ORIG	50 U	50 U	50 U			200 U	1000 U	
	5.9	12/13/95	ORIG	50 U	62	50 U			200 U	1000 U	
SB-10	2.2	12/14/95	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	6.5	12/14/95	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
SB-11	1.8	12/14/95	ORIG	10 U	10 U	10 U			40 U	200 U	
	6.5	12/14/95	ORIG	30 U	30 U	30 U			100 U	500 U	
SB-12	1.7	12/11/95	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	6.5	12/11/95	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
SB-13	1.8	12/12/95	ORIG	0.5 U	0.5 U	0.5 U			2 U	10 U	
	6.7	12/12/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
SB-14	1.8	12/11/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
	6.6	12/11/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
SB-15	1.7	12/11/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	
	6.7	12/11/95	ORIG	0.005 U	0.005 U	0.005 U			0.02 U	0.1 U	

Notes:

THF = Tetrahydrafuran

Concentrations are reported in micrograms per kilogram (ug/kg).

U = Not detected at a concentration greater than the reporting limit shown.
Only analytes detected in one or more soil samples are listed.
If result is blank, then analyte was not reported.
Samples analyzed by EPA Method 8260B or EPA Method 8240.

Sample Type:
DUP = Duplicate sample
ORIG = Original sample

Table 3-5
Omega Chemical Superfund Site
Semi-Volatile Organic Compounds (SVOCs) Analytical Summary
Soil Analytical Results

Borehole ID	Sample Depth (ft)	Sample Date	2-Methyl Naphthalene	Benzo (a) Anthracene	Benzyl Alcohol	Benzo (a) Pyrene	Benzo (b) Fluoranthene	Benzo (ghi) Perylene	Bis (2-ethylhexyl) Phthalate	Chrysene	Di-n-octyl Phthalate	Fluor-anthene	Isophorone	Phen-anthrene	Pyrene
SB-1	3	12/12/95	200 U	200 U	400 U	200 U	200 U	200 U	400 U	200 U	200 U	200 U	200 U	200 U	200 U
SB-2	1.8	12/11/95	200 U	200 U	400 U	200 U	200 U	200 U	400 U	200 U	200 U	200 U	200 U	200 U	200 U
SB-3	1.7	12/12/95	200 U	200 U	400 U	200 U	200 U	200 U	400 U	200 U	200 U	200 U	200 U	200 U	200 U
SB-4	1.6	12/11/95	200 U	200 U	400 U	200 U	200 U	200 U	400 U	200 U	200 U	200 U	200 U	200 U	200 U
SB-5	1.8	12/11/95	200 U	200 U	400 U	200 U	200 U	200 U	400 U	200 U	200 U	200 U	200 U	200 U	200 U
SB-6	2.1	12/12/95	200 U	200 U	400 U	200 U	200 U	200 U	400 U	200 U	200 U	200 U	200 U	200 U	200 U
SB-7	1.7	12/11/95	200 U	200 U	400 U	200 U	200 U	200 U	400 U	200 U	200 U	200 U	200 U	200 U	200 U
SB-8	2.1	12/12/95	200 U	200 U	400 U	200 U	200 U	200 U	400 U	200 U	200 U	200 U	540	200 U	200 U
SB-9	1.8	12/13/95	1000 U	1000 U	5200	1000 U	1000 U	1000 U	3600	1000 U	1000 U	1000 U	9900	1000 U	1000 U
	5.9	12/13/95	1000 U	1000 U	22000	1000 U	1000 U	1000 U	3500	1000 U	1000 U	1000 U	6500	1000 U	1000 U
SB-10	2.2	12/14/95	200 U	200 U	400 U	200 U	200 U	200 U	400 U	200 U	200 U	200 U	200 U	200 U	200 U
SB-11	1.8	12/14/95	200 U	200 U	400 U	200 U	200 U	200 U	3400	200 U	240	200 U	200 U	200 U	200 U
	6.5	12/14/95	400 U	400 U	800 U	400 U	400 U	400 U	4300	400 U	400 U	400 U	400 U	400 U	400 U
SB-12	1.7	12/11/95	200 U	200 U	400 U	200 U	200 U	200 U	3200	200 U	200 U	200 U	200 U	200 U	200 U
	6.5	12/11/95	200 U	200 U	400 U	200 U	200 U	200 U	400 U	200 U	200 U	200 U	200 U	200 U	200 U
SB-13	1.8	12/12/95	200 U	200 U	400 U	200 U	200 U	200 U	400 U	200 U	200 U	200 U	200 U	200 U	200 U
SB-14	1.8	12/11/95	200 U	200 U	400 U	200 U	200 U	200 U	400 U	200 U	200 U	200 U	200 U	200 U	200 U
SB-15	1.7	12/11/95	540	2400	800 U	1600	910	490	800 U	6000	400 U	660	400 U	5000	3100

Notes:

Concentrations are reported in micrograms per kilogram (ug/kg).
Only analytes detected in one or more soil samples are reported.
Samples analyzed by EPA Method 8270.

U = Not detected at a concentration greater than the reporting limit shown.

Table 3-6
Omega Chemical Superfund Site
PCB and Pesticide Analytical Summary
Soil Analytical Results

Borehole ID	Sample Depth	Sample Date	PCB-1254	4,4'-DDD	4,4'-DDE	4,4'-DDT
SB-1	3	12/12/95	30 U	0.7 U	0.7 U	0.7 U
SB-2	1.8	12/11/95	30 U	0.7 U	0.7 U	0.7 U
SB-3	1.7	12/12/95	30 U	0.7 U	0.7 U	0.7 U
SB-4	1.6	12/11/95	30 U	0.7 U	1.2	2.2
SB-5	1.8	12/11/95	30 U	0.7 U	0.7 U	1.7
SB-6	2.1	12/12/95	30 U	0.7 U	0.7 U	0.7 U
SB-7	1.7	12/11/95	30 U	0.7 U	0.7 U	0.7 U
SB-8	2.1	12/12/95	30 U	0.7 U	0.7 U	0.7 U
SB-9	1.8	12/13/95	30 U	0.7 U	0.7 U	0.7 U
	5.9	12/13/95	30 U	0.7 U	0.7 U	0.7 U
SB-10	2.2	12/14/95	30 U	0.7 U	0.7 U	0.7 U
SB-11	1.8	12/14/95	30 U	0.7 U	0.7 U	0.7 U
	6.5	12/14/95	60 U	2 U	2 U	2 U
SB-12	1.7	12/11/95	210 E	0.7 U	0.7 U	0.7 U
	6.5	12/11/95	52	0.7 U	0.7 U	0.7 U
SB-13	1.8	12/12/95	30 U	0.7 U	0.7 U	0.7 U
SB-14	1.8	12/11/95	30 U	0.7 U	0.7 U	4.8
SB-15	1.7	12/11/95	30 U	1.5 E	5.4 E	13 E

Notes:

Concentrations are reported in micrograms per kilogram (ug/kg).

U = Not detected at a concentration greater than the reporting limit shown.
E = Result may be biased high; high surrogate spike recovery.
Only analytes detected in one or more soil samples are listed.
Samples analyzed by EPA Method 8080.

Table 3-7
Omega Chemical Superfund Site
Metals Analytical Summary
Soil Analytical Results

Boring ID	Sample Depth (ft)	Arsenic	Antimony	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Mercury	Lead	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
SB-1	3.0	3.2	10 U	140	0.57	0.5 U	20	10	63	0.1 U	11	3.5	30	0.4 U	1 U	7 U	48	110
SB-2	1.8	3.7	10 U	130	0.52	0.5 U	16	8.8	27	0.1 U	15	3.2	24	0.4 U	1 U	7 U	45	73
SB-3	1.7	3.4	10 U	150	0.6	0.5 U	22	9	29	0.1 U	14	2.7	27	0.4 U	1 U	7 U	58	65
SB-4	1.6	4	10 U	120	0.39	0.5 U	18	8.6	22	0.1 U	20	2.2	18	0.4 U	1 U	7 U	44	76
SB-5	1.8	4.7	10 U	150	0.67	0.5 U	28	9.9	27	0.1 U	16	3.7	30	0.4 U	1 U	7 U	71	68
SB-6	2.1	4.5	10 U	160	0.57	0.5 U	19	9.3	32	0.1 U	21	3.7	26	0.4 U	1 U	7 U	52	68
SB-7	1.7	4.2	10 U	75	0.29	0.5 U	12	4.7	17	0.1 U	33	1.5	12	0.4 U	1 U	7 U	32	42
SB-8	2.1	3.1	10 U	150	0.56	0.5 U	15	8.2	43	0.1 U	8.5	3.6	25	0.4 U	1 U	7 U	46	65
SB-9	1.8	1.8	10 U	38	0.39	0.5 U	8.2	5.2	38	0.1 U	10	1 U	7.5	0.4 U	1 U	7 U	31	42
	5.9	0.81	10 U	28	0.29	0.5 U	5.6	4 U	38	0.1 U	5 U	1 U	4.9	0.4 U	1 U	7 U	21	34
SB-10	2.2	1.4	10 U	140	0.5	0.5 U	11	8.9	56	0.1 U	33	3.4	23	0.4 U	1 U	7 U	40	92
SB-11	1.8	2.1	10 U	160	0.46	0.5 U	12	6.3	99	0.1 U	110	2.1	18	0.4 U	1 U	7 U	37	89
	6.5	2.2	10 U	110	0.41	0.5 U	11	7.3	45	0.1 U	8.5	2.5	20	0.4 U	1 U	7 U	32	63
SB-12	1.7	9	13	180	0.75	0.5 U	210	16	150	0.54	890	4.1	55	0.4 U	1 U	7 U	56	350
	6.5	3.1	10 U	160	0.57	0.5 U	60	7.3	28	0.1 U	13	3.5	26	0.4 U	1 U	7 U	67	67
SB-13	1.8	3.5	18	230	0.57	0.5 U	21	8.6	34	0.1 U	33	4.2	25	0.4 U	1 U	7 U	56	69
SB-14	1.8	6.6	10 U	150	0.55	0.5 U	43	9.5	29	0.1 U	54	3.1	31	0.4 U	1 U	7 U	53	89
SB-15	1.7	3.2	10 U	170	0.55	0.5 U	24	9	24	0.1 U	41	2.9	26	0.4 U	1 U	7 U	62	81

Notes:

Concentrations are reported in milligrams per kilogram (mg/kg).

U = Not detected at a concentration greater than the reporting limit shown.

Table 3-8
Omega Chemical Superfund Site
Chlorinated VOCs Analytical Summary
Groundwater Analytical Results

Well Number	Sample Date	Sample Type	PCE	TCE	1,1,1-TCA	1,1,2-TCA	PCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	1,1-DCA	1,2-DCA	1,2-DCB	CBN	CTC	CFM	MCL	Freon 113	Freon 11	VC
OW1	6/6/1996	ORIG	81000	3400	12000	500 U		3600	500 U	500 U	500 U	2600	500 U	500 U	500 U	3200	15000	1400	990	500 U
	7/2/1999	ORIG	23000	1300	2100	4.6	2.6	1200	5.4	160	86	120	0.97	2	3.6	400	110	1300	550	2.1
	5/16/2001	ORIG	86000	2400	8900	20 U	20 U	2700	20 U	100	130	87	20 U	20 U	10 U	500	490	720	410	10 U
	8/17/2001	ORIG	54000	2000	5800	100 U	100 U	2100	100 U	100 U	100 U	62	100 U	100 U	50 U	380	500 U	1400	620	50 U
	11/15/2001	ORIG	33000	1200	2200	2.2	4.7	1300	4	74	54	40	1 U	1.8	0.5 U	280	21	1400	590	0.5 U
	2/14/2002	ORIG	30000	1200	2200	100 U	100 U	1200	100 U	100 U	100 U	50 U	100 U	100 U	50 U	280	500 U	1300	480	50 U
	8/20/2002	ORIG	42000	1900	3100	200 U	200 U	1300	200 U	200 U	200 U	100 U	200 U	200 U	100 U	320	1000 U	1100	600	100 U
OW1b	7/2/1999	ORIG	180 R	11	7.4	0.5 U	1 U	11	0.5 U	0.65	2.4	8.8	0.5 U	1 U	0.5 U	6.6	10 U	12	2.9	0.5 U
	7/2/1999	DUP	300	14	7.8	0.5 U	1 U	13	0.5 U	0.78	2.8	10	0.5 U	1 U	0.5 U	7.7	10 U	12	3	0.5 U
	5/16/2001	ORIG	62	2.4	1 U	1 U	1 U	1.9	2.7	1 U	1 U	2.9	1 U	1 U	0.5 U	1 U	5 U	5 U	1 U	0.5 U
	5/16/2001	DUP	56	1.9	1 U	1 U	1 U	1 U	2.4	1 U	1 U	2.2	1 U	1 U	0.5 U	1 U	5 U	5 U	1 U	0.5 U
	8/17/2001	ORIG	29	1 U	1 U	1 U	1 U	1 U	1.7	1 U	1 U	1.2	1 U	1 U	0.5 U	1 U	5 U	5 U	1 U	0.5 U
	11/16/2001	ORIG	60	5.6	6	1 U	1 U	1.6	1.4	1 U	1 U	1	1 U	1 U	0.5 U	1 U	5 U	5 U	1 U	0.5 U
	2/14/2002	ORIG	28	1 U	1 U	1 U	1 U	1 U	1.1	1 U	1 U	0.69	1 U	1 U	0.5 U	1 U	5 U	5 U	1 U	0.5 U
	8/20/2002	ORIG	41	1.4	1 U	1 U	1 U	1.1	1 U	1 U	1 U	0.76	1 U	1 U	0.5 U	1 U	5 U	5 U	1 U	0.5 U
OW2	7/2/1999	ORIG	1300	240	8.5	2 U	4 U	680	2 U	2 U	2.8	2 U	2 U	4 U	2 U	4 U	40 U	2600	610	2 U
	5/15/2001	ORIG	780	150	10 U	10 U	10 U	500	10 U	10 U	10 U	5 U	10 U	10 U	5 U	10 U	50 U	1100	370	5 U
	8/17/2001	ORIG	620	110	2	1 U	1 U	360	1 U	1 U	1.1	0.5 U	1 U	1 U	0.57	1 U	5 U	1400	330	0.5 U
	11/16/2001	ORIG	730	130	2.6	1 U	1 U	390	1 U	1 U	1.5	0.5 U	1 U	1 U	0.61	1 U	5 U	1600	390	0.5 U
	2/15/2002	ORIG	710	110	2.1	1 U	1 U	350	1 U	1 U	1.5	0.5 U	1 U	1 U	0.79	1.2	5 U	1400	380	0.5 U
	8/21/2002	ORIG	610	120	4 U	4 U	4 U	350	4 U	4 U	4 U	2 U	4 U	4 U	2 U	4 U	20 U	1400	310	2 U

Table 3-8
Omega Chemical Superfund Site
Chlorinated VOCs Analytical Summary
Groundwater Analytical Results

Well Number	Sample Date	Sample Type	PCE	TCE	1,1,1-TCA	1,1,2-TCA	PCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	1,1-DCA	1,2-DCA	1,2-DCB	CBN	CTC	CFM	MCL	Freon 113	Freon 11	VC
OW3	7/2/1999	ORIG	670	170	28	2 U	4 U	1200	2 U	2 U	2 U	2 U	2 U	4 U	2 U	4 U	40 U	800	410	2 U
	5/16/2001	ORIG	2100	270	33	20 U	20 U	1700	20 U	20 U	20 U	10 U	20 U	20 U	10 U	20 U	100 U	430	380	10 U
	8/17/2001	ORIG	1800	200	22	4 U	4 U	1500	4 U	4 U	4 U	2 U	4 U	4 U	2 U	12	20 U	520	330	2 U
	11/15/2001	ORIG	1300	180	17	1 U	1 U	1200	1 U	1 U	1.6	0.5 U	1 U	1 U	0.66	6.5	5 U	530	300	0.5 U
	2/15/2002	ORIG	1400	180	14	4 U	4 U	1100	4 U	4 U	4 U	2 U	4 U	4 U	2 U	7.7	20 U	530	280	2 U
	8/20/2002	ORIG	200	160	12	4 U	4 U	130	4 U	4 U	4 U	2 U	4 U	4 U	2 U	7.4	20 U	360	230	2 U
OW4A	5/16/2001	ORIG	1000	120	20 U	20 U	20 U	1500	20 U	20 U	20 U	10 U	20 U	20 U	10 U	39	100 U	580	260	10 U
	8/16/2001	ORIG	1300	180	21	1 U	1 U	2400	1 U	1 U	1.7	3.5	1 U	1 U	1	62	5 U	910	340	0.5 U
	11/16/2001	ORIG	9.8	30	1 U	1 U	1 U	10	1 U	1 U	1 U	0.5 U	1 U	1 U	0.5 U	32	5 U	5.3	2.2	0.5 U
	2/15/2002	ORIG	130	48	1.6	1 U	1 U	230	1 U	1 U	1 U	0.69	1 U	1 U	0.5 U	33	5 U	160	62	0.5 U
	8/21/2002	ORIG	87	50	1 U	1 U	1 U	120	1 U	1 U	1 U	0.5 U	1 U	1 U	0.5 U	37	5 U	88	44	0.5 U
OW4B	4/3/2001	ORIG	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	5 U	5 U	1 U	0.5 U
	5/16/2001	ORIG	1.2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	5 U	5 U	1 U	0.5 U
	8/16/2001	ORIG	1.2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	5 U	5 U	1 U	0.5 U
	11/16/2001	ORIG	1.9	1 U	1 U	1 U	1 U	1.2	1 U	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	5 U	5 U	1 U	0.5 U
	2/15/2002	ORIG	1.9	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	5 U	5 U	1 U	0.5 U
	8/21/2002	ORIG	12	7.9	1 U	1 U	1 U	22	1 U	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	5 U	86	14	0.5 U
OW5	8/17/2001	ORIG	150	510	2 U	2 U	2 U	22	31	2 U	2 U	1 U	2 U	2 U	1 U	2 U	10 U	220	52	1 U
	8/17/2001	DUP	190	550	1 U	1 U	1 U	35	36	1.4	1 U	0.5 U	1 U	1 U	0.5 U	2.4	5 U	240	66	0.5 U
	11/16/2001	ORIG	130	470	1 U	1 U	1 U	24	26	1 U	1 U	0.5 U	1 U	1 U	0.5 U	2.1	5 U	180	46	0.5 U

Table 3-8
Omega Chemical Superfund Site
Chlorinated VOCs Analytical Summary
Groundwater Analytical Results

Well Number	Sample Date	Sample Type	PCE	TCE	1,1,1-TCA	1,1,2-TCA	PCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	1,1-DCA	1,2-DCA	1,2-DCB	CBN	CTC	CFM	MCL	Freon 113	Freon 11	VC
OW5	11/16/2001	DUP	130	570	1 U	1 U	1 U	18	30	1.6	1 U	0.5 U	1 U	1 U	0.5 U	2.3	5 U	170	47	0.5 U
	2/15/2002	ORIG	130	390	1 U	1 U	1 U	22	30	1.3	1 U	0.5 U	1 U	1 U	0.5 U	2	5 U	230	40	0.5 U
	2/15/2002	DUP	120	410	1 U	1 U	1 U	18	32	1.8	1 U	0.5 U	1 U	1 U	0.5 U	2.1	5 U	230	39	0.5 U
	8/22/2002	ORIG	150	300	1 U	1 U	1 U	37	34	1.2	1 U	0.5 U	1 U	1 U	0.5 U	2.1	5 U	200	61	0.5 U
OW6	5/16/2001	ORIG	28	4	4 U	4 U	4 U	39	4 U	4 U	4 U	2 U	4 U	4 U	2 U	4 U	20 U	160	96	2 U
	8/17/2001	ORIG	24	4 U	4 U	4 U	4 U	39	4 U	4 U	4 U	2 U	4 U	4 U	2 U	4 U	20 U	180	93	2 U
	11/16/2001	ORIG	140	22	2.9	1 U	1 U	190	1 U	1 U	1 U	0.5 U	1 U	1 U	0.5 U	5.7	5 U	770	440	0.5 U
	2/15/2002	ORIG	69	13	1.3	1 U	1 U	120	1 U	1 U	1 U	0.5 U	1 U	1 U	1.1	3.2	5 U	530	190	0.5 U
	8/21/2002	ORIG	21	3.9	1 U	1 U	1 U	35	1 U	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1.1	5 U	140	95	0.5 U
OW7	3/27/2002	ORIG	5.6	1.2	1 U	1 U	1 U	0.61 J	1 U	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	5 U	62	36	0.5 U
	8/21/2002	ORIG	8.2	2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	1 U	1 U	0.5 U	1 U	5 U	51	44	0.5 U
OW8	3/27/2002	ORIG	11000	930	50	33	2.2	1600	6.3	92	48	110	1.7	1.2	0.5 U	390	36	2500	820	0.5 U
	8/22/2002	ORIG	9400	910	49	20 U	20 U	1700	20 U	81	46	49	20 U	20 U	10 U	350	100 U	2100	1000	10 U
	8/22/2002	DUP	10000	840	47	25	1.9	1500	9.7	66	45	86	1.2	1.1	0.5 U	340	140	5 U	910	0.5 U

Notes:

Concentrations are reported in micrograms per liter (ug/l).
Only chlorinated compounds detected in one or more groundwater samples are reported.
Samples analyzed by EPA Methods 502.2, 8240 or 8260.
If blank, analyte was either not reported or not analyzed.

U = Not detected at a concentration greater than the reporting limit shown.
H = Estimated result; sample analyzed after holding time.
R = Result not usable based on data validation.

Sample Type:
ORIG = Original sample
DUP = Duplicate sample

PCE = Tetrachloroethene; TCE = Trichloroethene; TCA = Trichloroethane; PCA = 1,1,1,2-Tetrachloroethane; DCE = Dichloroethene; DCA = Dichloroethane; DCB = Dichlorobenzene; CBN = Chlorobenzene; CTC = Carbon tetrachloride; CFM = Chloroform; MCL = Methylene chloride; Freon 113 = 1,1,2-Trichloro-1,2,2-trifluoroethane; Freon 11 = Trichlorofluoromethane; and VC = Vinyl chloride.

Table 3-9
Omega Chemical Superfund Site
Aromatic and Other VOCs Analytical Summary
Groundwater Analytical Results

Well ID	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	Total Xylenes	Acetone	2-Propanol	MTBE
OW1	6/6/1996	ORIG	500 U	500 U	500 U			2000 U	10000 U		
	7/2/1999	ORIG	10	14	1.5	1.5	3		10 U		
	5/16/2001	ORIG	15	23	20 U	20 U	20 U		200 U		20 U
	8/17/2001	ORIG	50 U	100 U	100 U	100 U	100 U		1000 U		100 U
	11/15/2001	ORIG	7.5	2.6	1 U	1 U	1 U		10 U		1 U
	2/14/2002	ORIG	50 U	100 U	100 U	100 U	100 U		1000 U		100 U
	8/20/2002	ORIG	100 U	200 U	200 U	200 U	200 U		2000 U		200 U
OW1b	7/2/1999	ORIG	0.5 U	0.5 U	1 U	1 U	1 U		10 U		
	7/2/1999	DUP	0.5 U	0.5 U	1 U	1 U	1 U		10 U		
	5/16/2001	ORIG	0.5 U	1 U	1 U	1 U	1 U		16		1 U
	5/16/2001	DUP	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	8/17/2001	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	11/16/2001	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	2/14/2002	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	8/20/2002	ORIG	0.55	1 U	1 U	1 U	1 U		10 U		1 U
OW2	7/2/1999	ORIG	2 U	2 U	4 U	4 U	4 U		40 U		
	5/15/2001	ORIG	5 U	10 U	10 U	10 U	10 U		100 U		10 U
	8/17/2001	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	11/16/2001	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	2/15/2002	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	8/21/2002	ORIG	2 U	4 U	4 U	4 U	4 U		40 U		4 U
OW3	7/2/1999	ORIG	2 U	2 U	4 U	4 U	4 U		40 U		
	5/16/2001	ORIG	10 U	20 U	20 U	20 U	20 U		200 U		20 U
	8/17/2001	ORIG	2 U	4 U	4 U	4 U	4 U		40 U		4 U
	11/15/2001	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	2/15/2002	ORIG	2 U	4 U	4 U	4 U	4 U		40 U		4 U
	8/20/2002	ORIG	2 U	4 U	4 U	4 U	4 U		40 U		4 U
OW4A	5/16/2001	ORIG	10 U	20 U	20 U	20 U	20 U		200 U		20 U
	8/16/2001	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	11/16/2001	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	2/15/2002	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	8/21/2002	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
OW4B	4/3/2001	ORIG	0.5 U	1 U	1 U	1.1	1 U		28	350	
	5/16/2001	ORIG	0.5 U	1 U	1 U	1 U	1 U		120	940	1 U
	8/16/2001	ORIG	0.5 U	1 U	1 U	1 U	1 U		470		1 U
	11/16/2001	ORIG	0.5 U	1 U	1 U	1 U	1 U		1500		1 U
	2/15/2002	ORIG	0.5 U	1 U	1 U	1 U	1 U		280	650	1 U
	8/21/2002	ORIG	1.8	1 U	1 U	1 U	1 U		240	570	1 U
OW5	8/17/2001	ORIG	1 U	2 U	2 U	2 U	2 U		20 U		2 U
	8/17/2001	DUP	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	11/16/2001	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	11/16/2001	DUP	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U

Table 3-9
Omega Chemical Superfund Site
Aromatic and Other VOCs Analytical Summary
Groundwater Analytical Results

Well ID	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	m,p-Xylenes	o-Xylene	Total Xylenes	Acetone	2-Propanol	MTBE
OW5	2/15/2002	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	2/15/2002	DUP	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	8/22/2002	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
OW6	5/16/2001	ORIG	2.8	4 U	4 U	4 U	4 U		40 U		270
	8/17/2001	ORIG	2.5	4 U	4 U	4 U	4 U		40 U		150
	11/16/2001	ORIG	1.7	1 U	1 U	1 U	1 U		10 U		120
	2/15/2002	ORIG	2.4	1 U	1 U	1 U	1 U		10 U		92
	8/21/2002	ORIG	0.86	1 U	1 U	1 U	1 U		10 U		150
OW7	3/27/2002	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
	8/21/2002	ORIG	0.5 U	1 U	1 U	1 U	1 U		10 U		1 U
OW8	3/27/2002	ORIG	5.4	1.9	1 U	1 U	0.62 J		41		1 U
	8/22/2002	ORIG	10 U	20 U	20 U	20 U	20 U		200 U		20 U
	8/22/2002	DUP	5.3	4.7	1 U	1 U	1 U		89		1 U

Notes:

Concentrations are reported in micrograms per liter (ug/l).

MTBE = Methyl tertiary butyl ether

Only analytes detected in one or more groundwater samples are listed.
U = Not detected at a concentration greater than the reporting limit shown.
H = Estimated result; sample analyzed after holding time.
Samples analyzed by EPA Methods 502.2, 8240 or 8260.
If blank, analyte was either not reported or not analyzed.

Sample Type:
DUP = Duplicate sample
ORIG = Original sample

Table 3-10
Omega Chemical Superfund Site
Metals Analytical Summary
Groundwater Analytical Results

Well ID	Sample Date	Sample Type		Ag	As	Ba	Be	Cd	Co	Cr	Cu	Hg	Mo	Ni	Pb	Sb	Se	Tl	V	Zn
OW1	5/16/2001	ORIG																		
			Total	2 U	7.4	81	1 U	2 U	5.1	8.1	4.2	0.2 U	22	45	2 U	4 U	24	2 U	14	40 U
			Diss	1 U	6.7	55	0.5 U	1 U	3.1	1 U	2 U	0.2 U	22	30	1 U	2 U	24	1 U	1.8	20 U
	8/17/2001	ORIG																		
			Total	1 U	6.6	79	0.5 U	1.6	4.3	8.9	5.3	0.2 U	22	32	1.2	2 U	25	1 U	13	20 U
			Diss	1 U	4	51	0.5 U	1.1	2.7	1 U	2 U	0.2 U	22	23	1 U	2 U	21	1 U	4.2	20 U
	11/15/2001	ORIG																		
			Total	2 U	2.7	55	1 U	2 U	3.4	2 U	4 U	0.2 U	23	21	2 U	4 U	19	2 U	7.7	40 U
			Diss	2 U	2.7	50	1 U	2 U	3	2 U	4 U	0.2 U	21	22	2 U	4 U	21	2 U	5.6	40 U
OW1b	5/16/2001	ORIG																		
			Total	1 U	2.3	20	0.5 U	1 U	1	1.8	5.9	0.2 U	49	6.8	1 U	2 U	2.6	1 U	2.7	120
			Diss	1 U	1.7	12	0.5 U	1 U	1 U	1 U	2 U	0.2 U	46	1.7	1 U	2 U	3.1	1 U	1.1	20 U
	5/16/2001	DUP																		
			Total	1 U	2.6	22	0.5 U	1 U	1.3	2.3	7.4	0.2 U	47	8.5	2.9	2 U	2.9	1 U	2.8	130
			Diss	1 U	1.9	11	0.5 U	1 U	1 U	1 U	2 U	0.2 U	45	1.7	1 U	2 U	3.3	1 U	1.2	20 U
	8/17/2001	ORIG																		
			Total	1 U	2.2	31	0.5 U	1 U	1.1	1.7	5	0.2 U	55	6.3	1 U	2 U	5.8	1 U	2.4	86
			Diss	1 U	1 U	22	0.5 U	1 U	1 U	1 U	2 U	0.2 U	59	2.8	1 U	2 U	4.8	1 U	1 U	20 U
	11/16/2001	ORIG																		
			Total	2 U	2 U	30	1 U	2 U	2 U	2 U	4 U	0.2 U	68	3.9	2 U	4 U	6.2	2 U	2.9	54
			Diss	2 U	2 U	24	1 U	2 U	2 U	2 U	4 U	0.2 U	68	8.1	2 U	4 U	6.5	2 U	2 U	40 U

Notes:

Concentrations are reported in micrograms per liter (ug/l).

U = Not detected at a concentration greater than the reporting limit shown.

Ag = Silver; As = Arsenic; Ba = Barium; Be = Beryllium; Cd = Cadmium; Co = Cobalt; Cr = Chromium; Cu = Copper; Hg = Mercury; Mo = Molybdenum; Ni = Nickel; Pb = Lead; Sb = Antimony; Tl = Thallium; V = Vanadium; Zn = Zinc.

All metals (except mercury) analyzed by EPA Method 6020; Mercury analyzed by EPA Method 7470.

Table 3-11
Omega Chemical Superfund Site
Pesticide and Semi-Volatile Organic Compound (SVOC) Analytical Summary
Groundwater Analytical Results

		OW-1			OW-1b			Duplicate
Method	Analyte	5/16/01	8/17/01	11/15/01	5/16/01	8/17/01	11/16/01	5/16/01
EPA 8081A	4,4'-DDD	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	4,4'-DDE	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	4,4'-DDT	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	ALDRIN (HHDN)	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	ALPHA-BHC (A-BHC)	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	BETA-BHC (B-BHC)	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	CHLORDANE	1 U	1 U	1 U	1 U	1 U	1 U	1 U
	DELTA-BHC (C-BHC)	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
	DIELDRIN	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	ENDOSULFAN I	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	ENDOSULFAN II	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	ENDOSULFAN SULFATE	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
	ENDRIN	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	ENDRIN ALDEHYDE	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	ENDRINE KETONE	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	GAMMA-BHC (LINDANE)	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	HEPTACHLOR	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	HEPTACHLOR EPOXIDE	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	METHOXYCHLOR	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	TOXAPHENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U
EPA 8270C	1,2,4-TRICHLOROBENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	1,2-DICHLOROBENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	1,3-DICHLOROBENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	1,4-DICHLOROBENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	2,4,5- TRICHLOROPHENOL	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	2,4,6-TRICHLOROPHENOL	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	2,4-DICHLOROPHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	2,4-DIMETHYLPHENOL	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	2,4-DINITROPHENOL	100 U	100 U	100 U	100 U	100 U	100 U	100 U
	2,4-DINITROTOLUENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	2,6-DINITROTOLUENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	2-CHLORONAPHTHALENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	2-CHLOROPHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	2-METHYLNAPHTHALENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	2-METHYLPHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	2-NITROANILINE	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	2-NITROPHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	3,3-DICHLOROBENZIDINE	40 U	40 U	40 U	40 U	40 U	40 U	40 U
	3-NITROANILINE	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	4,6-DINITRO-2-METHYLPHENOL	40 U	40 U	40 U	40 U	40 U	40 U	40 U

Table 3-11
Omega Chemical Superfund Site
Pesticide and Semi-Volatile Organic Compound (SVOC) Analytical Summary
Groundwater Analytical Results

		OW-1			OW-1b			Duplicate
Method	Analyte	5/16/01	8/17/01	11/15/01	5/16/01	8/17/01	11/16/01	5/16/01
EPA 8270C	4-BROMOPHENYL-PHENYL ETHER	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	4-CHLORO-3-METHYLPHENOL	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	4-CHLOROANILINE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	4-CHLOROPHENYL-PHENYL ETHER	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	4-METHYLPHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	4-NITROANILINE	100 U	100 U	100 U	100 U	100 U	100 U	100 U
	4-NITROPHENOL	100 U	100 U	100 U	100 U	100 U	100 U	100 U
	ACENAPHTHENE (ETHYLENE NAPH	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	ACENAPHTHYLENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	ANILINE (PHENYLAMINE) (AMINOBE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	ANTHRACENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	AZOBENZENE	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	BENZIDINE	100 U	100 U	100 U	100 U	100 U	100 U	100 U
	BENZO(A)ANTHRACENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	BENZO(A)PYRENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	BENZO(B)FLUORANTHENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	BENZO(G,H,I)PERYLENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	BENZO(K)FLUORANTHENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	BENZOIC ACID	100 U	100 U	100 U	100 U	100 U	100 U	100 U
	BENZYL ALCOHOL (PHENYLMETHA	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	BIS(2-CHLOROETHOXY)METHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	BIS(2-CHLOROETHYL)ETHER	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	BIS(2-CHLOROISOPROPYL)ETHER	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	BIS(2-ETHYLHEXYL)PHTHALATE	50 U	50 U	50 U	50 U	50 U	50 U	50 U
	BUTYLBENZYL PHTHALATE	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	CHRYSENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	DI-N-BUTYLPHTHALATE	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	DI-N-OCTYL PHTHALATE (DIOCTYL	40 U	40 U	40 U	40 U	40 U	40 U	40 U
	DIBENZO(A,H)ANTHRACENE	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	DIBENZOFURAN (DIPHENYLENE OXI	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	DIETHYL PHTHALATE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	DIMETHYL PHTHALATE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	FLUORANTHENE (IDRYL)	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	FLUORENE (ALPHA-DIPHENYLENEM	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	HEXACHLOROBENZENE (PERCHLO	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	HEXACHLOROBUTADIENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	HEXACHLOROCYCLOPENTADIENE	40 U	40 U	40 U	40 U	40 U	40 U	40 U
	HEXACHLOROETHANE (PERCHLOR	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	INDENO(1,2,3-C,D)PYRENE	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	ISOPHORONE	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Table 3-11
Omega Chemical Superfund Site
Pesticide and Semi-Volatile Organic Compound (SVOC) Analytical Summary
Groundwater Analytical Results

		OW-1			OW-1b			Duplicate
Method	**Analyte**	**5/16/01**	**8/17/01**	**11/15/01**	**5/16/01**	**8/17/01**	**11/16/01**	**5/16/01**
EPA 8270C	N-NITROSODI-N-PROPYLAMINE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	N-NITROSODIPHENYLAMINE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	NAPHTHALENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	NITROBENZENE (OIL OF MIRBANE)	40 U	40 U	40 U	40 U	40 U	40 U	40 U
	PENTACHLOROPHENOL (PCP)	40 U	40 U	40 U	40 U	40 U	40 U	40 U
	PHENANTHRENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	PHENOL	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	PYRENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Notes:

All concentrations are reported in micrograms per liter (ug/l)
U = Not detected at a concentration greater than the reporting limit shown

Table 3-12
Omega Chemical Superfund Site
Cyanide, Perchlorate and 1,4-Dioxane Analytical Summary
Groundwater Analytical Results

Well ID	Sample Date	Sample Type	Cyanide	Perchlorate	1,4-Dioxane
OW1	5/16/2001	ORIG	25 U	4 U	
	8/17/2001	ORIG	25 U	4 U	
	11/15/2001	ORIG		4 U	3300 H
	2/14/2002	ORIG	25 U	4 U	11000 H
	8/20/2002	ORIG			4100 E
OW1b	5/16/2001	ORIG	25 U	4 U	
	5/16/2001	DUP	25 U	4 U	
	8/17/2001	ORIG	25 U	4 U	
	11/16/2001	ORIG		4 U	57
	2/14/2002	ORIG	25 U	4 U	41
	8/20/2002	ORIG			60
OW2	11/16/2001	ORIG			0.5 U
	2/15/2002	ORIG			0.54 U
	8/21/2002	ORIG			1
OW3	11/15/2001	ORIG			1
	2/15/2002	ORIG			1.1
	8/20/2002	ORIG			1.2
OW4A	11/16/2001	ORIG			4.9
	2/15/2002	ORIG			11
	8/21/2002	ORIG			14
OW4B	11/16/2001	ORIG			0.53 U
	2/15/2002	ORIG			0.51 U
	8/21/2002	ORIG			0.5 U
OW5	11/16/2001	ORIG			0.76
	11/16/2001	DUP			0.88
	2/15/2002	ORIG			1.1
	2/15/2002	DUP			0.98
OW6	11/16/2001	ORIG			4
	2/15/2002	ORIG			0.86
OW7	3/27/2002	ORIG			0.5 U
OW8	3/27/2002	ORIG			1000
	8/22/2002	ORIG			830
	8/22/2002	DUP			840

Notes:

Concentrations are reported in micrograms per liter (ug/l).

U = Not detected at a concentration greater than the reporting limit shown.
H = Estimated result. Concentration exceeds instrument's upper calibration range.

Cyanide analyzed by EPA Method 335.2; perchlorate by EPA Method 300 modified; 1,4-dioxane analyzed by EPA Method 8270 modified.

Section 4
Work Plan Rationale

The following sections document data requirements for the risk assessment and the remedial alternatives evaluation. The Work Plan approach illustrates how the activities will satisfy data needs.

4.1 Data Requirements

4.1.1 Risk Assessment Data Requirements

As discussed in Section 3, the risk assessment will characterize potential risks to commercial/industrial workers and construction workers who may be exposed in the future to surface and/or subsurface soils at the Site. Risks will also be characterized for current and future on- and ~~offsite~~off-site commercial/industrial workers and current and future off-site recreational visitors who may be exposed ~~now or in the future~~ to vapors that have migrated from soil gas into indoor air and ambient air. In addition, risks to potential future on-site residents will be presented in an appendix to the -risk assessment report. Residential use of the site is not expected to occur in the future; however, residential risks will be evaluated to provide the risk manager with additional information. Residential risks will be characterized based on exposure to chemicals in surface soils and vapors that may migrate into indoor air and ambient air.

Risk is characterized by combining estimates of chemical intake with chemical-specific toxicity criteria. Sources of toxicity information include USEPA's on-line Integrated Risk Information System (IRIS), toxicity criteria presented in USEPA Region 9 Preliminary Remediation Goal (PRG) tables, as well as chemical-specific toxicity criteria developed by the~~,~~ California EPA (including California EPA Office of Environmental Health Hazard Assessment (OEHHA)). California EPA toxicity criteria will be used when more stringent than values developed by the USEPA. Chemical intake, or the amount of a chemical taken into a person's body following exposure, depends on the following factors:

- the exposure point concentration of a chemical in a medium (i.e., soils)
- exposure assumptions specific to the receptor population, including how long and how often exposure occurs

Site-specific data will be used to ~~collected to~~ characterize the exposure point concentration for all chemicals of potential concern (COPCs). COPCs will consist of all chemicals detected in site media. The exposure point concentration is the average chemical concentration a receptor will contact over an exposure period. This concentration does not reflect the maximum concentration that could be contacted at any one time because, in most situations, it is not reasonable to assume long-term contact with the maximum concentration. Average concentrations are used because:

- Toxicity criteria are based on lifetime average exposures; and
- The average concentration is most representative of the concentration contacted at a site over time, based on the assumption that an exposed individual moves randomly across an exposure area.

Because of the uncertainty associated with estimating the true average concentration at a site, the 95 percent upper confidence limit of the arithmetic mean (95UCL) is used as the exposure concentration. Use of the 95UCL provides reasonable confidence that the true site average will not be underestimated. In some instances where there is a great degree of variability in measured concentrations, the 95UCL will be greater than the maximum detected value. In those instances, USEPA (USEPA, 1989) recommends the use of the maximum detected value as the exposure concentration. Therefore, the risk assessment will use the lesser of the 95UCL and the maximum concentration.

The SCEM indicates that the following media may be of concern:

- Soil gas
- Surface soils
- Subsurface soils
- Indoor air
- Ambient air

The risk assessment requires sufficient data to calculate chemical-specific 95UCLs for each of these media. USEPA guidance indicates that data sets with fewer than 10 samples per exposure area provide poor estimates of the mean concentration. Data sets with 10 to 20 samples per exposure area provide somewhat better estimates of the mean and data sets with 20 to 30 samples provide fairly consistent estimates of the mean (USEPA 1992). The Site is considered to be one exposure area based on size (slightly less than one acre) and land use. Evaluation of the Site as a single exposure area may mask potential risks associated with "hot spots." USEPA guidance (USEPA, 1989) defines hot spots as areas of high contamination relative to other areas of the site and indicates that "if a hot spot is located near an area which, because of site or population characteristics, is visited or used more frequently, exposure to the hot spot should be assessed separately. The area over which the activity is expected to occur should be considered when averaging the monitoring data for a hot spot."

Currently available Site data indicate that the south end of the loading dock, in the vicinity of sampling location SB-9, is the only hot spot of significance. This hot spot will be evaluated separately. An area of one-eighth of an acre (size of a residential backyard [USEPA, 1989]) will be used as the exposure area over which to evaluate data for this hot spot. Data available for each of the media of concern are discussed below.

4.1.1.1 Soil Gas

Soil gas samples have been collected at 32 locations across the Site. At the majority of sampling locations, samples were collected from two depths (i.e., 6 and 12 feet bgs). At three sampling locations, soil gas samples were collected from three depths (i.e., 6, 12, and 16.7 or 24 feet bgs). Two sampling locations had only one sample due to soil penetration problems. At one location, six samples were collected at depths from 10 to 60 feet. Samples were analyzed for chlorinated VOCs including PCE, TCE, TCA, and freons. A subset of samples was analyzed for aromatic VOCs, including benzene, toluene, ethylbenzene, etc.

Sampling locations appear to generally follow a systematic sampling design, which is a preferred method for estimating Site means and patterns of contamination (Gilbert 1987). There appear to be a greater preponderance of samples collected from the area of the loading dock, which has been identified as having the highest contaminant concentrations in soil gas. This may impact exposure estimates in that it could skew them upwards. Given the number of samples collected and the size of the Site, the Site appears to be well characterized for contaminants in soil gas. There do not appear to be any data gaps for estimating risks to people on-Site for this medium.

The SCEM indicated that inhalation of contaminants released from soil gas to indoor air may be an exposure pathway of concern for current and future off-Site commercial/industrial workers at the ~~Cal-Air~~Medlin & Sons and Terra Pave facilities, ~~as well as~~ current and future recreational visitors at Skateland, and future on-site residents. To estimate potential exposure to these populations, this Work Plan recommends collection of supplemental soil gas samples at the northwest and northeast boundaries (i.e., the boundaries between the Site and ~~Cal-Air~~ Medlin & Sons and Skateland, respectively). The southwest and southeast boundaries of the Site appear to be sufficiently characterized.

Soil gas samples will also be collected from an off-site location. Samples will be collected from the area of the former Cal-Air facility, to determine whether the facility released chemicals that may have impacted the Site. The sampling effort, including sampling rationale and locations, is described in Section 6. Soil gas samples will be analyzed for VOCs and freons (including acetone, Freon 11, Freon 12, and Freon 113). The presence of any TICs (if detected) will be noted on the analytical reports.

4.1.1.2 Surface Soils

Shallow soil samples were collected at depths ranging from 1.6 to 2.1 feet; however, true surface soil data (e.g., from depths of 0 to 6 inches) are not available for the Site. The Site is currently paved and there is no exposure pathway to surface soils. Exposure to surface soils in the future is expected to be limited to site worker scenarios. ~~It is unlikely that exposure to surface soils will occur in the future.~~ However, risks associated with exposure to surface soils will be characterized in the risk assessment to provide the risk manager with additional information.

Surface soil data are identified as a data gap and included in the SAP presented in this Work Plan. Surface soils data will be analyzed for a suite of constituents (e.g., metals, pesticides, polychlorinated biphenyls [PCBs], ~~VOCs,~~ and semivolatile organic compounds [SVOCs]). Metals, pesticides, and PCBs are not expected to be risk drivers based on review of subsurface soil data. These constituents were included at the request of USEPA. However, selection of chemicals of potential concern (COPC) will take into consideration data from previous investigations as well as data resulting from the RI/FS sampling. ~~Metals, pesticides, and PCBs are not expected to be chemicals of potential concern (COPCs) based on review of subsurface soil data. These constituents were included at the request of USEPA.~~ The presence of any TICs (if detected) will be noted on the analytical reports. Sufficient data will be collected to provide a reasonable estimate of the mean for the COPC. In addition, samples will be analyzed for soil properties data used to characterize the potential for soil gas migration, such as ~~permeability~~hydraulic conductivity, density, and porosity. The sampling effort, including sampling rationale and locations, is described in Section 6.0.

4.1.1.3 Subsurface Soils

Subsurface soil samples have been collected at 18 locations across the approximately one acre Site. Two samples were collected at each location at depths ranging from 1.6 to 6.7 feet. Sample locations are distributed throughout the Site. These samples were analyzed for a suite of parameters, including metals, pesticides, PCBs, VOCs, and SVOCs. The subsurface soil data set is of sufficient size to calculate consistent estimates of the mean for the COPCs. No data gaps were identified for this data set in terms of chemical concentrations.

Limited data (several data points from one sampling location) are available describing soil characteristics that affect the potential for soil gas migration. Additional soil characteristics data, used to characterize the potential for soil gas migration, are needed from other areas of the Site to provide additional information regarding the potential for soil gas migration. The sampling effort, including sampling rationale and locations, is described in Section 6.

4.1.1.4 Indoor Air

To evaluate a potentially complete exposure pathway to indoor air at the Skateland and Terra Pave facilities, indoor air samples will be collected at USEPA's request from breathing zones within the two facilities. In addition, indoor air samples will be collected from breathing zones within facilities located on the Omega on-site property and the former Cal-Air facility.

4.1.1.5 Ambient Air

Ambient air samples will be collected from the Site. Given the likely detection of organic chemicals in ambient air from non-site related sources, ambient air samples will also be collected from locations upwind of the Site. Upwind locations will

provide an indication of anthropogenic (i.e., non-site related) chemical concentrations in ambient air.

4.1.1.6 Flux Chamber Samples

Flux chamber samples will be collected from potential release areas and analyzed for VOCs and freons (including acetone, Freon 11, Freon 12, and Freon 113). The data will be used to help evaluate potential contribution of non-site related sources to chemical concentrations in ambient air. Flux chamber data will also be used to help characterize current and future indoor and ambient air exposure scenarios.

4.1.2 Remedial Alternatives Evaluation Data Requirements

Remedial alternatives will be developed and screened as appropriate based on information presented in the Soils RI regarding nature and extent of contamination, and upon information in the risk assessment report. The FS will be prepared in accordance with USEPA guidance, including guidance on the use of presumptive remedies for sites with VOCs in soils (USEPA 1993 and 1996).

4.1.2.1 ~~Vapor~~ Flux Chamber Samples

~~Vapor~~ Flux chamber samples will be collected to provide additional information on source areas and areas that may require remediation. These samples will be collected from potential release areas identified in historical aerial photographs. ~~These samples will be collected to provide additional information on source areas and areas that may require remediation. These~~ Flux chamber samples will be analyzed for VOCs and freons (including acetone, Freon 11, Freon 12, and Freon 113). The presence of any TICs (if detected) will be noted on the analytical reports. The sampling effort, including rationale and sampling locations, is described in Section 6.

4.1.2.2 Surface Soils

Surface soil data are not available for the Site. Surface soil samples will be collected to provide information on nature and extent of contamination in surface soils, to the extent necessary to evaluate remedial alternatives. In addition, surface soil samples will be collected from potential release areas identified in historical aerial photographs. Samples will be analyzed for a suite of contaminants as well as for soil physical characteristics that have an impact of remedial alternative effectiveness.

4.1.2.3 Subsurface Soils

Subsurface soil physical characteristics data will be collected to evaluate the extent of the sandy unit in the western corner of the Site, the potential for soil vapor migration, and the effectiveness of remedial alternatives. The sampling effort, including rationale and sampling locations, is described in Section 6.

4.2 Work Plan Approach

This Work Plan presents the rationale and methodology for conducting the On-Site Soils RI/FS and provides the methodology for collecting physical and chemical data to support the RI/FS tasks. The RI/FS will characterize the nature and extent of

contamination in Site soils, assess the threat these contaminants pose to human health and the environment, and evaluate remedial action alternatives to eliminate, reduce, or control risks to human health and the environment at the Site.

The SCEM indicates the data that are necessary to evaluate human health risks at the Site. USEPA guidance indicates the data necessary for implementation of presumptive remedies. A considerable amount of investigative information has been collected for soils at the Site (CDM 2001a). Work Plan activities are streamlined as much as possible to focus on gaps in the data needed to perform the risk assessment and evaluate the presumptive remedies.

The FSP and QAPP are presented in Sections 6 and 7. These sections provide sampling rationale, sampling locations, methodologies, and other information necessary to perform the field investigation. The results of the field investigation, in conjunction with currently available Site data, should be sufficient to perform the RI/FS and risk assessment.

Section 5
Remedial Investigation/Feasibility Study Tasks

The following sections discuss the rationale and methodology for conducting the On-Site Soils RI/FS. The RI/FS is intended to characterize the nature and extent of contamination in soil, to assess the threat these contaminants pose to human health and the environment, and to evaluate remedial action alternatives to eliminate, reduce, or control risks to human health and the environment at the Site.

5.1 Remedial Investigation Report

Previously conducted investigations indicate that soils at the Site contain VOCs and other chemicals. Nature and extent of soils contamination has been discussed in the DSR and the Phase II Close Out Reports. However, gaps in the soils data set were identified based on the information presented in these and other reports. The FSP contained in Section 6 of this Work Plan presents the rationale and procedures for an on-site soils investigation that, upon implementation, should close these data gaps.

Results of the field investigation will be used along with previously collected data to characterize Site conditions, evaluate nature and extent of contamination, identify any additional source areas, and assess health risks (discussed in Section 5.2). Data will be collected to evaluate the feasibility of remedial alternatives.

5.2 Risk Assessment Report

A ~~baseline~~ risk assessment will be performed using currently available data and data resulting from the proposed field investigation. The risk assessment report will be considered the "Screening Risk Assessment" referenced in the ~~e~~Consent Order. The risk assessment will follow USEPA and State of California guidance and methodologies (USEPA 1989 and 1998, California EPA 1996a). The risk assessment will evaluate the potential for human health risks from exposure to site-related chemicals in soils and soil gas. Due to Site land use, location, and setting, ecological receptors are not assumed to be present at the Site and ecological risks are not evaluated.

USEPA Region 9 has developed PRGs, which are risk-based tools for evaluating and cleaning up contaminated sites. PRGs are being used to streamline and standardize the risk decision-making process. Extent of contamination at the Site will be initially defined by PRGs for residential soils for the risk assessment.

~~A technical memorandum was prepared by CDM that presents preliminary health-based cleanup goals (HBCGs) for the Site (CDM 2001b). HBCGs were developed for on- and off-Site receptors for COPCs using site-specific information such as soil porosity, total organic carbon, depth to contamination, and other site-related parameters. Receptors and exposure pathways identified in the HBCG~~

~~technical memorandum were reviewed in conjunction with USEPA comments for use in this Work Plan.~~

The risk assessment will evaluate exposure to Site-related COPCs. Risks will be evaluated for receptors of concern, consisting of current and future on- and off-Site commercial/industrial workers, future on-Site construction workers, and current and future off-Site recreational visitors. Exposure pathways that will be evaluated were discussed in Section 3 and consist of the following:

Current and Future ~~Onsite~~On-site Commercial/Industrial Workers

- Inhalation of VOCs released from soils to indoor air and ambient air
- Incidental ingestion of surface soils, dermal contact with surface soils, and inhalation of particulates released from surface soils (future scenario only)

Current and Future ~~Offsite~~Off-site Commercial/Industrial Workers

- Inhalation of volatiles released from soils to indoor air and ambient air

Future ~~Onsite~~On-site Construction Workers

- Incidental ingestion of surface soils, dermal contact with surface soils, and inhalation of particulates and vapors released from surface soils
- Incidental ingestion of subsurface soils, dermal contact with subsurface soils, and inhalation of particulates and vapors released from subsurface soils

Current and Future ~~Offsite~~Off-site Recreational Visitors

- Inhalation of volatiles released from soils to indoor air

Future On-site Residents

- Inhalation of VOCs released from soils to indoor air and ambient air
- Incidental ingestion of surface soils, dermal contact with surface soils, and inhalation of particulates released from surface soils

USEPA default exposure assumptions as well as any available Site-specific exposure parameters will be used to characterize chemical intake. Standard intake calculations and models ~~(e.g., Johnson and Ettinger Soil Vapor model)~~ will be used to characterize exposure to Site-related chemicals~~. The Johnson and Ettinger model uses soil gas data and soil physical characteristics data to estimate chemical concentrations in indoor air. Uncertainties are inherent in modeled concentrations; therefore, the model is designed to provide conservative estimates. Based on the conservative nature of the model, it will be considered a first screen of baseline risks at the Site. Results will be used to determine whether indoor air samples need to be collected in a second phase of sampling~~.

Metals will be evaluated using background metal concentrations for southern California. Metals present at concentrations less than background will not be

evaluated further in the risk assessment. Background values presented in California EPA's ~~DTSC's~~ 1996 report "~~Soil Metal Background Study~~Background Concentrations of Trace and Major Elements in California Soils" (California EPA, 1996b) will be used to represent Site background concentrations. These values are as follows:

Arsenic	~~2.2 to 19~~0.6 to 11 mg/kg
Antimony	~~0.12 to 0.93~~0.15 to 1.95 mg/kg
Barium	~~128 to 670~~133 to 1,400 mg/kg
Beryllium	~~0.1 to 0.9~~0.25 to 2.7 mg/kg
Cadmium	0.05 to ~~0.95~~1.7 mg/kg
Chromium	2~~0.~~3 to ~~32.6~~1,579 mg/kg
Cobalt	~~5.1~~2.7 to ~~9.2~~46.9 mg/kg
Copper	~~19.4~~9.1 to ~~35.9~~96.4 mg/kg
Lead	~~7.7~~12.4 to ~~189.4~~97.1 mg/kg
Mercury	~~0.1~~0.05 to ~~1.4~~0.9 mg/kg
Molybdenum	~~0.25~~ 0.1 to ~~1.7~~9.6 mg/kg
Nickel	~~14.3~~9 to ~~23.4~~509 mg/kg
Selenium	~~1~~0.015 to ~~4.2~~ 0.43 mg/kg
Silver	~~0.07~~0.1 to ~~2~~8.3 mg/kg
Thallium	~~0.16~~0.17 to ~~0.4~~1.1 mg/kg
Vanadium	~~34~~39 to ~~69~~ 288 mg/kg
Zinc	~~33~~88 to ~~331~~236 mg/kg

A toxicity assessment will be performed for chemicals of potential concern. Toxicity criteria for carcinogens are provided as cancer slope factors (CSFs) in units of risk per milligram of chemical per kilogram of body weight per day $(mg/kg\text{-}day)^{-1}$. These factors are based on the assumptions that no threshold for carcinogenic effects exists and that any dose is associated with some finite carcinogenic risk. Oral and inhalation CSF will be used for their respective exposure pathways. Toxicity criteria for noncarcinogens, or for significant systemic effects caused by carcinogens, are provided (in units of mg/kg-day) as reference doses (RfDs) for oral exposure or reference concentrations (RfCs) for inhalation exposure. RfDs and RfCs may be interpreted as thresholds below which adverse effects are not expected to occur, even in the most sensitive populations. In instances where inhalation toxicity criteria are provided as unit risk factors in units of $(\text{milligrams per cubic meter})^{-1}$ or reference concentrations in units of milligrams per cubic meter, they will be converted to units of $(mg/kg\text{-}day)^{-1}$ or mg/kg-day using exposure variables of 20 cubic meters of air inhaled per day and a body weight of 70 kilograms.

Sources of toxicity information include USEPA's on-line IRIS database, toxicity criteria presented in USEPA Region 9 PRG tables, as well as chemical-specific toxicity criteria developed by the California EPA. California EPA toxicity criteria will be used when more stringent than values developed by the USEPA. In instances where no toxicity criteria is available for a specific chemical or for a specific type of exposure (i.e., dermal), USEPA Region 9 staff will be consulted to determine whether route extrapolation or a surrogate value should be used.

Risks will be characterized using estimates of chemical intake and chemical-specific toxicity criteria. Risks associated with current exposure to indoor and ambient air will be evaluated using air data collected as specified in this work plan, supplemented by data from flux chamber samples. Future indoor and ambient air exposure scenarios will be evaluated using air data, flux chamber data, and soil gas data. Approved or accepted models may also be used with site-specific exposure parameters (e.g., air exchange rate) to evaluate future scenarios. If appropriate, a sensitivity analysis will be performed on future air exposure scenarios. Uncertainties associated with risk estimates will be discussed qualitatively to place the risk estimates in the appropriate perspective.

~~Site-specific physical parameters used to develop HBCGs will be evaluated based on data resulting from the RI. HBCGs will be revised if necessary. HBCGs will be used to help identify remedial action objectives for chemicals in Site soils.~~

5.3 Feasibility Study Report

The FS report will develop and evaluate a range of remedial alternatives that (1) protect human health and the environment; (2) comply with ARARs, unless a waiver is justified; (3) are cost effective; (4) utilize permanent solutions and alternative treatment technologies or resources recovery technologies to the maximum extent practicable; and (5) satisfy a preference for treatment as a principal element or provide an explanation in the record of decision (ROD) as to why this preference was not met. The FS report will be prepared according to USEPA methodology (EPA 1988, 1993, and 1996) and will be based on information presented in the RI and risk assessment reports.

The FS process consists of the following six steps: (1) develop remedial action objectives (RAOs) that specify contaminants and media of concern, potential exposure pathways, and remediation goals; (2) develop general response actions (GRAs) that address the RAOs; (3) identify and screen remedial technologies and process options; (4) combine process options to develop a set of remedial alternatives; (5) evaluate and select the most promising remedial alternatives for detailed analysis; and (6) present a detailed analysis of the most promising alternatives. The results of these six steps will be presented in the FS report. It is anticipated that remedial technologies considered in the FS may include institutional controls, containment, ex-site treatment, and in-situ treatment.

In general, the goal of any remedial action is to abate, prevent, minimize, stabilize, mitigate, or eliminate the release or threat of release which results in a threat to the human health and environment. The overall remedial action objective for the On-Site Soils RI/FS is to prevent human exposure to chemical concentrations in Site soils and soil vapors that would represent unacceptable human health risks. Medium-specific remedial action objectives will be identified in the FS to achieve this overall goal at the Site.

Section 6
Field Sampling Plan

6.1 Sampling Objectives, Rationale, and Locations

The objective of the field investigation is to collect the data needed to fulfill the Work Plan goals: 1) characterize the nature and extent of contamination in Site soils; 2) assess the threat these contaminants pose to human health and the environment; and 3) evaluate remedial action alternatives to eliminate, reduce, or control risks to human health and the environment at the Site.

The sampling design was developed based on the Work Plan goals. Data requirements for these goals were identified in the SCEM, the DSR (CDM 2001a), ~~the HBCG technical memorandum (CDM 2001b),~~ and guidance regarding USEPA's presumptive remedies (EPA 1993 and 1996). Historical data are available for the Site. These data provide information regarding nature and extent of contamination in subsurface soil and soil gas. A limited amount of soil physical characteristics data are also available. The sampling design weighs the data requirements against available data and previously sampled locations at the Site. The result is an optimized field investigation.

6.1.1 Surface Soil Sampling – Rationale and Sampling Locations

The objectives of the surface soil sampling program are 1) characterize the nature and extent of contamination in surface soils at the Site to the extent necessary to select the appropriate remedy, 2) generate data to support the human health risk assessment; 3) evaluate potential source areas identified in historical aerial photographs; and 4) generate soil physical characteristics data to evaluate the potential for vapor migration through surface soils. To accomplish these objectives, ~~19~~ 20 surface soil samples will be collected at the Site. Proposed sampling locations are shown on Figure 6-1.

Systematic sampling was selected as the primary sampling design for surface soils. This type of sampling strategy is effective for risk assessment and geostatistical characterizations (USEPA 1989). Systematic sample locations are established across an area of concern by laying out a grid of sampling locations that follow a regular pattern (e.g., square). Rectangular grid patterns were established for this Site. The location of the first grid point was randomly selected; the locations of the remaining grid points were determined by the fixed spacing between the grid lines. Sample locations along the grid were revised slightly to account for the presence of buildings on-Site. Sixteen surface soil samples will be collected based on the systematic sampling design. The resulting data set should be sufficient to provide reasonably consistent estimates of mean chemical concentrations across the Site (USEPA 1992). These data will be analyzed for ~~VOCs,~~ SVOCs, metals, and pesticides/PCBs, as discussed in Section 6.3. In addition, samples will be collected at 2 of these surface

soil sampling locations to obtain soil physical characteristics that affect VOC vapor migration through soil into air.

Three surface soil samples are proposed for collection from potential source areas identified in historical aerial photographs. These sample locations were selected purposively to provide additional information regarding potential sources. Several of the ~~20~~16 sampling locations based on systematic sampling are in potential source areas; therefore, 3 additional sampling locations should be sufficient for source evaluation. In addition, one surface soil sample is proposed from an area where lead was previously detected in shallow soil sample SB-12 (depth of 1.7 feet bgs) at a concentration of 890 mg/kg. The high lead concentration is bounded by lower concentrations in surrounding sample locations; however, the southeast sample is located somewhat further than the other sample locations. Therefore, another proposed soil sample is added to further bound this lead detection. The four purposive~~se~~ samples will be analyzed for ~~VOCs,~~ SVOCs, metals, and pesticides/PCBs as discussed in Section 6.3. Sampling results from purposive sampling may overestimate conditions at the Site. ~~Due to the bias associated with purposive samples, data from these types of samples should generally not be used for risk assessment purposes.~~

6.1.2 Subsurface Soil Sampling – Rationale and Sampling Locations

The objectives of the subsurface soil sampling program are 1) provide additional information regarding the extent of the sandy unit in the western corner of the Site; 2) generate data to evaluate the potential for vapor migration through subsurface soils; and 3) evaluate the potential effectiveness of remedial alternatives. To accomplish these objectives, subsurface soil samples will be collected at the Site. Proposed sampling locations are shown on Figure 6-1.

Purposive sampling was selected as the sampling design for subsurface soils. This type of sampling design is suitable when samples are collected for a unique value or interest or when Site knowledge indicates where the object of the search may be found.

Four subsurface sampling locations will be sampled to provide information on soil physical characteristics. At two of these locations (near the loading dock sump and the western corner of the Site), samples will be collected every 10 feet down to a depth of 70 feet bgs. Data from these samples will be used to evaluate the extent of the sandy unit in this area, as well as providing data for the other objectives. At the remaining two locations (near the Site boundaries with ~~Cal-Air~~Medlin & Sons and Skateland, respectively), samples will be collected at a depth of 6 feet bgs. Soil gas samples will also be collected at these two locations.

6.1.3 Soil Gas Sampling – Rationale and Sampling Locations

The objective of the soil gas sampling program is to generate site boundary data for use in the risk assessment. Proposed on-site sampling locations are shown on Figure 6-1. Soil gas sampling locations were identified at the northwest and ~~northeast~~southeast boundaries based on systematic sampling. Three locations will be sampled~~s~~ ~~will be collected~~ along both the northwest and northeast boundaries at two depths (6 and 12 feet bgs). In addition, three locations will be sampled at depths of 6 and 12 feet bgs from the off-site area of the former Cal-Air facility to determine whether it was a source of contamination to the Site. Potential off-site sampling locations are shown in Figure 6-2; these locations may be revised pending observations made during the site access process. If conditions permit, a soil gas sample may be collected from within the warehouse. Samples will be analyzed for VOCs, as discussed below.

6.1.4 ~~Vapor~~ Flux Chamber Sampling – Rationale and Sampling Locations

The objectives of the flux chamber sampling program are to provide additional information regarding vapor migration to indoor and ambient air (i.e., types of chemicals, flux rates) and to provide additional characterization of potential source areas identified in historical aerial photographs. Three flux chamber samples were located purposively in potential source areas. Proposed sampling locations are shown on Figure 6-1. Flux chamber samples will be collected using a flux chamber placed on the ground surface. Concrete corers will be used to exposure surface soil at the sampling locations. Sampling will be conducted in accordance with USEPA guidance (USEPA 1986). Samples will be analyzed for VOCs and freons (including acetone, Freon 11, Freon 12, and Freon 113). The presence of any TICs (if detected) will be noted on the analytical reports. Additional flux chamber samples may be collected in the future following evaluation of flux chamber, indoor air, and ambient air sample results, weather conditions during the sampling event, and discussions with USEPA.

~~The objective of the vapor sampling program is to evaluate potential source areas. Vapor sampling locations were selected purposively based on evaluation of historical aerial photographs. Proposed sampling locations are shown on Figure 6-1. Samples will be analyzed for VOCs, as discussed below.~~

6.1.5 Indoor Air Sampling – Rationale and Sampling Locations

Indoor air samples will be collected at USEPA's request, as follows: three indoor air samples will be collected from breathing zones within each of the following facilities: Omega on-site property, Terra Pave property, the former Cal-Air facility, and Skateland property. Data from indoor air samples will be evaluated in conjunction with a limited survey of chemical usage (based on readily available information) inside the sampled buildings and compared with soil gas data to evaluate whether chemicals detected in indoor air, if any, are likely to result from chemicals in soil gas.

Sample locations will be selected to be distant from areas used for storage of paints, cleaning products, and other potential sources of chemicals to indoor air. USEPA will provide input on the selection of appropriate indoor air sampling locations and sampling times. An industrial hygienist will also assist with these determinations. Because a facility walk-through and limited survey of chemical usage is required before sample locations are selected, indoor air sample locations are not shown on a figure. Maximum indoor air concentrations will be used to evaluate health risks. Based on results from the initial indoor air sampling, and discussions held with USEPA, further sampling may be required.

6.1.6 Ambient Air Sampling – Rationale and Sampling Locations

Two ambient air samples will be collected from the Site. Given the likely detection of organic chemicals in ambient air from non-site related sources, samples will also be collected from two locations upwind of the Site. Upwind locations will provide an indication of anthropogenic (i.e., non-site related) chemical concentrations in ambient air. A wind sock will be used to evaluate wind direction and sample locations will be selected following evaluation of site-specific meteorology. Therefore, sample locations are not indicated on a figure. Maximum upwind chemical concentrations will be subtracted from site data to estimate site contributions to chemical concentrations in ambient air.

6.2 Pre-Field Activities

This section describes activities that will be completed prior to commencement of field activities. This section also describes demobilization activities that will take place following completion of field activities.

6.2.1 Subcontracting/Procurement

Several activities will be performed by subcontractors under the direction or supervision of CDM. These subcontractors include a direct push technology (DPT) (e.g., Geoprobe™) driller and an analytical laboratory.

The DPT contractor will provide the services necessary to drive the sampling tool to the desired depth. The analytical laboratory will perform the required chemical and geotechnical analyses on the samples. The data validation contractor will verify the quality of the soils and soil gas analytical data.

Vendor procurement will include disposable sampling equipment and other equipment as required. Health and safety equipment will include personal protective equipment (PPE), such as gloves, etc. Miscellaneous equipment such as construction tools, polyethylene liners, etc. will be procured on an as-needed basis.

6.2.2 Access, Security, and Notification

It will be the field manager's responsibility to assure that Site access has been obtained prior to entry to the site by the project team members or subcontractor personnel.

USEPA will assist OPOG in gaining access to the former Cal-Air facility and other locations where indoor air and/or soil gas sampling will be collected. Field investigation activities may require access to potable water and electrical power. The project team or subcontractor personnel will utilize these on-Site services only with the permission of the property owner and current tenant. Notification will be made to USEPA at least 30 days prior to commencement of the on-Site field work.

Appropriate measures will be taken to assure that sampling locations and field investigation equipment are secured against unauthorized entry. A staging area will be made available at the site for the centralized storage of materials and equipment, and temporary storage of investigation-derived waste.

6.2.3 Mobilization/Demobilization

Following approval of the Work Plan and obtainment of Site access, the field personnel and equipment will be mobilized to the site. All equipment will be delivered to the Site in a clean condition. Mobilization activities include procuring and moving sampling equipment and materials to the site, as well as health and safety awareness training and site orientation of field personnel. Mobilization will involve the establishment of a suitable staging area to support the project activities. The staging area will include an equipment storage area and general support area. The staging area will be located in an area determined by the property owner.

6.2.4 Utility Clearances

Utilities will be cleared before any subsurface sampling activities are performed. Proposed subsurface sampling locations will be staked, and clearances will be obtained to ensure that no underground utilities exist. If underground utilities are present, any proposed subsurface sampling locations in question will be moved to avoid the utility.

6.2.5 Equipment, Supplies, and Containers

Equipment acceptance, handling, maintenance, and calibration procedures for environmental monitoring instruments are summarized below:

- Materials and supplies provided by subcontractors or vendors will be inspected and will meet all construction or material specifications. Inspection of materials and supplies may consist of ensuring that the appropriate rating logo, stamp, or specification certification is present or accompanied by the material or supply.

- The approved manufacturers' instructions for operation, and calibration and maintenance of all field equipment providing measurements of a chemical or physical parameter will be available ~~on-site~~on-site. These instructions or manuals will be updated as necessary.

- For all field instruments, physical or chemical standards appropriate for the accurate operation of the equipment will be used on a routine basis to verify the

accuracy of the measurements for each instrument. All physical or chemical standards will be traceable to nationally known, recognized standards. All standards will be documented as to origin, date of receipt, and date of expiration, if applicable. This information will be recorded and maintained in field logbooks or appropriate forms.

- All field instruments will be inspected and calibrated at least prior to use. More than one calibration per day may be necessary, depending on field and instrument conditions. All field personnel performing daily calibration will document the findings of the calibration event in the field logbook or on the appropriate form. Non-compliance with the findings of the calibration criteria will dictate removal of the equipment from use until sufficient remedial measures return the equipment to calibration compliance. This non-compliance will be reported to the last operator so that the results of measurements obtained since the prior calibration can be reviewed for consistency with anticipated results. The non-compliance will also be reported to the field manager and recorded in the designated site logbook. If prior results are in question, they will be reported to the Project Manager.

- All field instruments will be protected from exposure to potentially-contaminated materials and will be wiped clean with a damp cloth prior to removal from the site boundaries.

- All sample containers used to collect and contain samples designated for chemical analyses will be provided by the subcontractor laboratories. All sample containers will be laboratory precleaned and traceable to the laboratory that performed the cleaning. Sampling containers will not be cleaned or rinsed in the field. Analytical results from trip blanks and equipment rinsate blanks will be one method by which the quality of sample containers will be assessed to ensure that improperly cleaned containers are not producing false or biased results. A list of required containers and preservatives is presented in Section 6.3 below.

Critical supplies and consumables that may directly or indirectly affect the quality of the field data generated this investigation and their acceptance criteria are as follows:

Supply/Consumable	Acceptance Criteria
Calibration gases for the photoionization detector (PID) (100 parts per million [ppm])	± 5 ppm
pH buffer solutions (4, 7, and 10)	± 0.05 pH units
Purified water used in decontamination activities	Target analytes (i.e., VOCs) should not be detected in this supply.
Sample containers	Target analytes (i.e., VOCs) should not be detected in this supply.
Laboratory reagents/glassware	Target analytes (i.e., VOCs) should not be detected in this supply.

In lieu of independent acceptance testing, the manufacturer or supplier of each calibration standard, buffer solution, and purified water listed above will be required

to provide documentation with each shipment indicating the consumable's specifications (i.e., accuracy limits, purity, expiration dates, etc.). This documentation and the consumables themselves (when not being used) will be maintained/stored in the field equipment supply room, located at CDM's Irvine, California office, and will be checked prior to use. Expiration dates, purity and/or accuracy limits will be recorded in the field logbook.

The analytical laboratory will be responsible for maintaining, documenting and tracking certificates of analysis or specifications for sample containers, and laboratory reagents and glassware used during the analysis of the environmental samples.

6.3 Sample Analysis

This section describes analytical methods, sample containers and preservative requirements, and field and laboratory QC samples.

6.3.1 Analytical Methods and Detection Limits

Del Mar Analytical, located in Irvine, California, will provide analytical services during the field investigation. Data validation performed on groundwater and QC samples collected during recent investigations at other local CERCLA sites indicated that laboratory performance was acceptable.

All method-specific quality control measures, such as external and internal standard calibration procedures, instrument performance verifications, quantitation using method of standard additions, etc., which are suggested within any referenced method must be performed. Analytical methods and reporting limits for VOCs, metals, SVOCs, and pesticides/PCBs in soils are provided in Tables 6-1, 6-2, 6-3, and 6-4, respectively. Analytical methods and reporting limits for VOCs, metals, SVOCs, and pesticides/PCBs in water are provided in Tables 6-5, 6-6, 6-7, and 6-8, respectively. Water samples are collected only for equipment rinsate blanks. Sample containers, preservatives, and holding times for these methods are provided in Table 6-9.

VOCs in soil and IDW samples will be analyzed by EPA Method 8260, which utilizes gas chromatograph/mass spectrometry (GC/MS) methodology. With GC/MS methods, second column confirmation is not required because individual compounds are positively identified through the unique mass spectra that are generated. Soil samples will be collected using the Encore ® sampler . Sample preparation for soil samples will be in accordance with EPA Extraction Method 5035~~0~~. Encore ® sampling directions from the manufacturer are attached as an SOP in Appendix B. ~~Soil VOC results will be considered quantitative data even though the Encore ® sampler and EPA Extraction Method 5035 will not be utilized. California EPA does not require the use of EPA Extraction Method 5035, therefore, only one local laboratory currently provides this service. Due to past performance concerns, this laboratory was not selected for analysis of soil samples. Field preservation using methanol is considered impractical due to the need to handle and weigh soil and hazardous fluids. In~~

~~addition, field preservation dilutes the sample and increases the reporting limit 50 times. For these reasons, EPA Method 5030 has been specified for all soil samples.~~ VOCs in air, soil gas, and ~~vapor~~ flux chamber samples will be analyzed using EPA Method TO-14, also a GC/MS method.

With the exception of arsenic and mercury, metals will be analyzed using EPA Method 6010B. Arsenic will be analyzed using EPA Method 6020 and mercury will be analyzed using EPA Method 7471A. SVOCs will be analyzed using EPA Method 8270C. Pesticides will be analyzed using EPA Method 8081A and EPA Method 8082 will be used to analyze PCBs.

Specified soil samples will also be analyzed for physical characteristics, consisting of redox potential, clay content, organic carbon content, cation exchange capacity, moisture content, and ~~permeability~~hydraulic conductivity. The analytical methods for these are listed below:

- Redox potential: Standard Method 2580B
- Clay content: ASTM Method D-422~~1~~ or D4464~~and D-422~~
- Organic carbon content: SW-846 Method 9060 Mod
- Cation exchange capacity: SW-846 Method 9081~~0~~
- Moisture content (percent dry weight): ~~Agronomy No. 9, Part 1, 21-2~~ASTM D2216
- ~~Permeability~~Hydraulic Conductivity: ASTM Method D5084

References for these methods are as follows:

SW-846: "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods" with subsequent revisions (EPA 1997c)

Standard Methods: "Standard Methods for the Examination of Water and Wastewater" (AWWA 1995)

ASTM: "Annual Book of American Society for Testing and Materials Standards" (ASTM 1992)

~~Agronomy: "Methods of Soil Analysis, Chemical, and Microbiological Properties" (Agronomy 1982)~~

Field and laboratory quality control procedures, laboratory documentation and data evaluation procedures are presented in detail in the QAPP, which is included as Section 7 of this document.

6.3.2 Field Quality Control Samples

Field quality control samples are collected and analyzed to evaluate the quality of the field sampling process. The quality control samples that will be used during the field program will include duplicate (co-located) samples, trip blanks, and equipment (decontamination rinsate) blanks. Field sampling quality control procedures are discussed in the following sections. All field QC check samples will be submitted "blind" to the laboratory. The laboratory may not use field blanks for duplicate analyses or for matrix spiking. Because all field blanks will be submitted "blind", it must be specified to the laboratory which particular field sample(s) are to be used for duplicate and matrix spike analyses.

6.3.2.1 Field Duplicates

At a minimum, duplicates of soil samples (i.e., co-located samples) will be collected at a rate of 10 percent (1 per 10) of the samples collected. Field duplicate samples will be collected from areas where moderate levels of contamination may be expected. Data obtained from field duplicate samples will provide an estimate of measurement error attributable to the data collection process.

Duplicate soil samples collected using hand augers or DPT and sleeves are referred to as co-located samples because they are not true splits. Co-located soil samples will be collected by submitting one sleeve of the sampler as the original sample; an adjacent sleeve of the sampler will be submitted as the duplicate. Duplicate samples will be collected, preserved, packaged, labeled, and sealed in manners identical to the original sample being collected. Duplicate samples will be analyzed for the same parameters as the original sample.

6.3.2.2 Equipment Blanks

Equipment blanks (i.e., equipment rinsate samples) will consist of the final rinse water from decontamination of equipment. The blank is prepared in the field by pouring the appropriate "blank" water through the sampling equipment and into the appropriate sample containers after equipment decontamination. For blanks targeted for VOC analyses, organic-free water will be used as the "blank" water; whereas, deionized/distilled water will be used for the collection of blanks targeted for inorganic analyses. The equipment blank serves as a check to verify the effectiveness of decontamination procedures. A blind equipment blank will be collected at a target frequency of one per day of sampling. Equipment blanks will be analyzed for all target analytes submitted for analysis on that day.

6.3.2.3 Trip Blanks

Trip blanks will consist of empty Summa canisters that are transported from the analytical laboratory to the sampling site, and then returned to the laboratory along with the field samples without having been opened in the field. One trip blank (i.e., one Summa canister) will be submitted with each sample shipment; however, trip blanks are only required when volatile organic analyses are to be performed on

samples within the shipment. Trip blanks will be submitted for VOC and freon analyses only.

6.3.3 Laboratory Quality Control Samples

Laboratory QC samples are discussed in detail in Section 7.2.5.2. Laboratory QC samples (triple volume samples) will be collected during soil sampling. The additional sample containers will be labeled "for matrix spike/matrix spike duplicate (MS/MSD) analysis" and will be used by the laboratory for their internal QC. Samples for laboratory QC will be selected from locations where low levels of contamination are expected (as determined by historical data). Selection of QC samples with low, rather than moderate to high, levels of contamination will minimize the potential of diluting out the spike concentration. Laboratory QC samples will be designated on the chain-of-custody record. The laboratory will provide both electronic and hard copy reports for all QA/QC samples.

6.4 Sampling Methods and Procedures

This section describes the methods used to collect surface and subsurface soil, soil gas, ~~and vapor~~flux chamber, indoor air, and ambient air samples. A summary of analytical samples to be collected is provided in Table 6-10. Standard operating procedures (SOPs) for collection of these samples are provided in Appendix B~~C~~. All field work will be performed under the supervision of a California Registered Geologist. A Site Health and Safety Plan (HASP) has been prepared in accordance with 29 Code of Federal Regulations (CFR) 1910.120 and 8 California Code of Regulations (CCR) 5192 and is included as Appendix A~~B~~.

Where available, procedures for maintenance, calibration, and operation of field sampling and monitoring equipment are included in Appendix D~~E~~. All maintenance and calibration operations will be documented in the field logbook. Where standard procedures for pieces of equipment are not available, all maintenance, calibration, and operating procedures will be performed as recommended by the manufacturer. Copies of those instructions will be available to the field personnel during the investigation, as appropriate.

Prior to use, all field equipment will be checked and calibrated to verify that it is in good working order. The calibration, maintenance, and operating procedures for all instruments are based upon manufacturer's instructions and common industry practice.

6.4.1 Surface Soil Sampling

Surface soil sample locations are located in areas that are covered with concrete. Prior to sampling these locations, a concrete corer will be used to cut an eight-inch diameter hole through the concrete. The hole in the concrete will be repaired with a concrete patch after sample collection.

Following concrete coring, surface soil samples will be collected from a depth of approximately 0 to 6 inches bgs. Surface soil samples may be collected using hand augers and slide hammers with 6-inch long stainless steel samplers. If conditions permit, DPT (e.g., Geoprobe™ sampling method) may be used to collect the surface soil sample. The Geoprobe™ system is described in Section 6.4.2 below.

At each sampling location, the surface soil samples for SVOC, metal, and pesticide/PCB ~~VOC samples~~ analysis will be collected in stainless steel sleeves from the first push. ~~An Encore ® sampler will be used to collect the sample from the stainless steel sleeve for VOC analysis. Sample preparation for soil samples will be in accordance with EPA Extraction Method 5035.~~ If necessary to provide sufficient sample volume, ~~SVOC, metal, and pesticide/PCB~~ additional samples will be collected in stainless steel sleeves from an offset boring that is located within 1-foot laterally of the initial sampling location. The sample-filled sleeves will be sealed on each end with Teflon® sheets and plastic end caps. Samplers will be decontaminated prior to use and after each use as described in Section 6.4.5 below.

6.4.2 Subsurface Soil Sampling

A general description of subsurface drilling techniques is presented below, with SOPs (Soil Boring and Rock Coring) included in Appendix B~~C~~. Concrete corers will be used to expose soil for subsurface soil sampling. The Geoprobe™ system will be used to collect subsurface soil samples. The equipment used to collect these samples will consist of a truck-mounted Geoprobe™ Model 4220. The system is equipped with a small-diameter (generally 2-inch) drive casing and an inner sample barrel that are simultaneously pushed or driven into the ground using internal steel rods. The sampler is advanced with a hydraulic hammer that drives the sampling tool to the desired sampling depth. Undisturbed, continuous soil cores will be retrieved in 3-foot sections in sample liners placed within the sample barrel. When the sample barrel is retrieved, the drive casing is left in place to prevent the borehole from collapsing.

At two sampling locations near Site boundaries, soil samples will be collected from a depth of 6 feet bgs. In addition, samples will be collected at two locations (near the loading dock sump and the western corner of the Site) every 10 feet down to a depth of 60 feet bgs. In the event that the sampler can not be pushed to the required depth, a hollow-stem auger rig may be utilized to advance the boring to the desired depth.

After the sampler is driven, it will be raised to the surface, disassembled, and the sample liners removed. Samples will be analyzed for physical characteristics, as discussed below. A portion of the soil samples from the identified depths will be used for lithologic logging. Representative lithologic samples will be placed in resealable plastic bags which will be labeled with the sample location and depth interval. The Unified Soil Classification System (USCS) will be used to describe sample lithologies, and soil type designations and descriptions. Lithologic descriptions and visual observations will be recorded on the borehole log form found in Appendix C~~D~~. The following information will be included on each boring log:

- Depth of sample below surface;
- Sample interval;
- Sample type and identification number; and
- Soil description and classification using the USCS.

6.4.3 Soil Gas Sampling

Soil gas samples will be collected using a DPT rig (Geoprobe™) and a Simulprobe ® sampler (or approved equal). Soil gas sampling results are intended to meet EPA criteria for definitive data. Samples will be collected at depths of 6 and 12 feet bgs at each sampling location. These depths are consistent with previous investigations.

Soil gas samples will be collected in pre-cleaned and evacuated Summa ® canisters provided by the analytical laboratory. In order to ensure that the soil gas samples have not been diluted by the intrusion of atmospheric air, all hoses will be visually observed to verify that they are structurally sound (e.g., no visible holes and cracks) and all fittings will be checked for tightness prior to and immediately after sampling. If a fitting is observed to loosen during sampling, the sample will be discarded and the interval resampled. In addition, all fittings will be compression-type fittings recommended by the manufacturer.

6.4.4 ~~Vapor~~ Flux Chamber Sampling

~~Vapor~~ Flux chamber samples will be collected using a flux chamber placed on the ground surface. Concrete corers will be used to exposure surface soil at the sampling locations. Sampling will be conducted in accordance with USEPA guidance (USEPA 1986). Flux chamber samples will be collected by a subconsultant approved by USEPA (Dr. Chuck Schmidt).

The flux chamber method uses an enclosure or chamber that qualifies as a continuously stirred reactor to isolate a surface emitting gas species. Clean sweep air is added to the chamber at a fixed rate until steady-state conditions are achieved. At steady-state, the contents of the chamber will be collected in pre-cleaned and evacuated Summa ® canisters provided by the analytical laboratory.

6.4.5 Air Sampling

Indoor and ambient air sampling and analysis will be performed using EPA Method TO-14A to measure speciated VOC concentrations. Integrated sampling equipment will be used in a manner consistent with EPA Method TO-14A. The sampling device will consist of a six-liter stainless steel Summa canister which has a critical orifice air flow controller attached to meter flow over an eight-hour period. The critical orifice air flow controller will be set and verified by the analytical laboratory supplying the Summa canisters. The laboratory will provide a calibration certificate for the orifice.

For ambient air sampling, windsocks will be erected at each of the four corners of the site to identify wind direction. On- and off-site sample locations will be selected based on wind direction; off-site locations will be upwind of the Site. Should wind direction change during the day, air monitoring instruments may be moved as necessary.

6.4.65 Equipment Decontamination

All reusable field equipment used to collect and handle samples, or collect field measurements, will be decontaminated before coming into contact with any sample for laboratory analysis. The decontamination procedure will match the degree of contamination on the sampling tool. Sample collection equipment will be decontaminated before first use and between each sample. Decontamination areas will be established for cleaning equipment between sample locations. General decontamination procedures for sampling equipment are as follows:

- A supply of tap water of drinking water quality will be required for equipment decontamination. It is anticipated that the water will be obtained from local fire hydrants and faucets, as provided by the water purveyors to the local areas. A sample of the hydrant water will be collected for laboratory analysis of VOCs in order to document the quality of the water used for equipment decontamination purposes.

- The drilling contractor will be required to provide a decontamination station to steam clean all heavy equipment (e.g., drill rig, drill pipe, augers, bits, etc.). Fluids generated by the decontamination operation will be contained in a 55-gallon drum or other appropriate container.

- Ample amounts of tap water with a detergent (Alconox or equivalent) will be used to wash reusable sampling equipment, which will be rinsed thoroughly with tap water, checked for any residual dirt, and rewashed if necessary. The item will be rinsed twice with tap water, followed by a deionized/distilled water rinse. The item will be allowed to air dry and will be covered or wrapped in plastic, if not immediately used.

- Large items (i.e., casing, drill pipe, augers, drill bits, etc.) will be steam cleaned and placed on clean polyethylene sheeting or sawhorses and allowed to air dry.

All equipment decontamination procedures and events will be recorded in the field logbook. All liquids generated from decontamination procedures will be contained on-site in 55-gallon drums.

6.4.76 Investigation-Derived Waste Containment and Disposal

Investigation-derived waste (IDW) generated during field activities generally includes: drill cuttings; decontamination fluids; any used PPE, debris (e.g., empty cement bags, etc.), and miscellaneous disposable sampling equipment. All drill cuttings and decontamination fluids will be assumed to be hazardous waste and

labeled as such until the analytical results prove otherwise. Drums and/or other containers containing soil cuttings and decontamination water will be stored temporarily on-Site. Once analytical data are received and the waste profiling is completed, the containers will be removed for off-site disposal. It is anticipated that these materials will be handled as described in the following sections.

6.4.76.1 Drill Cuttings

Due to the direct push sampling methodology which will be used to collect the soil samples, the amount of soil cuttings is anticipated to be minimal (e.g., limited to one to two drums). Therefore, all soil cuttings generated from drilling activities will be placed in 55-gallon drums. The IDW-filled drums will be temporarily stored on-site and labeled as investigation-derived waste pending analytical results.

One composite soil sample for pre-disposal analysis will be collected from each drum and analyzed for VOCs, SVOCs, metals, pesticides, and PCBs. It is difficult to estimate the number of samples which will be collected because the volume of soil generated is dependent on site-specific lithologic conditions. Practical experience has shown that subsurface materials which consist primarily of fine-grained deposits usually generate a larger volume of cuttings. Subsurface materials which consist of coarse-grained deposits generally generate a smaller volume of IDW. Final determination of the number of samples will be made subsequent to completion of drilling activities, once the total volume of drill cuttings is known.

If the cuttings are determined to be hazardous, they will be transported (accompanied by hazardous waste manifests) to approved disposal facilities for treatment and/or disposal. The appropriate signatures will be obtained from the Respondents and wastes will be disposed in accordance with federal and state regulations. If determined nonhazardous, they will be transported to approved locations, such as a Class III landfill for soils.

6.4.76.2 Decontamination Fluids

Decontamination fluids generated during drilling and sampling activities will be containerized in 55-gallon drums. These containers will be stored on-site and labeled as investigation-derived waste pending analytical results and subsequent disposal.

Practical experience has shown that one composite sample collected from each container and submitted for VOC analyses is adequate to characterize the waste. If additional analyses (e.g., SVOCs, metals, pesticides, etc.) or samples are required by the disposal facility, additional samples will be collected as required.

6.4.76.3 PPE, Debris, and Miscellaneous Sampling Equipment

Used PPE including gloves, Tyvek suits, respirator cartridges, and disposable filters, and other miscellaneous items will be double-bagged using plastic trash bags and then disposed as solid waste. Items such as empty cement bags and wrapping materials will be placed directly into solid waste dumpsters. Items that appear to be contaminated with hazardous materials or wastes will be inserted into plastic bags

and placed inside 55-gallon drums for subsequent disposal at an appropriate facility. The drums will be inventoried and labeled to indicate the origin of the drum contents.

6.4.76.4 IDW Labeling Requirements

All drums will be labeled with a pre-printed, unclassified materials label. The label states that the unclassified materials are being temporarily held pending evaluation of laboratory analyses. The label also notes the site name, date, type of materials stored, and origin of materials stored.

6.4.87 Sample Labeling

Each collected sample and field QC sample, including duplicates or decontamination rinsate blanks, will have a completely filled-in sample label securely attached to it. The label will be completely filled in prior to filling the sample container. All field QC samples will be shipped "blind" (i.e., the sample is not identified as a QC sample) to the laboratory, but will be assigned a unique identification code, discussed below, to facilitate identification of the laboratory results. Labels will include the project code number, the location of the sampling site, the type of sample and analysis required, the preservative used, and the time of sampling.

A coding system will be used to identify each sample collected during this investigation. The coding system will allow tracking and retrieval of information concerning a particular sample, and will assure that each sample is uniquely identified. Each sample will be identified by site number, sample media type, sampling location, and date.

The first set of alphabetic symbols will be "OC." This is the site number for all samples collected during this investigation, representing the Omega Chemical site. The second set of alphabetic symbols identifies the sample media:

SS = Surface soil

SB = Subsurface soil

SG = Soil gas

IA = Indoor Air

AA = Ambient Air

WW = IDW Water

WS = IDW Soil

DI = Deionized water (used for trip blank samples only)

The third set of numeric symbols is always three characters. This set of characters identifies the sample depth rounded to the nearest foot for soil samples (i.e., surface

soil samples will end in "000") and is sequential for trip blanks and IDW samples. For duplicate samples and equipment rinsates, the identification number will be the same as the original sample except 500 will be added for duplicate samples and 700 will be added to equipment rinsates. Indoor and ambient air samples will be numbered sequentially.

The fourth set of numeric symbols represents the sample location at the Site (i.e., ##). Sample locations for IDW, trip blanks, and equipment rinsate will be "00." The date is given as the last set of numeric symbols. Typical sample numbers will be as shown below:

Site number	Sample media	Sample depth	Sample location	Date
OC	SS	500	22	040202

This sample identification would indicate that the sample was collected at the Omega Chemical Site from surface soil, that it is a duplicate sample from sample location 22, and that it was collected on April 2, 2002.

Site number	Sample media	Sample depth	Sample location	Date
OC	DI	005	00	050102

This sample identification would indicate that the sample was collected at the Omega Chemical Site from surface soil, that it is trip blank sample number 5, and that it was collected on May 1, 2002.

6.4.~~8~~9 Sample Packing and Shipment

All filled sample containers will be labeled, packed and shipped in accordance with Department of Transportation (DOT) regulations, which include documentation requirements. Filled sample containers will have completely filled-out labels and will be placed in resealable plastic bags. Glass containers will be enveloped with packing material designed to prevent breakage during shipment (i.e., plastic bubble-wrap, vermiculite, etc). Sample containers will be placed into sample coolers with ice packs to comply with preservation requirements. Ice packs will consist of either blue ice placed inside a plastic bag or double bagged ice cubes. A chain-of-custody record, as well as other appropriate documentation, will be placed in resealable plastic bags and then into the sample coolers.

All samples requiring transport to the laboratory will be shipped as environmental samples by common carrier or transported by CDM personnel or laboratory courier, in private or company owned vehicles, to the laboratory within 24 hours from the time of sample collection (or sooner if necessary based on holding times). The field manager will notify the laboratory of impending sample delivery the day the samples are to be delivered.

6.4.109 Chain-of-Custody

The purpose of chain-of-custody procedures is to document the sample identity and identify who has handled the sample. Custody records trace a sample from its collection through all transfers of custody until it is transferred to the analytical laboratory. Custody records will be used for the samples collected during the field investigation.

6.4.109.1 Field Custody

CDM field personnel will have overall responsibility for sample custody and for field document control during the field investigation. The field manager will ensure that the samplers have the appropriate identification and custody records, will resolve custody problems in the field, and will handle the shipment of samples to the analytical laboratories. A sample is under custody if one or more of the following criteria are met:

- The sample is in the custodian's (sampler, lab personnel, etc.) possession
- It is in the custodian's view after being in possession
- It was in the custodian's possession and was locked up to prevent tampering
- It is in a designated secure area

Multi-part carbonless copy Chain-of-Custody Records will be used. The sampler or field manager will complete a Chain-of-Custody Record to accompany each sample shipment from the field to the laboratory. The Custody records will be used for a packaged lot of samples; more than one sample will usually be recorded on one form. More than one custody record sheet may be used for one package, if necessary. The original custody record travels with the samples; the initiator of the record keeps a copy. When custody of the same group of samples changes hands several times, some people will not have a copy of the custody record. This is acceptable as long as the original custody record shows that each person who had received custody has properly relinquished custody. An example Chain-of-Custody Record is presented in Appendix CD.

The following information will be supplied on the Chain-of-Custody Record:

- Project code number
- Signature of sampler
- Sample identification
- Sample matrix
- Laboratory QC samples

- Date and time of sample collection
- Signatures of all persons receiving or relinquishing the samples
- Sample analyses required for each sample
- Preservative(s) used (if any)
- Number of sample containers

General use instructions follow:

- The originator fills in all requested information from the sample labels
- The originator signs in the top left "Relinquished by" box and keeps the copy
- The original record sheet travels with the samples
- The person receiving custody checks the sample label information against the custody record. He also checks sample condition and notes anything unusual under "Comments" on the custody form
- The person receiving custody signs in the adjacent "Received by" box and keeps the original

In general, the date/time will be the same for the signatures relinquishing and receiving custody since custody must be transferred to another person. However, when samples are shipped via common carrier (e.g., Federal Express), the date/time will not be the same for both signatures.

When samples are shipped via common carrier, the original travels with the samples and the shipper (e.g., CDM field personnel) keeps the copy. The shipper also keeps all shipping papers, bills of lading, etc.

6.4.109.2 Problems/Questions Concerning Custody Records

If a discrepancy between sample label numbers and custody record listings is found, the person receiving custody should document this and properly store the samples. The samples should not be analyzed until the problem is resolved by contacting a responsible authority (i.e., CDM's quality assurance coordinator).

The person receiving custody should attempt to resolve the problem by checking all available information (other markings on sample container, type of sample, etc.). They should then document the situation on the custody record and in the field logbook and notify the appropriate responsible authority in order to resolve the problem as soon as possible.

Changes may be written in the "Comments" section of the Custody record and should be initialed and dated. A copy of this record should accompany the written notification to the sample custodian. A complete copy of the documentation of the problem and its resolution should also be provided to the Project Manager and included with the project files.

6.4.109.3 Laboratory Custody Procedures

Custody procedures that will be followed by the analytical laboratory are outlined below:

- Upon receipt at the laboratory, each sample shipment will be inspected to assess the condition of the shipping container and the individual samples, and the condition or integrity of the custody seals on a received shipment of samples will be documented at the time of receipt by the laboratory. Any problems identified by this process will also be documented and the sample custodian will be notified by the fastest available means, followed by written notification.

- Enclosed chain-of-custody records will be cross-referenced with all the samples in the shipment; these records will be signed by the sample custodian and placed in the project file. The laboratory sample custodian will continue the chain-of-custody process by assigning a unique laboratory number to each sample on receipt; this number identifies the sample through all further handling. Internal logbooks and records will be kept that maintain the chain-of-custody throughout sample preparation and analysis.

6.4.110 Field Logbooks

Field logbooks will be used to record and document all data collection activities at the Site. All measurements and samples collected will be recorded. Any deviations from the SAP will also be noted. Entries will be as descriptive as possible, so that a particular situation can be reconstructed without reliance on the collector's memory. Entries will be made in pen; no erasures will be permitted. If an incorrect entry is made, the data will be crossed out with a single line and initialed.

Field logbooks will be bound and, preferably, contain water resistant paper with consecutively numbered pages. No pages will be removed for any reason. Logbooks will be permanently assigned to field personnel and will be stored in CDM's files when not in use. Indicated on the cover of each logbook will be the person or organization to whom the book is assigned, book number, project name and code number, start date, and end date. At the beginning of each sampling day, the following information will be recorded:

- Date

- Time of entry

- Location

- Field measurements
- Weather conditions
- Field personnel present
- Level of personal protection being used ~~on-site~~on-site
- Deviations (if any) from the FSP
- Field observations
- Signature of the person making entries
- Methods of sample collection and preservation

In addition, instrument calibration information (including instrument serial numbers) will be recorded each day. If the same instruments are used for each sampling event, the serial numbers only need to be recorded at the beginning of the sampling event. The date and signature of the person recording entries will be written on every page.

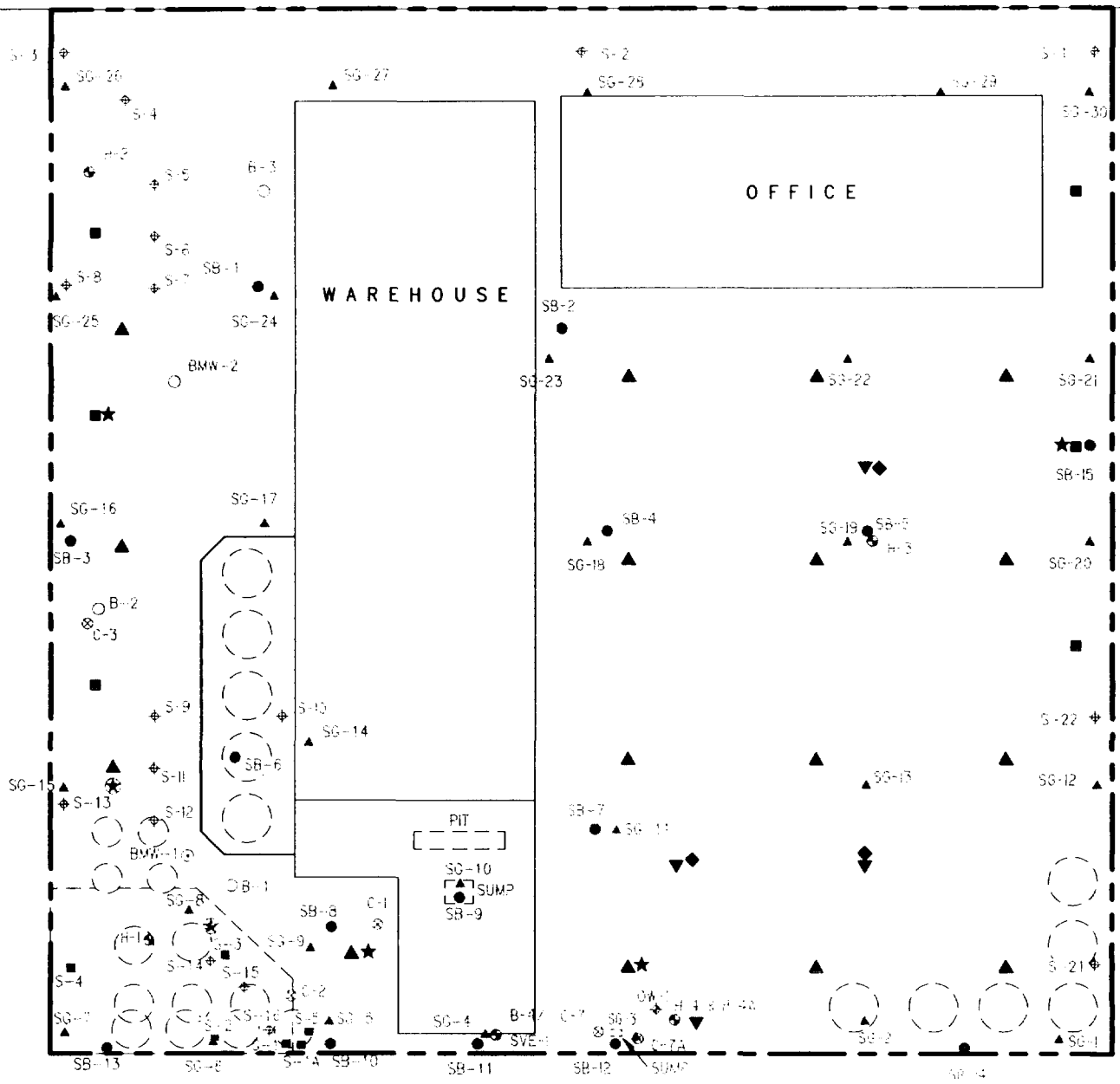
At each station where a sample is collected or a measurement is made, a detailed description of the location of the station will be noted. Equipment used to collect samples will also be recorded in the logbook, along with the time of sampling, sample description, volume and number of samples, and the date on which the equipment was calibrated. Sample numbers will also be recorded. Split samples, which receive a separate sample number, are also noted. Significant field logbook entries (samples collected, significant observations, etc.) will be reviewed and countersigned by another member of the project team at the end of each sampling day or major sampling activity.

6.4.12~~1~~ Photographs

Field personnel may take photographs to document field activities. As part of the documentation procedure, the name of the photographer, date, time, site location reference, reason why photograph was taken, and a brief description of the perspective/direction of view will be entered sequentially in the field logbook as photos are taken. Once developed, the photographic prints will be serially numbered corresponding to the logbook descriptions. Copies will be provided to the project coordinator.

6.4.13~~2~~ Document Corrections

Changes or corrections on any project documentation will be made by crossing out the item with a single line, initialing (by the person performing the correction), and dating the correction. The original item, although erroneous, must remain legible beneath the cross-out. The new information should be written clearly, near the crossed-out item.



LEGEND

- ■ Leroy Crandall Soil Boring (1985)
- ○ ENSR Soil Boring (1988)
- ⊙ ENSR Groundwater Monitoring Well (1988)
- ● England/Hargis Soil Boring (January 1996)
- ▲ England/Hargis Soil Gas Sample (December 1995)
- England/Hargis Monitoring Well (June 1996)
- England/Hargis Hydropunch (March 1996)
- England/Hargis Soil Boring (March 1996)
- ERT Soil Gas Sample (1988)
- Feature Removed
- ▲ Systematic Surface Soil Sample
- ▼ Purposive Surface Soil Sample
- ■ Soil Gas Sample
- ★ Physical Characteristics
- Deep Soil Boring
- ◆ Flux Chamber Sample

1" = 30'

15 0 30

Note: All locations approximate. Features based on Oct. 28, 1984 aerial photo and Figure 1 of England/Hargis Phase II Close Out Report

OMEGA CHEMICAL

Proposed Sample Locations

CDM

Figure 6-1

DATE: Feb 19, 2003 12:22pm XREFS:
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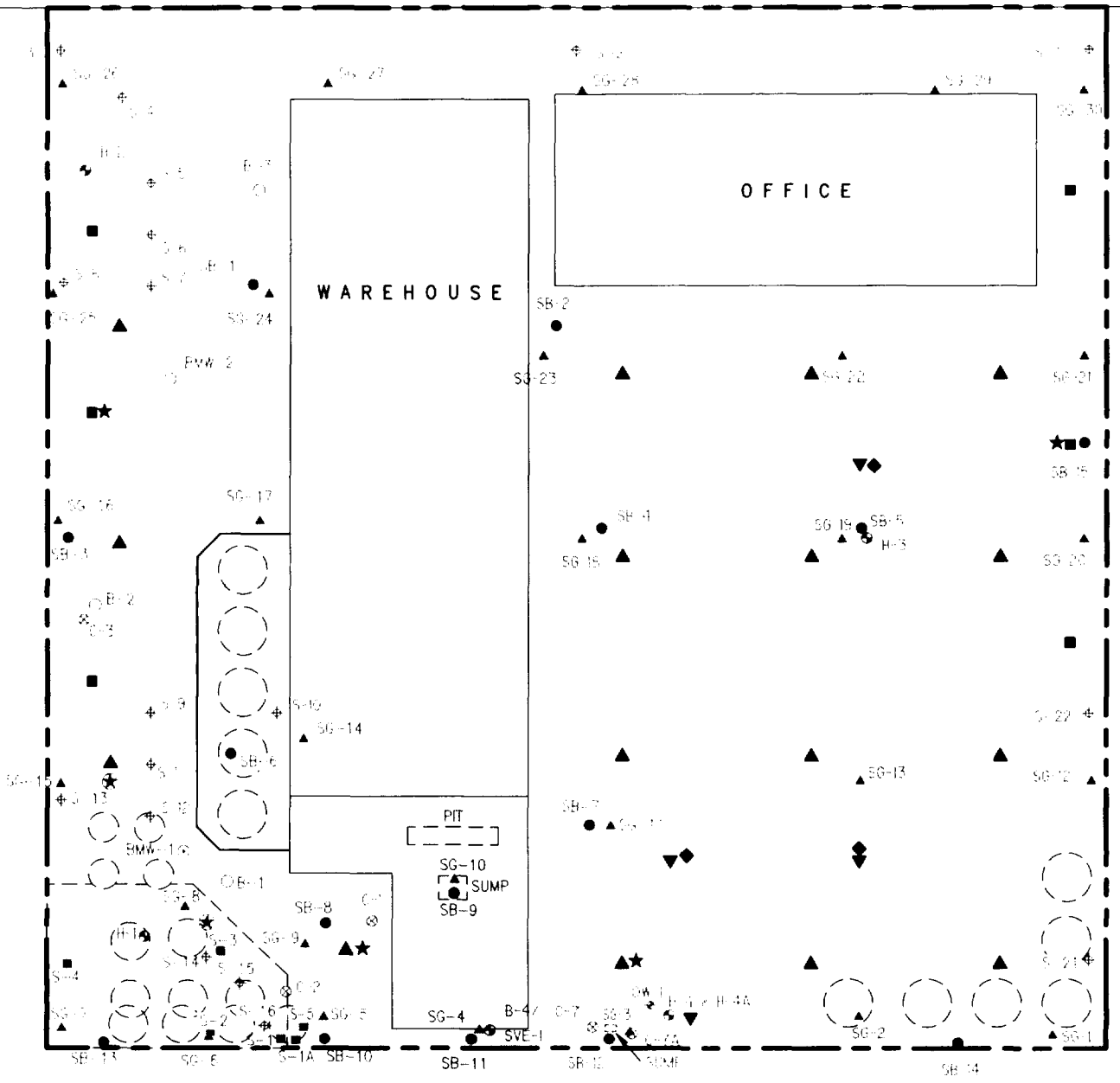

LEGEND

- ■ Leroy Crandall Soil Boring (1985)
- ENSR Soil Boring (1988)
- ENSR Groundwater Monitoring Well (1988)
- ● England/Hargis Soil Boring (January 1996)
- ▲ England/Hargis Soil Gas Sample (December 1995)
- England/Hargis Monitoring Well (June 1996)
- England/Hargis Hydropunch (March 1996)
- England/Hargis Soil Boring (March 1996)
- ERT Soil Gas Sample (1988)
- Feature Removed
- ▲ Systematic Surface Soil Sample
- ▼ Purposive Surface Soil Sample
- ■ Soil Gas Sample
- ★ Physical Characteristics
- Deep Soil Boring
- ◆ Flux Chamber Sample

N

1" = 30'

15 0 30

Note: All locations approximate. Features based on Oct. 28, 1984 aerial photo and Figure 1 of England/Hargis Phase II Close Out Report

OMEGA CHEMICAL

Proposed Sample Locations

CDM

Figure 6-1

DATE: Feb 19, 2003 12:22pm XREFS:
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Table 6-1
Target Compound List and Reporting Limits
Volatile Organic Compounds in Soils

Analyte	USEPA Method 8260 Soil Samples		USEPA Method T0-14 Soil Gas and ~~Vapor~~ Flux Chamber Samples
	Reporting Limit[1] (mg/kg)	PRG[2] (mg/kg)	Reporting Limit[1] (ppb (v/v))
Acetone	0.010	1,444	10
Benzene	0.002	0.62	2.0
Bromobenzene	0.005	28.1	NT
Bromochloromethane	0.005	--	NT
Bromodichloromethane	0.002	0.98	2.0
Bromoform	0.005	56.2	2.0
Bromomethane	0.005	3.84	2.0
n-Butylbenzene	0.005	134	NT
sec-Butylbenzene	0.005	105	NT
tert-Butylbenzene	0.005	122	NT
Carbon tetrachloride	0.005	0.23	2.0
Chlorobenzene	0.002	53.8	2.0
Chloroethane	0.005	1,600	4.0
Chloroform	0.002	0.24	2.0
Chloromethane	0.005	1.21	4.0
2-Chlorotoluene	0.005	152	NT
4-Chlorotoluene	0.005	--	NT
Dibromochloromethane	0.002	5.28	2.0
1,2-Dibromo-3-chloropropane	0.005	0.32	NT
1,2-Dibromoethane	0.002	0.0049	2.0
Dibromomethane	0.002	545	NT
1,2-Dichlorobenzene	0.002	370	2.0
1,3-Dichlorobenzene	0.002	40.6	NT
1,4-Dichlorobenzene	0.002	3.03	2.0
Dichlorodifluoromethane (Freon 12)	0.005	93.6	2.0
1,1-Dichloroethane	0.002	571	2.0
1,2-Dichloroethane	0.002	0.34	2.0
1,1-Dichloroethene	0.005	0.052	2.0
cis-1,2-Dichloroethene	0.002	41.9	2.0
trans-1,2-Dichloroethene	0.002	62.1	2.0
1,2-Dichloropropane	0.002	0.34	2.0
1,3-Dichloropropane	0.002	--	NT
2,2-Dichloropropane	0.002	--	NT
1,1-Dichloropropene	0.002	--	NT
cis-1,3-Dichloropropene	0.002	0.081	2.0
trans-1,3-Dichloropropene	0.002	0.081	2.0

Table 6-1 (continued)
Target Compound List and Reporting Limits
Volatile Organic Compounds in Soils

Analyte	USEPA Method 8260 Soil Samples		USEPA Method T0-14 Soil Gas, Air, and ~~Vapor~~ Flux Chamber Samples
	Reporting Limit[1] (mg/kg)	PRG[2] (mg/kg)	Reporting Limit[1] (ppb (v/v))
Ethylbenzene	0.002	230	2.0
Hexachlorobutadiene	0.005	5.69	4.0
Isopropylbenzene	0.002	156	NT
p-Isopropyltoluene	0.002	--	NT
Methylene chloride	0.020	8.49	2.0
Methyl tert-butyl ether	0.005	--	NT
Naphthalene	0.005	54.8	NT
n-Propylbenzene	0.002	134	NT
Styrene	0.002	1,700	2.0
1,1,1,2-Tetrachloroethane	0.005	2.85	NT
1,1,2,2-Tetrachloroethane	0.002	0.36	2.0
Tetrachloroethene	0.002	4.72	2.0
Toluene	0.002	520	2.0
1,2,3-Trichlorobenzene	0.005	--	NT
1,2,4-Trichlorobenzene	0.005	475	20
1,1,1-Trichloroethane	0.002	685	2.0
1,1,2-Trichloroethane	0.002	0.815	2.0
Trichloroethene	0.002	2.71	2.0
Trichlorofluoromethane (Freon 11)	0.005	383	2.0
1,2,3-Trichloropropane	0.010	0.0014	NT
Trichlorotrifluoroethane (Freon 113)	0.005	5,600	2.0
1,2,4-Trimethylbenzene	0.002	51.3	2.0
1,3,5-Trimethylbenzene	0.002	21.2	2.0
Vinyl chloride	0.005	0.021	2.0
o-Xylene	0.002	210	2.0
m,p-Xylenes	0.002	280	2.0

Notes:

1 Reporting Limits (RLs) shown are for samples that have not been diluted. RLs are matrix dependent and may be higher or lower than listed.
2 EPA Region IX Preliminary Remediation Goals (PRGs) for residential soils
Total Trihalomethanes
-- No standard
NT Not a target analyte

Table 6-2
Target Compound List and Reporting Limits
CAM Metals in Soils

Analyte	USEPA Method 6010B/6020/7471A Soil Samples	
	Reporting Limit[1] (mg/kg)	PRG[2] (mg/kg)
Antimony	10.0	31
Arsenic – Method 6020	0.5	0.39
Barium	1.0	5,375
Beryllium	1.0	154
Cadmium	0.50	37
Chromium	20	100000
Cobalt	10.0	4,692
Copper	2.0	2,905
Lead	10.0	400
Mercury – Method 7471A	0.10	23
Molybdenum	3.0	391
Nickel	2.0	1,564
Selenium	3.0	391
Silver	1.0	391
Thallium	6.0	5.2
Vanadium	1.0	547
Zinc	1.0	23,463

Notes:

1 Reporting Limits (RLs) are assumed to be for USEPA Method 6010B unless indicated differently beside the analyte. RLs shown are for samples that have not been diluted. RLs are matrix dependent and may be higher or lower than listed.

2 EPA Region IX Preliminary Remediation Goals (PRGs) for residential soils

-- No standard

Table 6-3
Target Compound List and Reporting Limits
Semi-Volatile Organic Compounds in Soils

Analyte	USEPA Method 8270C Soil Samples	
	Reporting Limit[1] (mg/kg)	PRG[2] (mg/kg)
SVOCs: Base/Neutral Extractables		
1,2,4-Trichlorobenzene	0.7	646
1,2-Dichlorobenzene	0.7	370
1,3-Dichlorobenzene	0.7	13
1,4-Dichlorobenzene	0.7	3.4
2,4-Dinitrotoluene	0.7	0.71
2,6-Dinitrotoluene	0.7	0.71
2-Chloronaphthalene	0.7	3,852
2-Methylnaphthalene	0.7	--
2-Nitroaniline	3.3	3.5
3-Nitroaniline	3.3	--
3,3'-Dichlorobenzidine	1.3	1.1
4-Bromophenyl phenyl ether	0.7	--
4-Chloroaniline	1.3	244
4-Chlorophenyl phenyl ether	0.7	--
4-Nitroaniline	3.3	--
Acenaphthylene	0.7	3,681
Acenapthene	0.7	3,681
Anthracene	0.7	21,896
Benz(a)anthracene	0.7	0.62
Benzo(a)pyrene	0.7	0.062
Benzo(b)fluoranthene	0.7	0.62
Benzo(g,h,I)perylene	0.7	--
Benzyl alcohol	1.3	18,330
Bis(2-chloroethoxy)methane	0.7	--
Bis(2-chlorethyl) ether	0.7	0.21
Bis(2-chloroisopropyl)ether	0.7	2.9
Bis(2-ethylhexyl)phthalate	0.7	35
Butyl benzylphthalate	0.7	12,220
Chrysene	0.7	62
Di-n-butylphthalate	0.7	6,110
Di-n-octylphthalate	0.7	1,222
Dibenz(a,h)anthracene	0.7	0.062
Dibenzofuran	0.7	290
Diethyl phthalate	0.7	48,882
Dimethyl phthalate	0.7	100,000
Fluoranthene	0.7	2,293

Table 6-3 (continued)
Target Compound List and Reporting Limits
Semi-Volatile Organic Compounds in Soils

Analyte	USEPA Method 8270C Soil Samples	
	Reporting Limit[1] (mg/kg)	PRG[2] (mg/kg)
Fluorene	0.7	2,643
Hexachlorobenzene	0.7	0.30
Hexachlorobutadiene	0.7	6.2
Hexachlorocyclopentadiene	0.7	423
Hexachloroethane	0.7	35
Indeno(1,2,3-cd)pyrene	0.7	0.62
Isophorone	0.7	511
n-Nitrosodiphenylamine	0.7	99
n-Nitrosodi-n-propylamine	0.7	0.069
Naphthalene	0.7	56
Nitrobenzene	0.7	20
Phenanthrene	0.7	--
Pyrene	0.7	2,308
SVOCs: Acid Extractables		
2,4,5-Trichlorophenol	3.3	6,110
2,4,6-Trichlorophenol	0.3	44
2,4-Dichlorophenol	0.3	183
2,4-Dimethylphenol	0.3	1,222
2,4-Dinitrophenol	3.3	122
2-Chlorophenol	0.3	63
2-Methylphenol	0.3	3,055
2-Nitrophenol	0.3	--
4,6-Dinitro-2-methylphenol	3.3	--
4-Chloro-3-methylphenol	1.3	--
4-Methylphenol	0.3	305
4-Nitrophenol	1.6	488
Benzoic Acid	1.6	100,000
Pentachlorophenol	3.3	3.0
Phenol	0.3	36,661

Notes:

1 Reporting Limits (RLs) shown are for samples that have not been diluted. RLs are matrix dependent and may be higher or lower than listed.

2 EPA Region IX Preliminary Remediation Goals (PRGs) for residential soils

-- No standard

Table 6-4
Target Compound List and Reporting Limits
Pesticides and Polychlorinated Biphenyls in Soils

Analyte	USEPA Method 8081A/8082 Soil Samples	
	Reporting Limit[1] (mg/kg)	PRG[2] (mg/kg)
Organochlorine Pesticides – 8081A		
α-BHC	0.019	0.09
β-BHC	0.033	0.32
δ-BHC	0.011	--
γ-BHC (Lindane)	0.020	0.44
α-Chlordane	0.015	1.6
γ-Chlordane	0.015	1.6
4,4'-DDD	0.042	2.4
4,4'DDE	0.025	1.7
4,4'-DDT	0.036	1.7
Aldrin	0.022	0.029
Dieldrin	0.035	0.03
Endosulfan I	0.021	366
Endosulfan II	0.024	366
Endosulfan Sulfate	0.036	--
Endrin	0.036	18
Endrin Aldehyde	0.016	--
Heptachlor	0.020	0.11
Heptachlor Epoxide	0.021	0.053
Methoxychlor	0.057	305
Toxaphene	0.57	0.44
Polychlorinated Biphenyls - 8082		
PCB-1016	0.70	3.9
PCB-1221	0.70	0.22
PCB-1232	0.70	0.22
PCB-1242	0.70	0.22
PCB-1248	0.70	0.22
PCB-1254	0.70	0.22
PCB-1260	0.70	0.22

Notes:

1 Reporting Limits (RLs) shown are for samples that have not been diluted. RLs are matrix dependent and may be higher or lower than listed.

2 EPA Region IX Preliminary Remediation Goals (PRGs) for residential soils

-- No standard

Table 6-5
Target Compound List and Reporting Limits
Volatile Organic Compounds in Water (Equipment Rinsate Blanks)

Analyte	USEPA Method 8260 Water Samples	
	Reporting Limit[1] (µg/L)	MCL[2] (µg/L)
Acetone	10	--
Benzene	0.50	1
Bromobenzene	1.0	--
Bromochloromethane	1.0	--
Bromodichloromethane	1.0	100#
Bromoform	1.0	100#
Bromomethane	1.0	--
n-Butylbenzene	1.0	--
sec-Butylbenzene	0.50	--
tert-Butylbenzene	1.0	--
Carbon tetrachloride	0.50	0.5
Chlorobenzene	1.0	70
Chloroethane	1.0	--
Chloroform	1.0	100#
Chloromethane	1.0	--
2-Chlorotoluene	1.0	--
4-Chlorotoluene	1.0	--
Dibromochloromethane	1.0	100#
1,2-Dibromo-3-chloropropane	5.0	0.2
1,2-Dibromoethane	1.0	0.05
Dibromomethane	1.0	--
1,2-Dichlorobenzene	0.50	600 (b)
1,3-Dichlorobenzene	1.0	--
1,4-Dichlorobenzene	1.0	5
Dichlorodifluoromethane (Freon 12)	5.0	1,000 (a)
1,1-Dichloroethane	0.50	5
1,2-Dichloroethane	0.50	0.5
1,1-Dichloroethene	0.50	6
cis-1,2-Dichloroethene	0.50	6
trans-1,2-Dichloroethene	0.50	10
1,2-Dichloropropane	1.0	5
1,3-Dichloropropane	1.0	--
2,2-Dichloropropane	0.50	--
1,1-Dichloropropene	1.0	--
cis-1,3-Dichloropropene	0.50	0.5
trans-1,3-Dichloropropene	0.50	0.5

Table 6-5 (continued)
Target Compound List and Reporting Limits
Volatile Organic Compounds in Water (Equipment Rinsate Blanks)

Analyte	USEPA Method 8260 Water Samples	
	Reporting Limit[1] (µg/L)	MCL[2] (µg/L)
Ethylbenzene	1.0	700
Hexachlorobutadiene	1.0	--
Isopropylbenzene	1.0	--
p-Isopropyltoluene	1.0	--
Methylene chloride	10	5
Methyl tert-butyl ether	10	13
Naphthalene	1.0	--
n-Propylbenzene	1.0	--
Styrene	1.0	100
1,1,1,2-Tetrachloroethane	1.0	--
1,1,2,2-Tetrachloroethane	1.0	1
Tetrachloroethene	0.50	5
Toluene	0.50	150
1,2,3-Trichlorobenzene	1.0	--
1,2,4-Trichlorobenzene	1.0	70
1,1,1-Trichloroethane	0.50	200
1,1,2-Trichloroethane	0.50	5
Trichloroethene	0.50	5
Trichlorofluoromethane (Freon 11)	0.50	150
1,2,3-Trichloropropane	1.0	--
Trichlorotrifluoroethane (Freon 113)	5.0	1,200
1,2,4-Trimethylbenzene	1.0	--
1,3,5-Trimethylbenzene	1.0	--
Vinyl chloride	0.50	0.5
o-Xylene	1.0	1,750 (b)
m,p-Xylenes	1.0	1,750 (b)

Notes:
[1] Reporting Limits (RLs) shown are for samples that have not been diluted. RLs are matrix dependent and may be higher or lower than listed.
[2] California primary Maximum Contaminant Level (MCL), unless otherwise noted
Total Trihalomethanes
(a) California Action Level
(b) Single isomer or sum of isomers
-- No standard
NT Not a target analyte

Table 6-6
Target Compound List and Reporting Limits
CAM Metals in Water (Equipment Rinsate Blanks)

Analyte	USEPA Method 6010B/6020/7470A Water Samples	
	Reporting Limit[1] (mg/L)	MCL[2] (mg/L)
Antimony	0.05	0.006
Arsenic – Method 6020	0.001	0.05
Barium	0.005	1
Beryllium	0.005	0.004
Cadmium	0.007	0.005
Chromium	0.01	0.05
Cobalt	0.006	--
Copper	0.01	1.3 (4)
Lead	0.025	0.015 (4)
Mercury – Method 7470A	0.001	0.002
Molybdenum	0.015	--
Nickel	0.01	0.1
Selenium	0.03	0.05
Silver	0.01	--
Thallium	0.08	0.002
Vanadium	0.01	0.05 (3)
Zinc	0.01	--

Notes:

1 Reporting Limits (RLs) are assumed to be for USEPA Method 6010B unless indicated differently beside the analyte. RLs shown are for samples that have not been diluted. RLs are matrix dependent and may be higher or lower than listed.

2 California primary Maximum Contaminant Level (MCL)

3 California Action Level

4 California Lead and Copper Rule

-- No standard

Table 6-7
Target Compound List and Reporting Limits
Semi-Volatile Organic Compounds in Water (Equipment Rinsate Blanks)

Analyte	USEPA Method 8270C Water Samples	
	Reporting Limit[1] (µg/L)	MCL[2] (µg/L)
SVOCs: Base/Neutral Extractables		
1,2,4-Trichlorobenzene	10	70 (a)
1,2-Dichlorobenzene	10	600 (a)
1,3-Dichlorobenzene	10	5.5
1,4-Dichlorobenzene	10	5 (a)
2,4-Dinitrotoluene	10	73
2,6-Dinitrotoluene	10	36
2-Chloronaphthalene	10	487
2-Methylnaphthalene	10	--
2-Nitroaniline	50	2.1
3-Nitroaniline	50	--
3,3'-Dichlorobenzidine	20	0.15
4-Bromophenyl phenyl ether	10	--
4-Chloroaniline	20	146
4-Chlorophenyl phenyl ether	10	--
4-Nitroaniline	50	--
Acenaphthylene	10	--
Acenapthene	10	365
Anthracene	10	1,825
Benz(a)anthracene	10	0.09
Benzo(a)pyrene	10	0.2 (a)
Benzo(b)fluoranthene	10	0.09
Benzo(g,h,I)perylene	10	--
Benzyl alcohol	20	10,950
Bis(2-chloroethoxy)methane	10	--
Bis(2-chlorethyl) ether	10	0.01
Bis(2-chloroisopropyl)ether	10	0.27
Bis(2-ethylhexyl)phthalate	10	4.8
Butyl benzylphthalate	10	7,299
Chrysene	10	9.2
Di-n-butylphthalate	10	3,649
Di-n-octylphthalate	10	730
Dibenz(a,h)anthracene	10	0.009
Dibenzofuran	10	24
Diethyl phthalate	10	29,200
Dimethyl phthalate	10	364,866
Fluoranthene	10	1,459

Table 6-7 (continued)
Target Compound List and Reporting Limits
Semi-Volatile Organic Compounds in Water (Equipment Rinsate Blanks)

Analyte	USEPA Method 8270C Water Samples	
	Reporting Limit[1] (µg/L)	MCL[2] (µg/L)
Fluorene	10	243
Hexachlorobenzene	10	1 (a)
Hexachlorobutadiene	10	0.86
Hexachlorocyclopentadiene	10	50 (a)
Hexachloroethane	10	4.8
Indeno(1,2,3-cd)pyrene	10	0.09
Isophorone	10	70.8
n-Nitrosodiphenylamine	10	13.7
n-Nitrosodi-n-propylamine	10	0.01
Naphthalene	10	6.2
Nitrobenzene	10	3.4
Phenanthrene	10	--
Pyrene	10	182
SVOCs: Acid Extractables		
2,4,5-Trichlorophenol	50	3,650
2,4,6-Trichlorophenol	10	6.1
2,4-Dichlorophenol	10	110
2,4-Dimethylphenol	10	730
2,4-Dinitrophenol	50	73
2-Chlorophenol	10	30
2-Methylphenol	10	1,825
2-Nitrophenol	10	--
4,6-Dinitro-2-methylphenol	50	--
4-Chloro-3-methylphenol	20	--
4-Methylphenol	10	182
4-Nitrophenol	50	292
Benzoic Acid	50	145,978
Pentachlorophenol	50	1 (a)
Phenol	10	21,899

Notes:

1 Reporting Limits (RLs) shown are for samples that have not been diluted. RLs are matrix dependent and may be higher or lower than listed.

2 EPA Region 9 Preliminary Remediation Goal for tap water

(a) California primary Maximum Contaminant Level (MCL)

-- No standard

Table 6-8
Target Compound List and Reporting Limits
Pesticides and Polychlorinated Biphenyls in Water (Equipment Rinsate Blanks)

Analyte	USEPA Method 8081A/8082 Water Samples	
	Reporting Limit[1] (µg/L)	**MCL[2] (µg/L)**
Organochlorine Pesticides – 8081A		
α-BHC	0.35	0.01 (a)
β-BHC	0.23	0.04 (a)
δ-BHC	0.24	--
γ-BHC (Lindane)	0.25	0.2
α-Chlordane	0.80	0.1
γ-Chlordane	0.37	0.1
4,4'-DDD	0.50	0.28 (a)
4,4'DDE	0.58	0.20 (a)
4,4'-DDT	0.81	0.20 (a)
Aldrin	0.34	0.004 (a)
Dieldrin	0.44	0.004 (a)
Endosulfan I	0.30	219 (a)
Endosulfan II	0.40	219 (a)
Endosulfan Sulfate	0.35	--
Endrin	0.39	2.0
Endrin Aldehyde	0.50	--
Heptachlor	0.40	0.01
Heptachlor Epoxide	0.32	0.01
Methoxychlor	0.86	40
Toxaphene	0.50	3.0
Polychlorinated Biphenyls - 8082		
PCB-1016	1.0	0.5
PCB-1221	1.0	0.5
PCB-1232	1.0	0.5
PCB-1242	1.0	0.5
PCB-1248	1.0	0.5
PCB-1254	1.0	0.5
PCB-1260	1.0	0.5

Notes:

1 Reporting Limits (RLs) shown are for samples that have not been diluted. RLs are matrix dependent and may be higher or lower than listed.

2 California primary Maximum Contaminant Level (MCL), unless otherwise noted

(a) EPA Region 9 Preliminary Remediation Goal (PRG) for tap water

-- No standard

Table 6-9
Sample Preservation, Holding Times, and Container Requirements

Analytical Parameters	USEPA Analytical Method	Preservative	Holding Time	Container Requirements
VOCs – Soil Gas, Air, and ~~Vapor~~Flux Chamber	T0-14	None	14 days from collection	Summa® Canisters
VOCs – Soils	8260	Cool to 4°C ± 2°C	~~14~~48 hours ~~days~~ from collection	~~One 2" x 6" brass sleeve w/ Teflon covers and polyethylene end caps~~Encore sampling device
VOCs - Water	8260	Cool to 4°C ± 2°C HCl to pH < 2	14 days from collection	2 x 40 mL glass jar with Teflon-lined septum
Metals – Soils (except mercury)	6010B/6020	Cool to 4°C ± 2°C	6 months from collection	6" brass sleeve w/ Teflon covers and polyethylene end caps
Metals – Water (except mercury)	6010B/6020	HNO_3 to pH < 2	6 months from collection	1 x 1L Amber or polyethylene
Mercury - Soils	7471A	Cool to 4°C ± 2°C	28 days from collection	6" brass sleeve w/ Teflon covers and polyethylene end caps
Mercury - Water	7470	HNO_3 to pH < 2	28 days from collection	1 x 1L Amber or polyethylene
SVOCs – Soils	8270C	Cool to 4°C ± 2°C	14 days for extraction, 40 days for analysis of extract	6" brass sleeve w/ Teflon covers and polyethylene end caps
SVOCs - Water	8270C	Cool to 4°C ± 2°C	7 days for extraction, 40 days for analysis of extract	2 x 1L amber glass jar with Teflon-lined screw cap
Pesticides/PCBs – Soils	8081A/8082	Cool to 4°C ± 2°C	14 days for extraction, 40 days for analysis of extract	6" brass sleeve w/ Teflon covers and polyethylene end caps
Pesticides/PCBs - Water	8081A/8082	Cool to 4°C ± 2°C	7 days for extraction, 40 days for analysis of extract	1 x 1 L amber glass jar
Redox potential – Soil	SM 2580B	Cool to 4°C ± 2°C	ASAP	1 x 8 oz glass jar
Clay content – Soil	ASTM D-422 or D4464~~1 and D-422~~	None	None	1 x 8 oz glass jar
Organic carbon content - Soil	SW-846 9060 ~~Mod~~A	Cool to 4°C ± 2°C	28 days	1 x 8 oz glass jar
Cation exchange capacity	SW-846 9081~~0~~	Cool to 4°C ± 2°C	7 days until drying, 8 months after drying	1 x 8 oz glass jar
Moisture Content	~~Agronomy No. 9, Part 1 21-2~~ASTM	Cool to 4°C ± 2°C	None	1 x 8 oz glass jar

	D2216			
~~Permeability~~Hydraulic Conductivity	ASTM D5084	None	None	Shelby Tube

Table 6-10
Sample Collection Summary

SAMPLE TYPE	ANALYSIS				
	VOCs EPA Method 8260	**SVOCs EPA Method 8270C**	**Metals EPA Method 6010B/6020/ 7471A**	**Pesticides/PCBs EPA Method 8081A/8082**	**Soil Physical Characteristics Various***
Surface Soil: 20~~19~~ Sample Locations	~~20~~19~~0~~	20~~19~~	20~~19~~	20~~19~~	2
Subsurface Soil: 4 Sample Locations	0	0	0	0	14
Soil Gas: 9 Sample Locations	~~6~~18 (T0-14)	0	0	0	0
Indoor Air: 12 Sample Locations	12 (T0-14)	0	0	0	0
~~Outdoor~~Ambient Air: 4 Sample Locations	4 (T0-14)	0	0	0	0
~~Vapor~~Flux Chamber: 3 Sample Locations	3 (T0-14)	0	0	0	0
QUALITY CONTROL					
Field Duplicates	20 Soil ~~1~~2 Soil Gas 1 ~~Vapor~~Flux Chamber 2 Indoor Air 1 ~~Outdoor~~Ambient Air	2 Soil	2 Soil	2 Soil	2 Soil
Equipment Blanks	1 per day	1 per day	1 per day	1 per day	1 per day
Trip Blanks	1 per sample shipment	0	0	0	0
Field Blanks	1	1	1	1	0
TOTAL SAMPLES	68~~35~~	24~~3~~	24~~3~~	24~~3~~	19~~21~~

*Soil samples will be analyzed for the following physical characteristics:

Redox potential: Standard Method 2580B

Clay content: ASTM Method D-422 or D4464~~1 and D-422~~

Organic carbon content: SW-846 Method 9060 Mod

Cation exchange capacity: SW-846 Method 9081~~0~~

Moisture content: ~~Agronomy No. 9, Part 1, 21-2~~ASTM D2216

~~Permeability~~Hydraulic Conductivity: ASTM Method D5084

Section 7
Quality Assurance Project Plan

This Quality Assurance Project Plan (QAPP) describes the minimum quality assurance/quality control (QA/QC) requirements for sampling activities during the RI/FS field investigation. The purpose of this QAPP is to provide a project-specific "blueprint" for collection of data that meet the data quality objectives (DQOs) established for the RI/FS field investigation. DQOs are qualitative and quantitative statements specified to ensure that data of known and appropriate quality in support of remedial action activities and decisions are generated.

Quality assurance is a system of management activities designed for assuring reliability of monitoring and measurement of data. Quality control is defined as the routine application of procedures for obtaining prescribed standards of performance in the monitoring and measuring process. Quality assurance procedures such as tracking, reviewing, and auditing are implemented as necessary to ensure that all project work is performed in accordance with professional standards, regulations and guidelines, and specific project goals and requirements.

This QAPP addresses the requirements set forth in USEPA's regulations and guidance documents, including EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5 (EPA 1998) and EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5 (EPA 2001). It includes procedures designed to ensure that the data are precise, accurate, representative, complete, comparable, and of sufficient sensitivity to meet the purposes for their intended use. Further, this QAPP provides the QA requirement for data handling and manipulation during all phases of this project. It is intended to guide field, laboratory, engineering, and management personnel in all relevant aspects of data collection, management, and control while on- or off-site.

7.1 Project Management

This section covers the basic area of project management, including project team organization, roles and responsibilities of participants, project background and purpose, etc. These elements ensure that the project has a defined goal and that the participants understand the goal and the approach to be used.

7.1.1 Project Team Organization and Responsibilities

This section presents the project team organization and team member responsibilities. The work will be performed by staff from the CDM offices located at the addresses shown below:

Camp Dresser & McKee Inc.
185~~881 Von Karman~~Teller Ave, Suite ~~650~~200
Irvine, CA 92612
Phone: 949/752-5452
Fax: 949/752-1307
Email: WallinSL@cdm.com

Camp Dresser & McKee Inc.
331 17th Street, Suite 1200
Denver, CO 80202
Phone: 303/298-1311
Fax: 303/298-8236
Email: ChamberlinDC@cdm.com

Project coordination is provided by:

de maximis, inc.
5225 Canyon Crest Drive
Building 200/Suite 253
Riverside, California 92507
Phone: 909/222-0387
Fax: 909/222-0389
Email: cmclaugh@demaximis.com

The Work Plan, RI report, risk assessment report, and FS report (draft and final) will be distributed to the following agencies and individuals:

Ms. ~~Nancy Riveland-Har~~Diane Strassmaier
United States Environmental Protection Agency
75 Hawthorne Street
San Francisco, California 94105
Phone: 415/744-2370
Fax: 415/744-2180
Email: ~~Riveland.Nancy~~Strassmaier.Diane@epamail.epa.gov

Ms. Lori Parnass
California Department of Toxic Substances Control
1011 North Grandview Avenue
Glendale, California 91201
Phone: 818/551-2856
Fax: 818/551-2850
Email: Lparnass@dtsc.ca.gov

7.1.1.1 Key Personnel

Key personnel are indicated in Figure 7-1 (Project Team Organizational Chart). The Project Coordinator is Chuck McLaughlin, *de maximis, inc.* The primary role of the Project Coordinator is to communicate and coordinate with USEPA, the OPOG technical review committee, and the CDM Program Director regarding site activities and deliverables, provide guidance and perform reviews of project deliverables, and maintain a set of project files. The key CDM team members are David Chamberlin (Program Director), Sharon L. Wallin, R.G. (Project Manager), Ravi Subramanian, P.E. and Erik Jorgensen, P.E. (Project Engineers), Angela Patterson (Risk Assessor), and

Barbara Wells (Quality Assurance Manager). Responsibilities of key staff are as follows:

Mr. Chamberlin, as Program Manager, is responsible for the overall management and coordination of site investigation and remediation activities and preparation of deliverables. He will coordinate with Mr. McLaughlin and the OPOG technical review committee.

Ms. Wallin, as Project Manager, is responsible for management and coordination of the following activities:

- Preparing status reports
- Supervising production and review of deliverables
- Coordinating with the subcontractor laboratory
- Reviewing analytical results from subcontractor laboratory
- Tracking work progress against planned budgets and schedules
- Notifying the CDM Quality Assurance Manager immediately of significant problems affecting the quality of data or the ability to meet project objectives
- Scheduling personnel and material resources
- Procuring subcontractors
- Implementing field aspects of the investigation
- Implementing corrective actions in the field resulting from staff observations, QA/QC surveillances, and/or QA audits
- Providing oversight of data management
- Providing oversight of report preparation

Mr. Subramanian will report to the Project Manager. He will provide technical support for site investigation and remediation activities. He will assist in preparation of technical documents, such as the RI/FS. Ms. Patterson will report to the Project Manager. She will prepare the risk assessment for the site.

Ms. Wells, as the Quality Assurance Manager, is independent of the technical staff and is not part of the data gathering process. The Quality Assurance Manager thus has the ability to objectively review projects and identify problems. Ms. Wells is responsible for the following:

- Maintaining QA oversight of the project

- Reviewing QA sections in project reports as applicable
- Reviewing QA/QC procedures applicable to this project
- Auditing selected activities of this project
- Initiating, reviewing, and following up on response actions as necessary
- Conducting internal system audits to check on the use of appropriate QA/QC measures
- Arranging performance audits of measurement activities, as necessary

~~Key personnel and their roles are indicated in Figure 7-1 (Project Team Organizational Chart). The Project Coordinator is Chuck McLaughlin, *de maximis, inc.* The key CDM team members are David Chamberlin (Program Director), Sharon L. Wallin, R.G. (Project Manager), Ravi Subramanian, P.E. (Project Engineer), Angela Patterson (Risk Assessor), and Barbara Wells (Quality Assurance Manager). Technical review will be performed by the Technical Review Committee consisting of Chris Ingalls; R. Bruce Chalmers, P.E.; and Jim Lavelle, Ph.D. Additional technical review will be provided by the OPOC Technical Committee.~~

7.1.1.2 Special Training and Certification Requirements

During the field portion of this investigation, all work will be performed under the supervision of a California Registered Geologist. All CDM personnel working ~~onsite~~on-site will hold current certification showing that they have received training in accordance with requirements specified in 29 CFR 1910.120 (Occupational Safety and Health Administration [OSHA]) regulations). Documentation and records verifying this training will be maintained by CDM's Health and Safety officer.

It is anticipated that Del Mar Analytical (Del Mar), located in Irvine California, will be selected as the project analytical laboratory. Del Mar is certified through California Department of Health Services' Environmental Laboratory Accreditation Program (ELAP). Any subcontracted laboratory will also be required to be certified by ELAP.

7.1.2 Project Schedule

The overall project schedule and timeframe for submittal of key deliverables for the On-Site Soils RI/FS are outlined in the Consent Decree. The anticipated schedule is summarized below.

~~Receipt of USEPA comments on the draft Work Plan is anticipated in early April. Comment resolution and document revision is estimated to require up to one and a half months.~~ The field investigation will begin following USEPA approval of the final Work Plan. Mobilization for field activities will take approximately three weeks. The field investigation will begin subsequent to mobilization and will take approximately two weeks. The draft RI report and risk assessment report ~~Risk Assessment~~ will be

submitted to USEPA for review within ninety calendar days after receipt of validated data for the final laboratory analytical reports associated with the RI. The FS report will be submitted to USEPA for review within sixty calendar days after USEPA approval of the RI report or risk assessment report, whichever is approved later.

7.1.3 Project Background and Description

Detailed information on the project background and description is provided in Sections 2 and 3 of this report. The following text provides a brief summary of this information.

The Omega Chemical site is located at 12504 East Whittier Boulevard in Whittier, California (see Figures 1-1 and 1-2 for site location and vicinity maps). The facility reportedly operated as a spent solvent and refrigerant recycling and treatment facility, handling primarily chlorinated hydrocarbons and chlorofluorocarbons from approximately 1976 to 1991. Drums and bulk loads of waste solvents and chemicals from various industrial activities were processed to form commercial products, which were returned to generators or sold in the marketplace. Chemical, thermal, and physical treatment processes were reportedly used to recycle and reuse the waste materials.

Soil gas, soil, and groundwater investigations have been performed by a variety of consultants to Omega between 1985 and 1999. Previously conducted investigations at the Site may be divided into three categories, as follows: 1) preliminary work performed from 1985 through 1988, 2) detailed and focused Phase II investigation work performed by England+Hargis and C_2Rem from 1995 through 1997, and 3) Phase 1a pre-design investigation performed by CDM during 1999.

The objective of this Work Plan is to present the rationale and methodology for conducting the On-Site Soils RI/FS and to provide the methodology for collecting physical and chemical data to support the RI/FS tasks. The RI/FS is being conducted to characterize the nature and extent of contamination in Site soils, to assess the threat these contaminants pose to human health and the environment, and to evaluate remedial action alternatives to eliminate, reduce, or control risks to human health and the environment at the Site. Work Plan activities are streamlined as much as possible to focus on data gaps identified in the DSR and requirements of the presumptive remedies. Groundwater at the Site is being addressed under a separate program.

7.1.4 Quality Objectives and Criteria for Measurement Data

The overall quality assurance objective for sampling data is to ensure that the data generated are of documented quality for the intended data uses. To achieve these objectives, data will be: 1) representative of actual site physical and chemical conditions; 2) comparable to other studies, where appropriate; 3) complete to the extent that necessary conclusions may be reached; and 4) of known quantitative statistical significance in terms of precision and accuracy, at levels appropriate for each stated data use for the project.

7.1.4.1 Data Quality Objectives

The DQO process is a series of planning steps that are designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended purpose. The USEPA has issued guidelines to help data users develop site-specific DQOs (USEPA 2000a). The DQO process is intended to:

- Clarify the study objective;
- Define the most appropriate type of data to collect;
- Determine the most appropriate conditions from which to collect the data; and
- Specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the design.

The DQO process specifies project decisions, the data quality required to support those decisions, specific data types needed, data collection requirements, and analytical techniques necessary to generate the specified data quality. The process also ensures that the resources required to generate the data are justified. The DQO process consists of seven steps of which the output from each step influences the choices that will be made later in the process. These steps are as follows:

- Step 1: state the problem
- Step 2: identify the decision
- Step 3: identify the inputs to the decision
- Step 4: define the study boundaries
- Step 5: develop a decision rule
- Step 6: specify tolerable limits on decision errors
- Step 7: optimize the design

During the first six steps of the process, the planning team develops decision performance criteria (that is, DQOs) that will be used to develop the data collection design. The final step of the process involves designing the data collection program based on the DQOs. A brief discussion of these steps and their application to this SAP is provided below and summarized in Table 7-1.

7.1.4.1.1 Step 1: State the Problem

The purpose of this step is to describe the problem to be studied so that the focus of the study will be unambiguous. To summarize the problem, former solvent recycling activities have resulted in the release of chemicals to groundwater and soils of the Site. Elevated concentrations of freons, PCE, TCE, and other chlorinated products

have been detected in soils and groundwater. These chemicals could potentially have an adverse effect upon human health and the environment.

Section 2.0 presents a detailed discussion of the Site background, including history and Site conditions. Section 3.0 describes previous investigations that have been conducted at the Site, summarizes the currently available information regarding nature and extent of contamination, provides a SCEM for the Site, and lists the gaps in available data needed for the RI/FS. Section 7.1.1 identifies the project team and decision makers (i.e., USEPA and OPOG). Groundwater is being addressed in a separate program.

7.1.4.1.2 Step 2: Identify the Decision

This step identifies the questions that the investigation will attempt to resolve, and actions that may take place based on investigation results. As discussed in Section 1.0 of the Work Plan, the purpose and objectives of the On-Site Soils RI/FS are to (1) estimate the extent and nature of contamination in soils, (2) assess the threat to human health and environment, and (3) evaluate remedial alternatives to eliminate, reduce, or control risks to human health and the environment. The goal of this Work Plan is to provide the methods and guidance to develop the data necessary to support these objectives.

The following are principal questions of the RI/FS:

1. What is the nature and extent of contamination in surface soils, subsurface soils, and soil gas at the Site?

2. Do contaminant concentrations in surface soils, subsurface soils, ~~or~~ soil gas, or air represent an unacceptable risk to human health or the environment?

3. Are additional source areas present at the Site that are currently uncharacterized?

4. What remedial alternatives are appropriate for the contaminants and media of concern?

Actions that could result from resolution of these questions:

1. If contaminant concentrations in Site soils, ~~or~~ soil gas, or air pose a significant threat to human health or the environment, further evaluation would be performed to determine how to best mitigate the threat.

2. If additional source areas are present at the Site, the FS report will evaluate whether remedial action is necessary to address these areas.

3. Remedial alternatives will be identified and evaluated based on nature and extent of contamination and Site conditions.

4. The decision statement for the Site is to generate data sufficient to resolve the principal questions of the RI/FS and to take appropriate action based on results of the investigation.

7.1.4.1.3 Step 3: Identify the Inputs to the Decision

The purpose of this step is to identify the information and measurements needed to support the decision statement. This is determined by the data uses. Based on the objectives and goal of the RI/FS, data will be used to achieve the following:

- Estimate the nature and extent of contamination in soils and soil gas at the Site.
- Estimate chemical concentrations in indoor and ambient air at the Site and specific off-site locations.
- Determine whether additional source areas are present at the Site.
- Determine whether contaminant concentrations in soils, ~~or~~ soil gas, indoor air, or ambient air present a threat to human health or the environment.
- Select remedial actions based on the data collected.

Subsurface soils and soil gas data are available from previous investigations. The Work Plan focuses on filling gaps in the available data. Based on data uses and availability, the following data are needed:

- Data that characterize the nature and extent of contamination in surface soils.
- Soil gas data from the northwest and northeast boundaries.
- Indoor air from specific on-site and off-site facilities.
- Ambient air from on- and off-site locations.
- ~~Vapor~~ Flux chamber and surface soil data that characterize contaminant types and concentrations in potential source areas identified through review of historical aerial photographs.
- Data that characterize selected chemical and physical properties of soil that may influence the distribution and migration of contaminants from source areas to potential targets or the effectiveness of remedial alternatives.

Human health risks will be evaluated using data for Site soils and soil gas collected in previous investigations, as well as data for Site soils, soil gas, indoor air, and ambient air ~~and~~ resulting from this investigation. Action levels will be generated in the risk assessment using USEPA guidance. Section 6.0 provides detailed information on the sampling rationale, objectives, and methods and the laboratory analytical methods. Reporting limits for VOCs, metals, SVOCs, and pesticides/PCBs in soils are provided in Tables 6-1, 6-2, 6-3, and 6-4, respectively. Reporting limits for VOCs, metals,

SVOCs, and pesticides/PCBs in water are provided in Tables 6-5, 6-6, 6-7, and 6-8, respectively.

7.1.4.1.4 Step 4: Define the Boundaries of the Study

This step defines the time periods and spatial area to which decisions will apply and determines when and where data should be collected. Information describing the spatial boundaries of the Site, and the time frame over which the decision will apply, is provided in Section 2.0 and Section 3.0. To summarize, this investigation will determine the extent of contamination in soils at the Site. Decisions regarding remedial action approaches will be based on historical information and information gathered during this field investigation. Decisions will be applied to contaminated soils over the time frame and spatial area deemed necessary based on results from the ~~human health~~ risk assessment and comparison to action levels or ~~preliminary remediation goals (~~PRGs~~)~~, as appropriate. Section 6.0 describes sampling locations and the schedule of sampling events is discussed in Section 7.0.

7.1.4.1.5 Step 5: Develop a Decision Rule

The purpose of this step is to define the parameter of interest, specify the action level, and integrate previous DQO outputs into a single statement that describes a logical basis for choosing among alternative actions.

As described in previous sections, the purpose of the field investigation is to provide data for use in the RI/FS. The investigation is intended to fill gaps in the available data that will be used to determine nature and extent of soils contamination, assess potential threats to human health and the environment, and identify and evaluate remedial alternatives. Parameters of interest are contaminant concentrations (including minimum, maximum, mean, and 95UCL) in soils, ~~and~~ soil gas, indoor air, and ambient air resulting from hazardous substance releases at the Site.

The following decisions will be based on site data:

If additional source areas are identified at the Site, then the available site data will be evaluated to determine whether further sampling is necessary to delineate the extent of these source areas. If no additional source areas are identified, then site characterization of soils will be considered complete.

If results of the risk assessment indicate the potential for unacceptable human health risks or hazards associated with exposure to site soils, then further action will be deemed necessary at the site with regards to soils. If human health risks and hazards are estimated to be acceptable, then no further action will be necessary for site soils.

If further action is needed for site soils, then action levels will be established for chemicals of concern. If no further action is needed for site soils, then action levels will not be established for site soils.

If further action is needed for site soils, then an approach for site remediation will be selected based on available site data, results of the risk assessment, and information

presented in the FS report. If no further action is needed for site soils, then the remedial investigation will document this conclusion and an FS will not be required for the site. ~~Results of the risk assessment will determine whether further action is needed at the Site. Action levels for chemicals at the Site will be established following completion of the human health risk assessment. An approach for site remediation will be selected based on historical information, information produced during this field investigation, results of the human health risk assessment, and information presented in the FS report.~~

7.1.4.1.6 Step 6: Specify Tolerable Limits on Decision Errors

Tolerable limits on decision errors, which are used to establish performance goals for the data collection design, are specified in this step.

Section 6.0 discusses the sampling design basis and rationale and the quantity of samples to be collected. The quality of data necessary for the purposes of the investigation is described in the sections below.

7.1.4.1.7 Step 7: Optimize the Design for Obtaining Data

The Work Plan was optimized to focus on collection of data based on data uses, availability of historical data, data gaps identified in the DSR, and data gaps identified through evaluation of the SCEM. The data collection program, including sampling rationale, is presented in the FSP in Section 6.0.

7.1.4.2 DQO Data Categories

Field and analytical data can be used for a vast number of purposes ranging from qualitative field screening data to quantifiable enforcement level data. USEPA has developed two descriptive data categories to assist in the interpretation of data: 1) screening data with definitive confirmation, and 2) definitive data. Screening data are generated by rapid, less precise analytical or sample preparation methods and provide analyte identification and quantification, however, quantification may be somewhat approximate. Definitive data, on the other hand, are generated using rigorous analytical methods, generally USEPA-approved reference methods, with confirmation of analyte identity and concentration. Definitive data generate tangible raw data and require additional QA/QC elements, including, but not limited to, QC blanks, matrix spike samples, and performance evaluation (PE) samples.

For this program, all soil and soil gas samples submitted for laboratory analyses will be analyzed according to definitive data requirements (USEPA 2000a). All samples will be analyzed using standard USEPA approved methods at an off-site analytical laboratory. Laboratory data deliverable requirements are listed in Table 7-2.

7.1.4.3 Data Measurement Objectives

Every reasonable attempt will be made to obtain a complete set of usable field measurements and analytical data. If a measurement cannot be obtained, or is unusable for any reason, the effect of the missing or invalid data will be evaluated. In order to determine data usability, data parameters consisting of precision, accuracy,

representativeness, completeness, comparability, and sensitivity (PARCCS) will be evaluated as described below.

7.1.4.3.1 PARCCS Parameters

PARCCS parameters are indicators of data quality. PARCCS goals are established for the site characterization to aid in assessing data quality. The following paragraphs define these PARCCS parameters in conjunction with this project.

Precision. The precision of a measurement is an expression of mutual agreement among individual measurements of the same property taken under prescribed similar conditions. Precision is quantitative and most often expressed in terms of relative percent difference (RPD).

Precision of the laboratory analysis will be assessed by comparing original and duplicate results. The RPD will be calculated for each pair of applicable duplicate analyses using the following equation:

$$\text{Relative Percent Difference} = (|S - D| \ / \ (S + D) \ / \ 2) \times 100$$

Where:

S = First sample value (original value)

D = Second sample value (duplicate value)

Precision of reported results is a function of inherent field-related variability plus laboratory analytical variability depending on the type of QC samples. Various measures of precision exist depending upon "prescribed similar conditions." Field duplicate samples will be collected to provide a measure of the contribution to overall variability of field-related sources.

Contribution of laboratory-related sources to overall variability is measured through various laboratory QC samples. Inorganic data will be evaluated for precision using field and laboratory duplicates and organic data will be evaluated for precision using field duplicates and matrix spike/matrix spike duplicates (MS/MSD). Other data (i.e., soil characteristics data) will be evaluated for precision using (in order of priority) field duplicates, laboratory duplicates, laboratory control sample/laboratory control sample duplicates (LCS/LCSD), or MS/MSDs, whichever is appropriate and analyzed.

The acceptable RPD limits for field duplicate measurements are plus or minus (±) 35% for soil and ± 20 % for ground water. The acceptable RPDs for inorganic laboratory duplicates are ± 20% for original and duplicate water or soil sample values greater than or equal to 5 times the reporting limit. An absolute difference of ± the reporting limit will be used if either the sample or duplicate value is less than 5 times the reporting limit. Acceptable MS/MSD RPD limits for VOC soil analyses are provided in Table 7-3. Acceptable RPD limits for metals, SVOCs, and pesticides/PCB soil

analyses are provided in Tables 7-4, 7-5, and 7-6, respectively. Acceptable MS/MSD RPD limits for VOC water analyses are provided in Table 7-7. Acceptable RPD limits for metals, SVOCs, and pesticides/PCB soil analyses are provided in Tables 7-8, 7-9, and 7-10, respectively.

Accuracy. Accuracy is the degree of agreement of a measurement with an accepted reference or true value and is a measure of the bias in a system. Accuracy is quantitative and usually expressed as the percent recovery (%R) of a sample result. The %R is calculated as follows:

Percent Recovery = $(SSR - SR / SA) \times 100$

Where:

SSR = Spiked Sample Result

SR = Sample Result

SA = Spike Added

Ideally, it is desirable for the reported concentration to equal the actual concentration present in the sample. Inorganic data will be evaluated for accuracy using MS/MSDs and LCS/LCSDs and organic data will be evaluated for accuracy using MS/MSDs and surrogates. Other data will be evaluated for accuracy using (in order of priority) LCS/LCSDs or MS/MSDs and surrogates, whichever is appropriate and analyzed. Acceptable LCS/LCSD MS/MSD %R limits are provided in Tables 7-3 through 7-10.

Representativeness. Representativeness expresses the degree to which sample data accurately and precisely represent the following:

- The characteristic being measured
- Parameter variations at a sampling point
- An environmental condition

Representativeness is a qualitative and quantitative parameter that is most concerned with the proper design of the sample plan and the absence of cross-contamination of samples. Acceptable representativeness will be achieved through (1) careful, informed selection of sampling sites, (2) selection of testing parameters and methods that adequately define and characterize the extent of possible contamination and meet the required parameter reporting limits, (3) proper gathering and handling of samples to avoid interferences and prevent contamination and loss, and (4) collection of a sufficient number of samples to allow characterization. Representativeness is a consideration that will be employed during all sample location and collection efforts. The representativeness will be assessed qualitatively by reviewing the procedures and design of the sampling event and quantitatively by reviewing the blank samples. If an analyte is detected in a laboratory or field blank, any associated positive result less

than 5 times (10 times for common laboratory contaminants) the concentration detected in the sample may be considered undetected.

Completeness. Completeness is a measure of the amount of usable data obtained from a measurement system compared to the amount that was expected to be obtained. Usability will be determined by evaluation of the PARCC parameters excluding completeness. Those data that are validated and need no qualification or are qualified as estimated or undetected are considered usable. Rejected data are not considered usable. Completeness will be calculated following data evaluation. For the RI, a completeness goal of 90% is projected. If this goal is not met, additional sampling may be necessary to adequately achieve project objectives. Completeness is calculated using the following equation:

$$\%Completeness = (DO/DP)x100$$

Where:

DO = Data Obtained and usable

DP = Data Planned to be obtained

Comparability. Comparability is a qualitative parameter. Consistency in the acquisition, handling, and analysis of samples is necessary for comparing results. Data developed under this investigation will be collected and analyzed using standard USEPA or nationally recognized analytical methods and QC procedures to ensure comparability of results with other analyses performed in a similar manner. Data resulting from this sampling effort may be compared to other data sets.

Sensitivity. Sensitivity is the achievement of method detection limits and depends on instrument sensitivity and matrix effects. Therefore, it is important to monitor the sensitivity of data-gathering instruments to ensure that data quality is met through constant instrument performance. Instrument sensitivity will be monitored through the analysis of blanks. Reporting limits are found in Tables 6-1 through 6-8. Methods were chosen to meet the necessary reporting limits.

7.1.4.3.2 Field Measurements

Field measurements collected during this investigation will consist of dust screening and VOC monitoring for health and safety purposes. These are described in the HASP in Appendix A~~B~~.

7.1.4.3.3 Laboratory Analysis

Laboratory analyses, including methods, reporting limits, and holding times, are described in detail in Section 6.3. Del Mar Analytical, located in Irvine, California, will provide analytical services during the field investigation. VOCs in soil and IDW samples will be analyzed by EPA Method 8260. VOCs in soil gas and ~~vapor~~ flux chamber samples will be analyzed using EPA Method TO-14. With the exception of arsenic and mercury, metals will be analyzed using EPA Method 6010B. Arsenic will

be analyzed using EPA Method 6020 and mercury will be analyzed using EPA Method 7471A. SVOCs will be analyzed using EPA Method 8270C. Pesticides will be analyzed using EPA Method 8081A and EPA Method 8082 will be used to analyze PCBs.

Specified soil samples will also be analyzed for physical characteristics, consisting of redox potential, clay content, organic carbon content, cation exchange capacity, moisture content, and ~~permeability~~hydraulic conductivity. The analytical methods for these are listed below:

- Redox potential: Standard Method 2580B
- Clay content: ASTM Method D-422~~1~~ or D4464~~and D-422~~
- Organic carbon content: SW-846 Method 9060 Mod
- Cation exchange capacity: SW-846 Method 9081~~0~~
- Moisture content (percent dry weight): ~~Agronomy No. 9, Part 1, 21-2~~ASTM D2216
- ~~Permeability~~Hydraulic Conductivity: ASTM Method D5084

7.2 Measurement/Data Acquisition

This section covers requirements and procedures for sample process design, sampling methods requirements, sample handling and custody, analytical methods, quality control, equipment maintenance, instrument calibration, supply acceptance, nondirect measurements, and data management. The field procedures are designed so that the following occurs:

- Samples collected are consistent with project objectives
- Samples are collected in such a manner that data represent actual site conditions.

7.2.1 Sample Process Design

The general objectives of the field investigation are to characterize the nature and extent of contamination in Site soils, to assess the threat these contaminants pose to human health and the environment, and to evaluate remedial action alternatives to eliminate, reduce, or control risks to human health and the environment at the Site. Groundwater at the Site is being addressed under separate documentation. The number, types, locations, and analyses of samples are discussed in Section ~~7~~6.0. Table 6-10 provides information on number, type, and analyses of samples and Figure 6-1 provides information on number, type, and location of samples.

7.2.2 Sampling Methods Requirements

Sampling equipment, containers, and overall field management are described below.

7.2.2.1 Sampling Equipment and Preparation

The necessary equipment required for the field program for sampling, health and safety, documentation, and decontamination is discussed in Section 6 and in the HASP (Appendix A~~B~~).

Field preparatory activities include review of SOPs, procurement of field equipment, laboratory scheduling and coordination, confirmation of site access, and a field planning meeting that includes field personnel and QA staff. Mobilization is described in Section 6.

7.2.2.2 Sample Containers

Sample containers and preservatives required for the soil samples are presented in Table 6-9. The samples will be preserved in the field, if necessary. Containers and preservatives will be supplied by the laboratory.

7.2.2.3 Sample Collection, Handling, and Shipment

Samples collected in this field investigation consist of soil, IDW, and QC samples. Sample collection procedures are outlined in the FSP and attached SOPs. CDM SOPs for sample collection, handling, and shipment include the following (other SOPs may be used for other activities):

- Soil Boring and Rock Coring
- Subsurface Soil Sampling
- Duplicate and Split Sample Preparation
- Chain-of-Custody Procedures
- Field Logbook
- Field Sampling Equipment Decontamination
- Air Sampling for Summa Canisters

Data will be collected and managed and samples will be collected, handled, and shipped in accordance with these SOPs. Equipment calibration and operating procedures for the following field equipment are included in Appendix D~~E~~:

- Photoionization Detector
- Flame Ionization Detector
- Combustible Gas Indicator
- Particulate Monitor

7.2.3 Sample Handling and Custody Requirements

Custody and documentation for field and laboratory work are described below, followed by a discussion of corrections to documentation.

7.2.3.1 Field Sample Custody and Documentation

The information contained on the sample label and the chain-of-custody record will match. The purpose and description of both the sample label and the chain-of-custody record are discussed in the following sections. Detailed descriptions of sample labeling and identification, Chain-of-Custody requirements, sample packaging and shipping, and field logbooks and records are provided in Section 6.4.

7.2.3.2 Laboratory Custody Procedures and Documentation

Laboratory custody procedures are provided in the designated laboratory's QA Management Plan. Upon receipt at a laboratory, each sample shipment will be inspected to assess the condition of the shipping cooler and the individual samples. This inspection will include measuring the temperature of the cooler to document that the temperature of the samples is within the acceptable criteria (4 ± 2 °C) and verifying sample integrity. The pH of the samples will be measured, if preservation was required. The enclosed Chain-of-Custody records will be cross-referenced with all of the samples in the shipment. These records will then be signed by the laboratory sample custodian and copies provided to CDM will be placed in the project files. The sample custodian may continue the Chain-of-Custody record process by assigning a unique laboratory number to each sample on receipt. This number, if assigned, will identify the sample through all further handling. It is the laboratory's responsibility to maintain internal logbooks and records throughout sample preparation, analysis, data reporting, and disposal.

7.2.3.3 Corrections to and Deviations from Documentation

Logbook modification requirements are described in CDM's Field Logbook SOP. For the logbooks, a single strikeout initialed and dated is required for documentation changes. The correct information should be entered in close proximity to the erroneous entry. All deviations from the guiding documents will be recorded in the field logbook(s). Any major deviations will be documented. Any modifications to Chain-of-Custody forms will be made on all copies.

7.2.4 Analytical Methods Requirements

The laboratory QA program and analytical methods are addressed below.

7.2.4.1 Laboratory Quality Assurance Program

The selected laboratory will be certified through the State of California DHS' ELAP and will have a documented QA Program that complies with EPA guidance document QAMS-005/80. The laboratory selected will be required to allow access by USEPA's authorized representatives to the laboratory and personnel utilized by the laboratory for analyses.

7.2.4.2 Methods

Laboratory analyses, including methods, reporting limits, and holding times, are described in detail in Section 6.3. Del Mar Analytical, located in Irvine, California, will provide analytical services during the field investigation.

7.2.5 Quality Control Requirements

Field, laboratory, and internal office QC are discussed below.

7.2.5.1 Field Quality Control Samples

Field QC samples are collected and analyzed to evaluate the quality of the field sampling process. The following types of field QC samples will be collected in the field and shipped the selected laboratory:

- Field duplicates
- Equipment blanks
- Trip blanks
- Field blanks

These types of QC samples are discussed in detail in Section 6.3.2.

7.2.5.2 Laboratory Quality Control Samples

The designated analytical laboratory will follow all method-specific quality control measures, such as external and internal standard calibration procedures, instrument performance verifications, etc., which are suggested within any referenced method. In addition, the laboratories performing the analyses will be required to submit documentation that all of the QC criteria were satisfied for all analyses. The following sections provide a general description of general QC procedures that are typically required in most analyses. In all cases, however, the specific QC requirements referenced in each analytical method must be followed. Laboratory data deliverable requirements are listed in Table 7-2.

7.2.5.2.1 Purity of Standards, Solvents, and Reagents

All reagents will be of reagent-grade (equivalent) or higher quality whenever obtainable. Organic solvents are to be pesticide-grade or equivalent. Where applicable, reference standard solutions will be traceable to EPA or the National Institutes of Standards and Technology (NIST).~~National Bureau of Standards (NBS).~~ Each new lot of reagent-grade chemicals will be tested for quality of performance, and laboratory records will be kept to document the results of lot tests. Alternatively, reagent blanks will be prepared from each lot. If method blank contamination is found, the reagent blank will be analyzed to evaluate the source of contamination.

7.2.5.2.2 *Analytical QC Samples*

Laboratory "Reagent-Grade" Water

Laboratory grade water is generally prepared by a special deionized water system augmented by individual filter cartridges and polishers located at each outlet point. The polishers include special particulate filters, organic resins and inorganic resins. Distilled/deionized water may also be used. Laboratory grade water will be tested so as to demonstrate that it is free of contaminants at levels below the detection limits for the applicable analytical procedures.

Method Blank

A laboratory grade water blank is analyzed along with all aqueous and nonaqueous samples submitted for analyses. The method blank is processed through all procedures, materials, reagents and labware used for sample preparation and analysis. The frequency for method blank preparation and analysis is a minimum of 1 per 20 field samples or per analytical batch, whichever is most frequent. An analytical batch is defined as a maximum of 20 samples from one project that are analyzed together with the same method sequence and the same lots of reagents and with the manipulations common to each sample within the same time period or in continuous sequential time periods. Samples in each batch are to be of similar composition or matrix. Specific requirements are outlined in the applicable methods.

Calibration Standards (Initial Calibration)

The calibration standard is prepared in the laboratory by dissolving a known amount of pure (nominally 100%) analyte in an appropriate matrix. The final concentration calculated from the known quantity is the true value of the standard. All calibration standards must be traceable to certified reference materials or certified check standards. The results obtained from these standards are used to generate a standard curve which can be used to quantify the compound in the environmental sample. Five calibration standards and a blank are generally used when generating a calibration curve for organic analyses. However, three calibration standards and a blank are required when analyzing soil gas samples using EPA Method TO-14. For organic analyses using GC/MS methodology, a relative standard deviation (RSD) of the calibration factor (defined in method) of less than 30 percent for all calibration check compounds (CCCs) and less than 15 percent for all other target analytes is required before initial calibration is accepted. Method TO-14 requires an RSD of the response factor of less than 30 percent for all target analytes before initial calibration is accepted.

Check Standard (Continuing/Daily Calibration)

The check standard is prepared in the same manner as a calibration standard. The final concentration calculated from the known quantity is the true value of the standard. The check standard is not carried through the same process used for the environmental samples as it does not undergo the sample preparation procedure. The check standard result is used to monitor the continuing validity of an existing calibration curve or concentration calibration standard file. Continuing calibration

standards must satisfy method-specific QC requirements prior to initiation of sample analysis.

Quality Control Check Samples

The QC check sample is a reference standard acquired from an USEPA-approved source ~~(e.g., USEPA Standards Repository, NBS)~~ that is analyzed "as is" or diluted according to instructions provided with the reference material, to provide independent verification of instrument calibration. Quality control check samples for most types of analyses are available from ~~USEPA Cincinnati free of charge,~~private vendors, and will be used at a specified frequency as a means of evaluating the analysis techniques.

QC check samples will be analyzed at the frequency specified in the referenced protocols or at a minimum of each time a new calibration curve is established. Corrective action in the form of re-analysis of all associated samples is required if a QC check sample is outside control limits. The control limits are typically a recovery of ±10 percent of the true value except when the established limits provided by the supplier of the standard reference material are different. Applicable control limits must be provided with the data.

Control Samples

The Laboratory Control Sample (LCS) is a type of QC check sample (i.e., reference standard) that is carried along with the samples through the entire sample preparation/analysis sequence. Solid matrix control samples are to be digested/extracted and analyzed when applicable and as available. The frequency for the inclusion of control samples is 1 per 20 or as stated in the referenced protocols.

Spikes

A sample matrix spike is prepared by adding a known amount of the pure analyte to the environmental sample before extraction/digestion. The added analyte is the same as that being assayed for in the environmental sample. An analytical spike is prepared by adding a known amount of analyte(s) to a known amount of sample digestate or extract.

Background and interferences having an effect on the actual sample analyte will have a similar effect on the spike. The calculated percent recovery of the matrix spike is considered to be a measure of the relative accuracy of the total analytical method, i.e., sample preparation and analysis. The calculated percent recovery of the analytical spike is considered to be a measure of the relative accuracy of the sample analysis procedure only. Matrix spikes and surrogate spikes also provide a measure of the effect of the sample matrix has on the ability of the methodology to detect specific analytes. When there is no change in volume due to the spike, it is calculated as follows:

~~%R = 100(A-X)/T~~

~~Where:~~

~~%R = Percent Recovery~~
~~A = Measured value of analyte after spike is added~~
~~X = Measured value of analyte concentration in the sample before the spike is added~~
~~T = Value of spike~~

$$\%R = \frac{\dfrac{(C_{spike\ sample})(V_{spike\ sample\ digestate})}{(W_{soil\ spiked})\left(\frac{percent\ solids}{100}\right)} - \dfrac{(C_{native\ sample})(V_{native\ sample\ digestate})}{(W'_{soil\ spiked})\left(\frac{percent\ solids}{100}\right)}}{\dfrac{(C_{spike\ solution})(V_{spike\ added})}{(W_{soil\ spiked})\left(\frac{percent\ solids}{100}\right)}}(100)$$

where:

$W_{soil\ spiked}$ = weight of spiked sample (kg)

$W'_{soil\ spiked}$ = weight of native sample (kg)

$V_{spike\ sample\ digestate}$ / $V_{native\ sample\ digestate}$ = volumes of digestate (L)

$C_{spike\ sample}$ = concentration of spiked sample at instrument (mg/L)

$C_{native\ sample}$ = concentration of native sample at instrument (mg/L)

$C_{spike\ solution}$ = concentration of spiking solution (mg/L)

$V_{spike\ added}$ = volume of spike solution added (L)

1) The percent solids terms in the denominators are associated with the same sample and all cancel.

Usually $V_{spike\ sample\ digestate} = V_{native\ sample\ digestate}$

Tolerance limits for acceptable percent recoveries are established in the referenced methods and are summarized in Tables 7-3 through 7-10. Project-specific QC acceptance limits may be established on a parameter-specific basis for each analysis method if after sufficient data have been compiled it is apparent that different limits than those specified in the referenced methodology should be applied.

Matrix spikes will be analyzed at a minimum frequency of 1 per 20 samples of similar matrix or analytical batch.

Matrix Spike Duplicate

Matrix spike duplicate samples are required at a specified frequency of 1 per 20 samples. A matrix spike duplicate is prepared from a second aliquot of the sample that was analyzed as the matrix spike. The RPD value between the matrix spike and the matrix spike duplicate for each spike analyte must be reported. The RPD control limits are defined in Tables 7-3 through 7-10.

Surrogate Spikes

For organic analyses, every sample is spiked before extraction/analysis with a surrogate mixture of compounds which are considered to behave similarly during analysis, but are not identical to analytes potentially found in naturally-occurring sample matrices. Specific requirements are outlined in the analytical method. Acceptance limits are defined in Table 7-3 and 7-7.

Laboratory Duplicate Sample

Aliquots (e.g., subsamples) are made in the laboratory of the same sample, and each aliquot is treated exactly the same throughout the analytical method. The RPD between the values of the duplicates, as calculated below, is taken as a measure of the precision (reproducibility) of the analytical method:

$$RPD = (D_1 - D_2)/[(D_1 + D_2)/2] \times 100$$

Where:

RPD = Relative Percent Difference
D_1 = First Sample Value
D_2 = Second sample value (duplicate)

The duplicate is a measure of the precision of the laboratory sampling (i.e., aliquoting) and analysis procedure and of the homogeneity of the sample matrix as provided to the laboratory. For most organic analyses, the matrix spike duplicate can be used to fulfill the requirement for a laboratory duplicate.

Mass Spectrometer Tuning Solution

Proper operating configuration of the instrument and data system is performed using a mass spectrometer tuning solution. Mass calibration and resolution, and instrument stability are demonstrated using the tuning solution prior to initial calibration. Mass ion abundances must meet the criteria specified in the appropriate methods.

7.2.5.3 Internal Quality Control Checks

Internal QC checks will be conducted throughout the project to evaluate the performance of the project team during data generation. All project deliverables will receive technical and QA reviews prior to being issued. Completed review forms will be maintained in the project files. Corrective action of any noted deficiencies will be the responsibility of the Project Manager, with assistance from the QA staff, if necessary.

7.2.6 Equipment Maintenance Procedures

Instrument maintenance logbooks will be maintained in the analytical laboratories at all times. The logbooks in general contain a schedule of maintenance, as well as a complete history of past maintenance, both routine and non-routine.

Preventive maintenance shall be performed according to the procedures delineated in the manufacturer's instrument manuals, including lubrication, source cleaning, detector cleaning, and the frequency of such maintenance. Chromatographic carrier gas purification traps, injector liners, and injector septa shall be cleaned or replaced on a regular basis. Precision and accuracy data shall be examined for trends and excursions beyond control limits to determine evidence of instrument malfunction. Maintenance shall be performed when an instrument begins to degrade as evidenced by the degradation of peak resolution, shift in calibration curves, decrease in sensitivity, or failure to meet one or another of the quality control criteria.

7.2.7 Instrument Calibration Procedures and Frequency

7.2.7.1 Field Equipment

Field instruments and equipment used to gather, generate, or measure data will not be used during this investigation for data collection activities except for dust screening and VOC monitoring for health and safety purposes. The field instruments will be calibrated following manufacturer's instructions and recommended frequencies. No secondary sources will be used to verify calibrations.

7.2.7.2 Laboratory Equipment

Calibration of laboratory equipment will be based on written procedures approved by laboratory management. Instruments and equipment will be initially calibrated and continuously calibrated at required intervals as specified by either the manufacturer or more updated requirements (e.g., methodology requirements). Calibration standards used as reference standards will be traceable to the EPA, the National Institute of Standards and Technology, or another nationally-recognized reference standard source.

Records of initial calibration, continuing calibration and verification, repair, and replacement will be filed and maintained by each laboratory. Calibration records will be filed and maintained at each laboratory location where the work is performed and may be required to be included in data reporting packages.

7.2.8 Acceptance Requirements for Supplies

Critical supplies and consumables that may directly or indirectly affect the quality of the field data generated during investigation activities and their acceptance criteria are discussed in Section 6.2.6.

7.3 Assessment/Oversight

Field performance audits will be the responsibility of the QA manager and will be conducted as presented in the following paragraph with additional audits performed if problems are discovered. Performance audits are quantitative checks on different aspects of internal support or project work, and are most appropriate for environmental sampling and analysis activities.

The QA manager will select personnel to perform the CDM field audit(s). A field performance audit will be performed on an unscheduled basis and will consist of a visit to the field to verify that all QA/QC procedures set forth in this document are being followed. The auditor will compare the sampling, collection and documentation procedures as stated in project documents to what is actually being performed in the field. Discrepancies will be noted and the appropriate field personnel will be notified so that corrections can be made immediately. A formal field performance audit report will be produced and delivered to the project manager and field personnel. A copy will also be submitted to the files. The project manager is responsible for seeing that all recommended corrections occur.

CDM will order a PE sample from an appropriate vendor. The PE sample will be entered into the sample stream as a double blind standard and submitted to the laboratory.

7.3.1 Assessments and Response Actions

An important part of a quality assurance program is a well defined, effective policy for correcting problems. The QA program operates to prevent problems, but it also serves to identify and correct those that exist. Usually these problems require either on the spot, immediate corrective action or long term corrective action.

The corrective action system used during the field activities is designed to quickly identify problems, and solve them efficiently. The QA manager is responsible for the direction of this system and receives full support from management for its implementation. The essential steps are as follows:

- Identify and define the problem
- Assign responsibility for investigating the problem
- Determine a corrective action to eliminate the problem
- Assign and accept responsibility for implementing the corrective action
- Implement the corrective action
- Verify that the corrective action has eliminated the problem

- Document the problem identified, the corrective action taken and its effectiveness in eliminating the problem

Corrective action procedures which will be used to resolve deficiencies found during routine activities or QA audits of field, laboratory or office activities will be as described in the following section.

Corrective Action Resulting from Routine Activities

Deficiencies found during normal routine activities will be resolved by implementing corrective action as part of normal operating procedures by staff. Corrective actions of this type will be noted in the field or laboratory log book; no other formal documentation is necessary unless further corrective action is required. If normal procedures do not solve the problem, the staff will document the problem in a formal memo addressed to the QA manager and copied to the project file.

Corrective Action Resulting from QA Audits

Deficiencies encountered during a QA audit will be corrected as soon as possible. The QA manager, with the project manager, is responsible for completion of appropriate corrective action. The procedures used to expedite corrective action will be:

- Auditor verbally notifies the QA manager and field personnel immediately during audits of deficiencies found
- QA manager institutes corrective action as soon as possible
- QA manager distributes the audit report promptly

7.3.2 Reports to Management

All project staff will be responsible for maintaining constant communication with the Project Manager and for identifying any issues that may affect the usability of the data and the decisions that are based on the data. Project management will be kept informed through daily verbal and/or written communication. The QA Manager will monitor laboratory performance and compliance with quality assurance requirements. The laboratory will be subject to an ~~onsite~~on-site audit if necessary. Results of such audits will be documented and placed in the project files.

7.4 Data Review, Validation, and Verification Requirements

The following sections discuss the overall verification and validation process that will be implemented for data generated during the field investigation. The verification process involves the evaluation of the data with respect to SOPs and project requirements, whereas the data validation process involves the evaluation of the technical usability of the data. The results of the data validation will determine the level of uncertainty associated with the analytical results to be used in the decision-making process. Reduction of laboratory measurements and laboratory

reporting of analytical parameters will be in accordance with the procedures specified for each analytical method (i.e., perform laboratory calculations in accordance with the method-specific procedure).

USEPA Data Validation Functional Guidelines (1994a and 1994b) will be used in conjunction with the above sources to establish analytical data quality. All method deviations and reporting or calculation variances will be fully documented by the project lab. Technical personnel from CDM or a subcontractor qualified in data validation procedures will be responsible for data verification and validation.

7.4.1 Validation and Verification Methods

Data validation will be performed on results for 5 samples from each media, or 10% of the sample results for each media, whichever is greater. Data ~~Ten percent of the data~~ will be validated in accordance with laboratory-specific limits, methodology, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA 1994a), and/or USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (EPA 1994b), whichever are applicable. Data sets with the largest number of analyses will be selected for validation, as this will provide the best coverage of methods. The validation process will be expanded to additional data sets if problems are noted with the data.

Data quality and utility depends on many factors, including sampling methods, sample preparation, analytical methods, quality control, and documentation. Subcontractors, such as laboratories, must be advised of all applicable documentation and procedural requirements. Once the data are assembled, satisfaction of all validation criteria will be documented as listed below. Chemical data must meet criteria of: (1) quantitative statistical significance; (2) custody and document control; and (3) sample representativeness. Physical data include: (1) sampling location, time, and personnel; (2) documentation; and (3) methodologies. Data validation and assessment of analytical data will be performed by technical personnel from CDM, under the supervision of the QA manager.

Documentation may be either direct (e.g., listing of dates, names, methodologies, etc.) or by reference to existing documents. Any reference documents will be specifically identified. The precise and retrievable location of nonstandard documents (e.g., in-house procedures manuals, chain-of-custody forms, laboratory reports) will be stated.

To determine the quantitative statistical significance of chemical data, the following items will be documented as appropriate (e.g., with laboratory records, laboratory standard operating procedures by reference to an approved SOP manual, or with equipment manufacturer/supplier records):

- Laboratory/field instrumentation, including calibration data, standard methods and references.

- Proper sample bottle preparation.
- Laboratory analysis methods, including reference methods.
- Laboratory analysis detection limits.
- Verification of standards using EPA or ~~NBS~~ NIST reference materials.
- Analysis of laboratory blanks, spikes, duplicates, etc., as specified herein.
- QC limits shall be consistent with the limits specified in Tables 7-3 through 7-10.
- Analysis of field duplicates, blanks, and other field QC sample types as specified herein.

To evaluate the custody and document control for samples and results, the following items will be documented:

- Field custody noted in field logbook or transfer-of-custody documentation for sample collection, handling, and shipment.
- Laboratory custody documented by transfer-of-custody documentation from either field personnel or shipper.
- Laboratory custody documented through designated laboratory sample custodian with secured sample storage area.
- Traceability of sample designation number(s) through entire monitoring system.
- Maintenance and storage of all field notebooks, laboratory data, and all custody documents.
- Completion of all forms and logbooks (indelible ink without alterations except as crossed-out [not erased] and initialed).
- Identity of sample collector.
- Dates of sample collection, shipping, and laboratory analysis.

In some cases, the handling of a sample while in the custody of one individual may not be properly documented. In addition, written documentation of transfers of custody between two individuals may be lost. In such cases, it may be necessary to rely on the custodian's verbal testimony that the sample remained secure or that a transfer was made to another individual. If there is any chance that the custodian's testimony will be seen as unreliable, the data produced as a result of that sample may be rejected.

The existence of appropriate and proper documentation associated with a sample's analysis may be judged as acceptable in a court of law; however, the possibility exists that individual testimony as to the proper application of all procedures may be required as well.

To determine sample representativeness, the following items must be checked:

- Compatibility between field and laboratory measurements or suitable explanation of any discrepancy.
- Sample preservation technique and holding time.
- Sample storage within suitable temperature, light, and moisture conditions.
- Use of proper sample containers (e.g., inert for the parameter(s) of interest).
- Use of proper sample collection equipment.
- Use of proper decontamination procedures.
- Use of proper laboratory preparation techniques (e.g., aliquoting, digestion, extraction).
- Evaluation of proper sample site selection criteria to provide representativeness.

To evaluate the physical data that support the analytical data, the following items will be documented.

- Sampling date and time.
- Sampling team; observation taker and recorder, team leader.
- Sampling location and physical description (e.g., private or public, asphalt, concrete or soil, industrial, commercial or residential, etc.).
- Sample depth increment for soil and soil gas samples.
- Sample collection techniques.
- Field preparation techniques (e.g., compositing, etc.).
- Visual classification of sample using the USCS.

7.4.2 Reconciliation with User Requirements

Once the data have been verified and validated, the data will be evaluated to determine whether the DQOs have been satisfied. The data usability process will determine whether the data meet the assumptions under which the DQOs and the data collection design were developed. If the data do not support the underlying

assumptions, then corrective action must be taken. Corrective action may include collecting additional data that fill in data gaps so that future decisions can be made.

Data generated during the field investigation will be used as input to select and design an appropriate remedy for the Omega Chemical Superfund Site. Prior to any data interpretation or risk screening, the data will be evaluated with respect to QA/QC results. Specifically, the data will be examined with regard to data qualifiers assigned during the data verification and validation process. Data qualifiers will be evaluated to determine their effect on data quality. If data verification or validation indicates that a particular result is unusable, the data will be rejected and not used during the data interpretation or risk screening process. If data verification or validation indicates that a result is estimated, the result may be used, but with caution, to assist in the data interpretation or risk screening process.

The usable data will be used in the remedial investigation, risk assessment, and feasibility study. If the data interpretation process does not yield sufficient information to select and design an appropriate remedy for the site, then additional data collection activities will be conducted.

7.4.3 Data Reporting and Report Archival

Upon successful completion of the data validation process and assessment of usability of the data, new data generated for the project will be entered into the project database. Data will be available for analysis by the project manager and other authorized personnel.

Copies of all analytical data and/or final reports are retained in the laboratory files and, at the discretion of the laboratory manager, data will be stored on computer disks for a minimum of six months. Subsequent to completion of the project, the files will be transferred to data archives. Data may be retrieved from archives, upon request. CDM will be responsible for record retention at the completion of the investigation.

All data generated during the course of this program will be provided to USEPA in both paper and electronic formats for incorporation into the existing USEPA database.

7.5 Data Management Plan

The data management requirements as listed herein provide procedures necessary to properly document, track and manage, and store all field and laboratory data generated during the course of the field investigation. The database developed for this investigation will be consistent with the Phase I investigation database.

7.5.1 Analytical Database

The primary objective of developing an analytical database is to ensure that a detailed record of data collection, analysis, verification and reporting is maintained. In particular, environmental sampling data need to be stored within a medium that

allows for accurate and appropriate manipulation for the purposes of handling, evaluation, accessing, and reporting. Management of analytical data will be the responsibility of CDM. The project database will be developed and maintained using Microsoft Access®, or equivalent, database management system.

File format compatibility with existing USEPA data reporting requirements will be maintained to provide efficient transfer of information. Access® provides a flexible database management environment and allows importing from and exporting to a variety of other software packages. Electronic analytical data will be provided by the laboratory so that the data can easily be imported into the project database.

Data appended to the project database will be subjected to a rigorous QC check. The laboratory will be required to submit analytical results as hard copies as well as in electronic format. Prior to transferring to the database, the electronic data will be printed out and a 100 percent check will be performed against the hard copies. If any errors are noted, the laboratory will be contacted and the discrepancy resolved. If required, any corrections will be made to the electronic file before it is appended to the project database.

Backups of the project database will be performed whenever it is changed to minimize the possible loss of data in the event of system failure/corruption. Routine backups will be saved as an archive file.

7.5.1.1 Data Inclusions

The types of data to be included in the development and management of the comprehensive database will include soil and soil gas analytical data.

7.5.1.2 Database Structure

Access® uses relational data structures (called tables) to store, retrieve, and relate records. These tables are related through "key fields" containing data common to the associated tables. During database development, it is anticipated that the following data tables will be generated:

- Stations: Sampling point location description (this will be designated as the key field)
- Quality: Lab results, one parameter per record
- Parameter: Coded reference table of parameter names
- Laboratory: Coded reference table of laboratory information (name, phone number, etc. of laboratory)

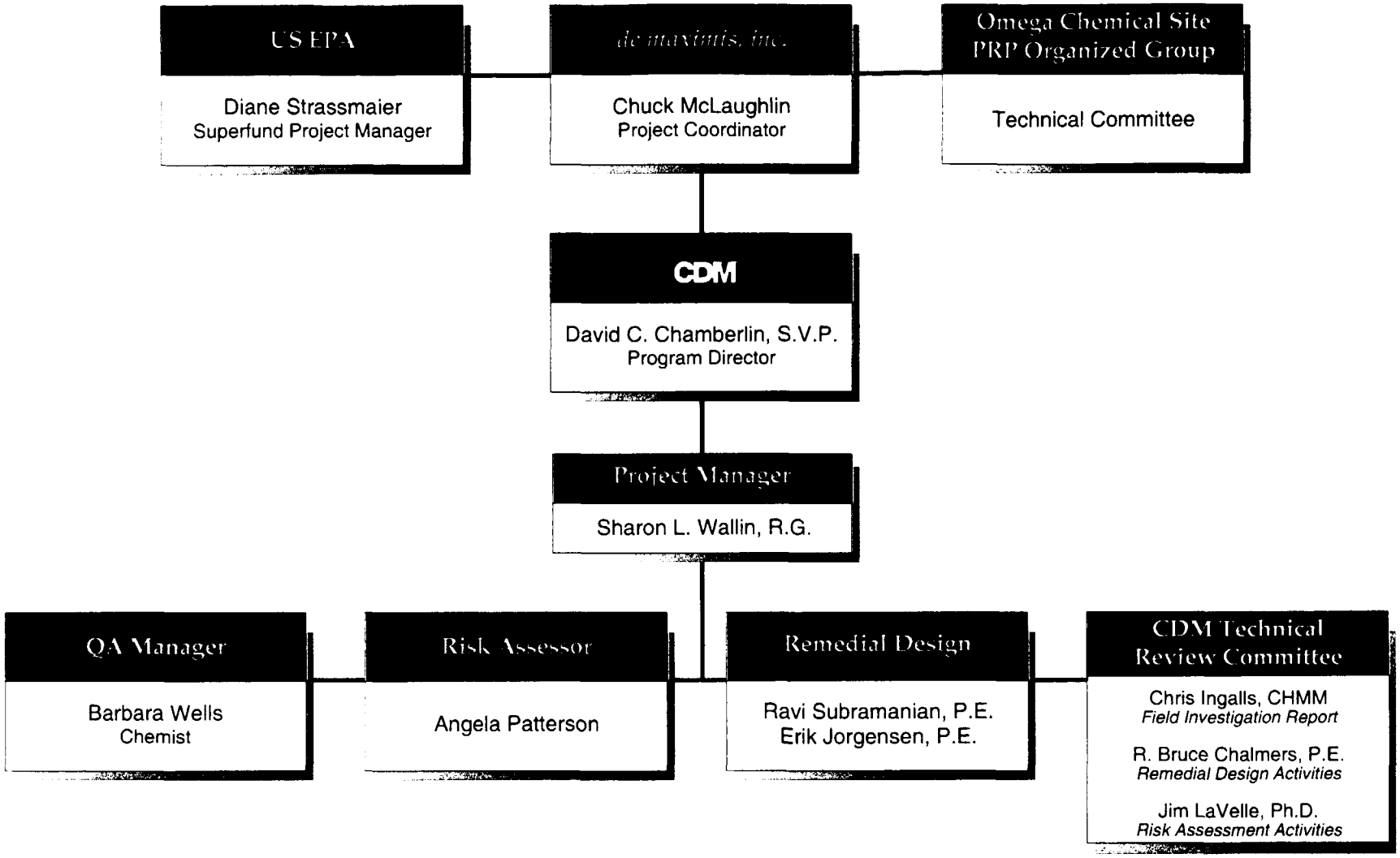
7.5.2 Document Storage

7.5.2.1 Project Files

The central files for the On-Site Soils RI/FS investigation will be located in CDM's Irvine, California office. All project documents, including field and analytical data, analysis records and supporting documentation, and all draft and final deliverables submitted to USEPA will be kept in file cabinets. The project coordinator will also retain copies of all documents related to the project.

7.5.2.2 Laboratory Record Keeping

Copies of all analytical data and/or final reports are retained in the laboratory files and, at the discretion of the laboratory manager, data will be stored on computer disks for a minimum of six months. Subsequent to completion of the project, the files will be transferred to data archives. Data may be retrieved from archives, upon request.



OMEGA CHEMICAL

Project Team Organization Chart

CDM

Figure 7-1

Table 7-1
Summary of Data Quality Objectives

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	STEP 7
Statement of Problem	Decisions	Inputs to the Decisions	Boundaries of the Study	Decision Rules	Limits on Decision Errors	Optimize the Sampling Design
Former solvent recycling activities have resulted in release of chemicals to groundwater and soils of the Site. These chemicals could potentially have an adverse effect upon human health and the environment. A soils RI/FS and risk assessment are being prepared to evaluate the nature and extent of contamination in soils and the potential threat to human health and to identify remedial alternatives. Groundwater is being addressed under separate documentation.	What is the nature and extent of contamination in soils and soil gas? What are site-related contaminant concentrations in indoor and ambient air? Do contaminant concentrations in soils, ~~or~~ soil gas, or air pose an unacceptable risk to human health or the environment? Are additional source areas present at the Site? What remedial alternatives are appropriate for the contaminants and media of concern?	Historical subsurface soil, soil gas, and soil characteristics data Analytical data resulting from this project: 1) Nature and extent of surface soil contamination; 2) ~~Vapor~~ Flux chamber and surface soil data that characterize potential source areas identified in historical aerial photographs; 3) soil gas data for site boundaries; 4) indoor and ambient air data; and ~~5~~4) Chemical and physical soil properties that influence risk and feasibility of remedial alternatives.	Surface and subsurface soils and soil gas within Site boundaries. Soil gas at the off-site former Cal-Air facility. Off-site ambient air. Off-site indoor air. The project schedule is discussed in Section 7.0.	If chemical concentrations in soil, indoor air, ambient air, and soil gas do not pose a risk to human health, then recommend no further action. If chemicals in soil, indoor air, ambient air, or soil gas at the Site pose a risk to human health, the following will take place: Chemical-specific action levels will be developed based on site-specific data ~~based on the HBCGs~~; An approach for Site remediation will be selected; The FS will identify remedial alternatives based on historical data and data collected during the investigation.	Sample design for evaluating potential source areas is purposive (i.e., judgment) sampling. Decision errors will not be set for judgmental samples. Likewise, decision errors will not be set for physical characteristics data. Regarding nonjudgmental surface soil, indoor air, ambient air, and soil gas samples, data quality is defined in Section 7.1.4.3.	The Work Plan was optimized to focus on collection of data based on data uses, availability of historical data, data gaps identified in the DSR, and data gaps identified through evaluation of the SCEM. The data collection program is presented in the FSP in Section 6.0.

Table 7-2
Laboratory Data Deliverable Requirements

A list of the minimum information that should be included in a laboratory analysis data report is provided below. Reporting requirements include a sample report, quality control results, and instrument performance results.

Each analytical set (20 or fewer samples) will be compiled into a data package that contains the following elements:

1. Case Narrative which includes an explanation of difficulties encountered, potential effect on the data and/or corrective action taken.
2. Chain-of-custody documentation (location, date and time of sample collection)
3. An analysis results page for each sample which contains:
   - Unique Report Identifier
   - Laboratory Name, Address and Phone Number
   - Client Name
   - Project Name
   - Client Sample Identifier
   - Laboratory Sample Number
   - Date Sample was Collected
   - Date Laboratory Received the Sample
   - Analysis Method Number
   - Date of Extraction/Digestion (if applicable)
   - Extraction/Digestion Method Number
   - Date of Successful Analysis
   - Dilution Factor
   - Concentration Units
   - Reporting Limit for Each Analyte
   - Concentration of Each Target Analyte in the Sample
   - Data Qualifiers (when applicable)
   - Percent Recovery of Each Surrogate Compound Spiked into the Sample (where applicable)
4. QC Results
   - Blank Results (method, initial and continuing calibration), including documentation of detection limits
   - Laboratory Control Sample and QC Check Sample Results (including analyte, known and found concentrations, percent recovery and acceptance criteria)
   - Spike Results (blank spikes, matrix spikes,), including spiked amount, unspiked and spiked sample concentrations, percent recovery and acceptance limits
   - Duplicate Results (sample duplicates and matrix spike duplicates), including sample ID, analyte, original and duplicate sample concentrations, relative percent difference and acceptance limits
   - Control charts for any QC limits determined by laboratory
5. Additional Supporting Documentation
   - Instrument Tuning Results (MS analyses)
   - Initial Calibration Statistics Report
   - Continuing Calibration Statistics Report
   - Internal Standard Results
   - Standard and Sample Preparation Logs
6. Electronic Deliverables
7. Laboratory Raw Data from Instruments and Bench Records

Table 7-3
Acceptance Limits for Spiked Samples
Volatile Organic Compounds in Soils

Analyte	USEPA Method 8260 Soil Samples		
	MS/MSD		LCS
	Accuracy: Recovery (%)	Precision: RPD (%)	Recovery (%)
Benzene*	45 – 140	20	75 – 130
Chlorobenzene*	75 – 130	20	75 – 130
Chloroform	75 – 140	20	75 – 130
1,1-Dichloroethane	70 – 150	20	60 – 130
1,2-Dichloroethane	65 – 145	25	65 – 140
1,1-Dichloroethene	70 – 165	20	70 – 145
Ethylbenzene	55 – 140	20	75 – 135
Tetrachloroethene	75 – 200	25	75 – 130
Toluene*	50 – 140	20	75 – 130
Trichloroethene	75 – 145	20	75 – 130
Vinyl chloride	45 – 160	30	45 – 140
m,p-Xylenes	55 – 160	20	75 – 135
o-Xylene	75 – 150	20	75 – 130
Surrogates			
Dibromofluoromethane	85 – 125		
Toluene-d8	80 – 120		
4-Bromofluorobenzene	80 - 120		
	USEPA T0-14		
	Soil Gas Samples		
Analyte*	Accuracy: Recovery (%)		
*USEPA Method T0-14 performance criteria and quality assurance indicates that a recovery of between 90% and 110% is expected for all targeted VOCs.			

Notes:

*	Method-specified spiking compound
LCS	Laboratory Control Sample
MS/MSD	Matrix Spike/Matrix Spike Duplicate
RPD	Relative Percent Difference

Table 7-4
Acceptance Limits for Spiked Samples
CAM Metals in Soils

Analyte	USEPA Method 6010B/6020/7471A Soil Samples – LCS AND MS/MSD	
	Accuracy: Recovery (%)	Precision: RPD (%)
Antimony	75 – 125	< 20
Arsenic – Method 6020	75 – 125	< 25
Barium	75 – 125	< 20
Beryllium	75 – 125	< 20
Cadmium	75 – 125	< 20
Chromium	75 – 125	< 20
Cobalt	75 – 125	< 20
Copper	75 – 125	< 20
Lead	75 – 125	< 20
Mercury – Method 7471A	75 – 120	< 25
Molybdenum	75 – 125	< 20
Nickel	75 – 125	< 20
Selenium	75 – 125	< 20
Silver	75 – 125	< 20
Thallium	75 – 125	< 20
Vanadium	75 – 125	< 20
Zinc	75 – 125	< 20

Notes:

LCS Laboratory Control Sample
MS/MSD Matrix Spike/Matrix Spike Duplicate
RPD Relative Percent Difference

Table 7-5
Acceptance Limits for Spiked Samples
Semi-Volatile Organic Compounds in Soils

Analyte	USEPA Method 8270C Soil Samples – LCS AND MS/MSD			
	Accuracy: Recovery (%)	Precision: RPD (%)	Assoc. Internal Standard	Associated Surrogate
SVOCs: Base/Neutral Extractables				
1,2,4-Trichlorobenzene	35 – 120	< 30	2	4
1,2-Dichlorobenzene	30 – 120	< 30	1	3
1,3-Dichlorobenzene	30 – 120	< 30	1	3
1,4-Dichlorobenzene	25 – 120	< 30	1	3
2,4-Dinitrotoluene	50 – 125	< 30	3	4
2,6-Dinitrotoluene	50 – 120	< 30	3	4
2-Chloronaphthalene	35 – 120	< 30	3	4
2-Methylnaphthalene	35 – 120	< 30	2	5
2-Nitroaniline	45 – 120	< 30	3	2
3-Nitroaniline	30 – 120	< 30	5	6
3,3'-Dichlorobenzidine	30 – 125	< 30	3	2
4-Bromophenyl phenyl ether	45 – 120	< 30	4	1
4-Chloroaniline	20 – 120	< 30	2	5
4-Chlorophenyl phenyl ether	45 – 120	< 30	3	4
4-Nitroaniline	35 – 130	< 30	3	2
Acenaphthylene	45 – 120	< 30	3	4
Acenapthene	45 – 120	< 30	3	4
Anthracene	65 – 120	< 30	4	1
Benz(a)anthracene	60 – 125	< 30	5	6
Benzo(a)pyrene	65 – 135	< 30	6	6
Benzo(b)fluoranthene	55 – 145	< 30	6	6
Benzo(g,h,I)perylene	40 – 140	< 30	6	6
Benzyl alcohol	35 – 120	< 30	1	3
Bis(2-chloroethoxy)methane	35 – 120	< 30	2	5
Bis(2-chlorethyl) ether	30 – 120	< 30	1	3
Bis(2-chloroisopropyl)ether	35 – 120	< 30	1	3
Bis(2-ethylhexyl)phthalate	35 – 135	< 30	5	6
Butyl benzylphthalate	50 – 130	< 30	5	6
Chrysene	55 – 130	< 30	5	6
Di-n-butylphthalate	50 – 125	< 30	4	1
Di-n-octylphthalate	35 – 140	< 30	5	6
Dibenz(a,h)anthracene	45 – 130	< 30	6	6

Table 7-5 (continued)
Acceptance Limits for Spiked Samples
Semi-Volatile Organic Compounds in Soils

Analyte	USEPA Method 8270C Soil Samples – LCS AND MS/MSD			
	Accuracy: Recovery (%)	Precision: RPD (%)	Assoc. Internal Standard	Associated Surrogate
Dibenzofuran	45 – 120	< 30	3	4
Diethyl phthalate	45 – 120	< 30	3	4
Dimethyl phthalate	45 – 120	< 30	3	4
Fluoranthene	55 – 125	< 30	4	1
Fluorene	55 – 120	< 30	3	2
Hexachlorobenzene	45 – 120	< 30	4	1
Hexachlorobutadiene	30 – 120	< 30	2	5
Hexachlorocyclopentadiene	25 – 120	< 30	3	2
Hexachloroethane	25 – 120	< 30	1	3
Indeno(1,2,3-cd)pyrene	45 – 145	< 30	5	6
Isophorone	35 – 120	< 30	2	5
n-Nitrosodiphenylamine	50 – 120	< 30	1	3
n-Nitrosodi-n-propylamine	35 – 120	< 30	4	1
Naphthalene	35 – 120	< 30	2	5
Nitrobenzene	30 – 120	< 30	2	4
Phenanthrene	60 – 120	< 30	4	1
Pyrene	50 – 135	< 30	5	6
SVOCs: Acid Extractables				
2,4,5-Trichlorophenol	40 – 120	< 30	3	1
2,4,6-Trichlorophenol	45 – 120	< 30	3	1
2,4-Dichlorophenol	36 – 120	< 30	2	5
2,4-Dimethylphenol	30 – 120	< 30	2	5
2,4-Dinitrophenol	30 – 120	< 30	3	4
2-Chlorophenol	30 – 120	< 30	1	3
2-Methylphenol	35 – 120	< 30	1	3
2-Nitrophenol	35 – 120	< 30	2	4
4,6-Dinitro-2-methylphenol	55 – 120	< 30	4	1
4-Chloro-3-methylphenol	40 – 120	< 30	2	5
4-Methylphenol	35 – 120	< 30	1	3
4-Nitrophenol	35 – 130	< 30	3	2
Benzoic Acid	20 – 120	30	2	5
Pentachlorophenol	40 – 120	< 30	4	1
Phenol	30 – 120	30	1	5

Table 7-5 (continued)
Acceptance Limits for Spiked Samples
Semi-Volatile Organic Compounds in Soils

Analyte	USEPA Method 8270C Soil Samples – LCS AND MS/MSD			
	Accuracy: Recovery (%)	Precision: RPD (%)	Assoc. Internal Standard	Associated Surrogate
Surrogates:				**Number**
2,4,6-Tribromophenol	45 – 130			1
2-Fluorobiphenyl	30 – 110			2
2-Fluorophenol	25 – 110			3
Nitrobenzene-D5	30 – 110			4
Phenol-D6	30 – 110			5
Terphenyl-D14	45 – 145			6
Internal Standards:				
1,4-Dichlorobenzene-D4				1
Naphthalene-D8				2
Acenaphthalene-D8				3
Phenanthrene-D10				4
Chrysene-D12				5
Perylene-D12				6

Notes:

LCS Laboratory Control Sample
MS/MSD Matrix Spike/Matrix Spike Duplicate
RPD Relative Percent Difference

Table 7-6
Acceptance Limits for Spiked Samples
Pesticides and Polychlorinated Biphenyls in Soils

Analyte	USEPA Method 8081A/8082 Soil Samples – LCS AND MS/MSD	
	Accuracy: Recovery (%)	Precision: RPD (%)
Organochlorine Pesticides – 8081A		
α-BHC	50 – 115	< 30
β-BHC	50 – 115	< 30
δ-BHC	50 – 115	< 30
γ-BHC (Lindane)	50 – 115	< 30
α-Chlordane	31 – 135	< 50
γ-Chlordane	31 – 133	< 50
4,4'-DDD	55 – 115	20
4,4'DDE	55 – 115	< 30
4,4'-DDT	55 – 115	25
Aldrin	50 – 115	< 30
Dieldrin	55 – 115	20
Endosulfan I	50 – 115	20
Endosulfan II	45 – 115	< 30
Endosulfan Sulfate	60 – 115	< 30
Endrin	55 – 115	30
Endrin Aldehyde	45 – 115	20
Heptachlor	45 – 115	20
Heptachlor Epoxide	55 - 115	20
Methoxychlor	55 – 120	35
Toxaphene	31 – 136	< 50
Surrogates:		
DCBP	45 – 115	
TCMX	35 – 115	
Polychlorinated Biphenyls - 8082		
PCB-1016	40 – 130	20
PCB-1221	45 – 130	20
PCB-1232	45 – 130	20
PCB-1242	45 – 130	20
PCB-1248	45 – 130	20
PCB-1254	45 – 130	20
PCB-1260	45 – 130	20
Surrogates:		
DCBP	40 – 125	

Notes:

LCS Laboratory Control Sample
MS/MSD Matrix Spike/Matrix Spike Duplicate
RPD Relative Percent Difference

Table 7-7
Acceptance Limits for Spiked Samples
Volatile Organic Compounds in Water (Equipment Rinsate Blanks)

Analyte	USEPA Method 8260 Water Samples		
	MS/MSD		LCS
	Accuracy: Recovery (%)	Precision: RPD (%)	Recovery (%)
Benzene*	70 - 140	20	75 – 130
Chlorobenzene*	75 - 130	20	75 – 130
Chloroform	75 - 150	20	75 – 135
1,1-Dichloroethane	60 - 130	20	60 – 130
1,2-Dichloroethane	65 - 140	20	65 – 140
1,1-Dichloroethene	65 - 165	20	70 – 145
Ethylbenzene	75 - 135	20	75 – 135
Tetrachloroethene	75 - 155	20	75 – 130
Toluene*	75 - 135	20	75 – 130
Trichloroethene	75 - 130	20	75 – 130
Vinyl chloride	40 - 190	25	45 – 140
m,p-Xylenes	70 - 140	20	75 – 135
o-Xylene	75 - 150	20	75 – 130
Surrogates			
Dibromofluoromethane	80 – 120		
Toluene d8	80 – 120		
4-Bromofluorobenzene	80 – 120		

Notes:

*	Method-specified spiking compound
LCS	Laboratory Control Sample
MS/MSD	Matrix Spike/Matrix Spike Duplicate
RPD	Relative Percent Difference

Table 7-8
Acceptance Limits for Spiked Samples
CAM Metals in Water (Equipment Rinsate Blanks)

Analyte	USEPA Method 6010B/6020/7470A Water Samples – LCS AND MS/MSD	
	Accuracy: Recovery (%)	Precision: RPD (%)
Antimony	75 – 125	≤ 20
Arsenic – Method 6020	75 – 125	≤ 20
Barium	75 – 125	≤ 20
Beryllium	75 – 125	≤ 20
Cadmium	75 – 125	≤ 20
Chromium	75 – 125	≤ 20
Cobalt	75 – 125	≤ 20
Copper	75 – 125	≤ 20
Lead	75 – 125	≤ 20
Mercury – Method 7470A	77 – 120	≤ 15
Molybdenum	75 – 125	≤ 20
Nickel	75 – 125	≤ 20
Selenium	75 – 125	≤ 20
Silver	75 – 125	≤ 20
Thallium	75 – 125	≤ 20
Vanadium	75 – 125	≤ 20
Zinc	75 – 125	≤ 20

Notes:

LCS Laboratory Control Sample
MS/MSD Matrix Spike/Matrix Spike Duplicate
RPD Relative Percent Difference

Table 7-9
Acceptance Limits for Spiked Samples
Semi-Volatile Organic Compounds in Water (Equipment Rinsate Blanks)

Analyte	USEPA Method 8270C Water Samples – LCS AND MS/MSD			
	Accuracy: Recovery (%)	Precision: RPD (%)	Associated Internal Standard	Associated Surrogate
SVOCs: Base/Neutral Extractables				
1,2,4-Trichlorobenzene	44 – 120	25	2	4
1,2-Dichlorobenzene	45 – 120	25	1	3
1,3-Dichlorobenzene	30 – 120	30	1	3
1,4-Dichlorobenzene	35 – 120	25	1	3
2,4-Dinitrotoluene	65 – 120	20	3	4
2,6-Dinitrotoluene	65 – 120	20	3	4
2-Chloronaphthalene	60 – 118	25	3	4
2-Methylnaphthalene	55 – 120	20	2	5
2-Nitroaniline	50 – 135	15	3	2
3-Nitroaniline	50 – 125	20	5	6
3,3'-Dichlorobenzidine	35 – 145	25	3	2
4-Bromophenyl phenyl ether	55 – 120	20	4	1
4-Chloroaniline	25 – 120	20	2	5
4-Chlorophenyl phenyl ether	60 – 120	20	3	4
4-Nitroaniline	55 – 140	15	3	2
Acenaphthylene	55 – 120	20	3	4
Acenapthene	55 – 120	≤35	3	4
Anthracene	65 – 120	15	4	1
Benz(a)anthracene	70 - 125	20	5	6
Benzo(a)pyrene	70 - 125	15	6	6
Benzo(b)fluoranthene	65 - 125	20	6	6
Benzo(g,h,I)perylene	25 - 150	25	6	6
Benzyl alcohol	45 – 120	25	1	3
Bis(2-chloroethoxy)methane	50 – 120	25	2	5
Bis(2-chlorethyl) ether	45 – 120	25	1	3
Bis(2-chloroisopropyl)ether	36 – 120	25	1	3
Bis(2-ethylhexyl)phthalate	65 – 140	15	5	6
Butyl benzylphthalate	70 - 135	15	5	6
Chrysene	70 - 130	10	5	6
Di-n-butylphthalate	60 - 118	10	4	1
Di-n-octylphthalate	55 - 146	20	5	6
Dibenz(a,h)anthracene	50 – 130	≤20	6	6
Dibenzofuran	55 – 120	25	3	4
Diethyl phthalate	60 – 114	25	3	4
Dimethyl phthalate	65 – 112	20	3	4
Fluoranthene	70 – 120	≤20	4	1
Fluorene	59 – 120	30	3	2
Hexachlorobenzene	60 – 120	15	4	1
Hexachlorobutadiene	35 – 116	25	2	5
Hexachlorocyclopentadiene	10 – 120	35	3	2
Hexachloroethane	40 – 113	25	1	3

Table 7-9 (continued)
Acceptance Limits for Spiked Samples
Semi-Volatile Organic Compounds in Water (Equipment Rinsate Blanks)

Analyte	USEPA Method 8270C Water Samples – LCS AND MS/MSD			
	Accuracy: Recovery (%)	Precision: RPD (%)	Associated Internal Standard	Associated Surrogate
Indeno(1,2,3-cd)pyrene	40 – 135	20	5	6
Isophorone	50 - 120	20	2	5
n-Nitrosodiphenylamine	45 – 120	25	1	3
n-Nitrosodi-n-propylamine	45 – 125	25	4	1
Naphthalene	40 – 120	25	2	5
Nitrobenzene	45 – 120	25	2	4
Phenanthrene	65 – 120	≤20	4	1
Pyrene	50 – 115	≤20	5	6
SVOCs: Acid Extractables				
2,4,5-Trichlorophenol	55 – 120	35	3	1
2,4,6-Trichlorophenol	55 – 120	25	3	1
2,4-Dichlorophenol	50 – 120	25	2	5
2,4-Dimethylphenol	32 – 119	30	2	5
2,4-Dinitrophenol	40 – 125	<30	3	4
2-Chlorophenol	45 – 120	25	1	3
2-Methylphenol	45 – 120	25	1	3
2-Nitrophenol	50 – 120	50	2	4
4,6-Dinitro-2-methylphenol	65 – 125	20	4	1
4-Chloro-3-methylphenol	55 – 120	25	2	5
4-Methylphenol	45 – 120	25	1	3
4-Nitrophenol	50 – 132	30	3	2
Benzoic Acid	25 – 120	40	2	5
Pentachlorophenol	50 – 130	45	4	1
Phenol	35 – 112	25	1	5
Surrogates:				**Number**
2,4,6-Tribromophenol	55 – 140			1
2-Fluorobiphenyl	40 – 120			2
2-Fluorophenol	30 – 110			3
Nitrobenzene-D5	40 – 110			4
Phenol-D6	40 – 110			5
Terphenyl-D14	55 – 160			6
Internal Standards:				
1,4-Dichlorobenzene-D4				1
Naphthalene-D8				2
Acenaphthalene-D8				3
Phenanthrene-D10				4
Chrysene-D12				5
Perylene-D12				6

Notes:

LCS Laboratory Control Sample
MS/MSD Matrix Spike/Matrix Spike Duplicate
RPD Relative Percent Difference

Table 7-10
Acceptance Limits for Spiked Samples
Pesticides and Polychlorinated Biphenyls in Water (Equipment Rinsate Blanks)

Analyte	USEPA Method 8081A/8082 Water Samples – LCS AND MS/MSD	
	Accuracy: Recovery (%)	Precision: RPD (%)
Organochlorine Pesticides – 8081A		
α-BHC	50 – 115	≤30
β-BHC	55 – 115	≤30
δ-BHC	55 – 120	≤30
γ-BHC (Lindane)	50 – 115	≤30
α-Chlordane	41 – 125	≤30
γ-Chlordane	41 – 125	≤30
4,4'-DDD	55 – 120	≤30
4,4'DDE	55 – 120	≤30
4,4'-DDT	60 – 120	≤30
Aldrin	45 – 115	≤30
Dieldrin	55 – 115	≤30
Endosulfan I	50 – 115	≤30
Endosulfan II	45 – 120	≤30
Endosulfan Sulfate	60 – 125	≤30
Endrin	55 – 115	≤30
Endrin Aldehyde	50 – 115	≤30
Heptachlor	45 – 120	≤30
Heptachlor Epoxide	50 – 115	≤30
Methoxychlor	60 – 120	≤30
Toxaphene	41 – 126	≤30
Surrogates:		
DCBP	35 – 125	
TCMX	30 – 120	
Polychlorinated Biphenyls - 8082		
PCB-1016	45 – 115	20
PCB-1221	50 – 120	20
PCB-1232	50 – 120	20
PCB-1242	50 – 120	20
PCB-1248	50 – 120	20
PCB-1254	50 – 120	20
PCB-1260	50 – 120	20
Surrogates:		
DCBP	35 – 125	

Notes:

LCS Laboratory Control Sample
MS/MSD Matrix Spike/Matrix Spike Duplicate
RPD Relative Percent Difference

~~Table 7-3~~
~~Acceptance Limits for Spiked Samples~~
~~Volatile Organic Compounds in Soils~~

~~Analyte~~	~~USEPA Method 8260~~ ~~Soil Samples~~		
	~~MS/MSD~~		~~LCS~~
	~~Accuracy: Recovery (%)~~	~~Precision: RPD (%)~~	~~Recovery (%)~~
~~Benzene*~~	~~60 – 140~~	~~25~~	~~65 – 130~~
~~Chlorobenzene*~~	~~70 – 135~~	~~20~~	~~75 – 125~~
~~Chloroform~~	~~65 – 140~~	~~20~~	~~65 – 135~~
~~1,1-Dichloroethane~~	~~55 – 150~~	~~20~~	~~60 – 140~~
~~1,2-Dichloroethane~~	~~55 – 145~~	~~30~~	~~55 – 135~~
~~1,1-Dichloroethene~~	~~45 – 165~~	~~40~~	~~55 – 145~~
~~Ethylbenzene~~	~~70 – 140~~	~~20~~	~~70 – 125~~
~~Tetrachloroethene~~	~~10 – 200~~	~~50~~	~~65 – 130~~
~~Toluene*~~	~~65 – 140~~	~~20~~	~~70 – 125~~
~~Trichloroethene~~	~~60 – 145~~	~~30~~	~~70 – 130~~
~~Vinyl chloride~~	~~30 – 160~~	~~30~~	~~40 – 145~~
~~m,p-Xylenes~~	~~40 – 160~~	~~20~~	~~70 – 130~~
~~o-Xylene~~	~~65 – 150~~	~~20~~	~~70 – 135~~
	~~USEPA T0-14~~		
	~~Soil Gas Samples~~		
~~Analyte*~~	~~Accuracy: Recovery (%)~~		
~~*USEPA Method T0-14 performance criteria and quality assurance indicates that a recovery of between 90% and 110% is expected for all targeted VOCs.~~			

~~*Notes:*~~
~~* Method-specified spiking compound~~
~~LCS Laboratory Control Sample~~
~~MS/MSD Matrix Spike/Matrix Spike Duplicate~~
~~RPD Relative Percent Difference~~

~~**Table 7-4**~~
~~**Acceptance Limits for Spiked Samples**~~
~~**CAM Metals in Soils**~~

~~**Analyte**~~	~~**USEPA Method 6010B/6020/7471A Soil Samples – LCS AND MS/MSD**~~	
	~~**Accuracy: Recovery (%)**~~	~~**Precision: RPD (%)**~~
~~Antimony~~	~~75 – 125~~	~~< 20~~
~~Arsenic – Method 6020~~	~~80 – 120~~	~~< 25~~
~~Barium~~	~~75 – 125~~	~~< 20~~
~~Beryllium~~	~~75 – 125~~	~~< 20~~
~~Cadmium~~	~~75 – 125~~	~~< 20~~
~~Chromium~~	~~75 – 125~~	~~< 20~~
~~Cobalt~~	~~75 – 125~~	~~< 20~~
~~Copper~~	~~75 – 125~~	~~< 20~~
~~Lead~~	~~75 – 125~~	~~< 20~~
~~Mercury – Method 7471A~~	~~75 – 120~~	~~< 25~~
~~Molybdenum~~	~~75 – 125~~	~~< 20~~
~~Nickel~~	~~75 – 125~~	~~< 20~~
~~Selenium~~	~~75 – 125~~	~~< 20~~
~~Silver~~	~~75 – 125~~	~~< 20~~
~~Thallium~~	~~75 – 125~~	~~< 20~~
~~Vanadium~~	~~75 – 125~~	~~< 20~~
~~Zinc~~	~~75 – 125~~	~~< 20~~

~~*Notes:*~~
~~LCS — Laboratory Control Sample~~
~~MS/MSD — Matrix Spike/Matrix Spike Duplicate~~
~~RPD — Relative Percent Difference~~

~~Table 7-5~~
~~Acceptance Limits for Spiked Samples~~
~~Semi-Volatile Organic Compounds in Soils~~

Analyte	USEPA Method 8270C Soil Samples – LCS AND MS/MSD			
	Accuracy: Recovery (%)	Precision: RPD (%)	Assoc. Internal Standard	Associated Surrogate
SVOCs: Base/Neutral Extractables				
1,2,4-Trichlorobenzene	34 – 152	< 30	2	4
1,2-Dichlorobenzene	32 – 135	< 30	1	3
1,3-Dichlorobenzene	26 – 135	< 30	1	3
1,4-Dichlorobenzene	25 – 135	< 30	1	3
2,4-Dinitrotoluene	29 – 149	< 30	3	4
2,6-Dinitrotoluene	41 – 135	< 30	3	4
2-Chloronaphthalene	50 – 135	< 30	3	4
2-Methylnaphthalene	31 – 135	< 30	2	5
2-Nitroaniline	40 – 135	< 30	3	2
3-Nitroaniline	25 – 175	< 30	5	6
3,3'-Dichlorobenzidine	41 – 135	< 30	3	2
4-Bromophenyl phenyl ether	43 – 137	< 30	4	1
4-Chloroaniline	35 – 146	< 30	2	5
4-Chlorophenyl phenyl ether	41 – 142	< 30	3	4
4-Nitroaniline	30 – 153	< 30	3	2
Acenaphthylene	37 – 135	< 30	3	4
Acenapthene	39 – 135	< 30	3	4
Anthracene	35 – 175	< 30	4	1
Benz(a)anthracene	41 – 143	< 30	5	6
Benzo(a)pyrene	31 – 135	< 30	6	6
Benzo(b)fluoranthene	27 – 135	< 30	6	6
Benzo(g,h,I)perylene	25 – 159	< 30	6	6
Benzyl alcohol	25 – 135	< 30	1	3
Bis(2-chloroethoxy)methane	39 – 135	< 30	2	5
Bis(2-chlorethyl) ether	34 – 135	< 30	1	3
Bis(2-chloroisopropyl)ether	26 – 175	< 30	1	3
Bis(2-ethylhexyl)phthalate	25 – 139	< 30	5	6
Butyl benzylphthalate	25 – 135	< 30	5	6
Chrysene	45 – 143	< 30	5	6
Di-n-butylphthalate	25 – 136	< 30	4	1
Di-n-octylphthalate	28 – 137	< 30	5	6
Dibenz(a,h)anthracene	40 – 135	< 30	6	6

~~Table 7-5 (continued)~~
~~Acceptance Limits for Spiked Samples~~
~~Semi-Volatile Organic Compounds in Soils~~

Analyte	USEPA Method 8270C Soil Samples – LCS AND MS/MSD			
	Accuracy: Recovery (%)	Precision: RPD (%)	Assoc. Internal Standard	Associated Surrogate
Dibenzofuran	42 – 135	< 30	3	4
Diethyl phthalate	27 – 135	< 30	3	4
Dimethyl phthalate	25 – 175	< 30	3	4
Fluoranthene	37 – 135	< 30	4	1
Fluorene	38 – 149	< 30	3	2
Hexachlorobenzene	36 – 143	< 30	4	1
Hexachlorobutadiene	25 – 135	< 30	2	5
Hexachlorocyclopentadiene	31 – 135	< 30	3	2
Hexachloroethane	25 – 163	< 30	1	3
Indeno(1,2,3-cd)pyrene	25 – 170	< 30	5	6
Isophorone	25 – 175	< 30	2	5
n-Nitrosodiphenylamine	27 – 135	< 30	1	3
n-Nitrosodi-n-propylamine	25 – 135	< 30	4	1
Naphthalene	40 – 135	< 30	2	5
Nitrobenzene	36 – 143	< 30	2	4
Phenanthrene	44 – 135	< 30	4	1
Pyrene	37 – 146	< 30	5	6
SVOCs: Acid Extractables				
2,4,5-Trichlorophenol	25 – 175	< 30	3	1
2,4,6-Trichlorophenol	29 – 138	< 30	3	1
2,4-Dichlorophenol	36 – 135	< 30	2	5
2,4-Dimethylphenol	35 – 149	< 30	2	5
2,4-Dinitrophenol	25 – 161	< 30	3	4
2-Chlorophenol	31 – 135	< 30	1	3
2-Methylphenol	25 – 135	< 30	1	3
2-Nitrophenol	34 – 135	< 30	2	4
4,6-Dinitro-2-methylphenol	25 – 144	< 30	4	1
4-Chloro-3-methylphenol	34 – 135	< 30	2	5
4-Methylphenol	25 – 135	< 30	1	3
4-Nitrophenol	25 – 141	< 30	3	2
Benzoic Acid	25 – 172	< 30	2	5
Pentachlorophenol	38 – 146	< 30	4	1
Phenol	25 – 135	< 30	1	5

~~Table 7-5 (continued)~~
~~Acceptance Limits for Spiked Samples~~
~~Semi-Volatile Organic Compounds in Soils~~

Analyte	~~USEPA Method 8270C Soil Samples – LCS AND MS/MSD~~			
	~~Accuracy: Recovery (%)~~	~~Precision: RPD (%)~~	~~Assoc. Internal Standard~~	~~Associated Surrogate~~
~~**Surrogates:**~~				~~Number~~
~~2,4,6-Tribromophenol~~	~~25 – 144~~			~~1~~
~~2-Fluorobiphenyl~~	~~34 – 135~~			~~2~~
~~2-Fluorophenol~~	~~25 – 135~~			~~3~~
~~Nitrobenzene-D5~~	~~25 – 135~~			~~4~~
~~Phenol-D5~~	~~25 – 135~~			~~5~~
~~Terphenyl-D14~~	~~32 – 136~~			~~6~~
~~**Internal Standards:**~~				
~~1,4-Dichlorobenzene-D4~~				~~1~~
~~Naphthalene-D8~~				~~2~~
~~Acenaphthalene-D8~~				~~3~~
~~Phenanthrene-D10~~				~~4~~
~~Chrysene-D12~~				~~5~~
~~Perylene-D12~~				~~6~~

~~*Notes:*~~
~~LCS Laboratory Control Sample~~
~~MS/MSD Matrix Spike/Matrix Spike Duplicate~~
~~RPD Relative Percent Difference~~

~~Table 7-6~~
~~Acceptance Limits for Spiked Samples~~
~~Pesticides and Polychlorinated Biphenyls in Soils~~

Analyte	USEPA Method 8081A/8082 Soil Samples – LCS AND MS/MSD	
	Accuracy: Recovery (%)	Precision: RPD (%)
Organochlorine Pesticides – 8081A		
α-BHC	65 – 135	< 50
β-BHC	41 – 133	< 50
δ-BHC	65 – 136	< 50
γ-BHC (Lindane)	63 – 130	< 50
α-Chlordane	31 – 135	< 50
γ-Chlordane	31 – 133	< 50
4,4'-DDD	38 – 146	< 50
4,4'DDE	35 – 149	< 50
4,4'-DDT	25 – 153	< 50
Aldrin	37 – 126	< 50
Dieldrin	32 – 142	< 50
Endosulfan I	39 – 153	< 50
Endosulfan II	65 – 169	< 50
Endosulfan Sulfate	36 – 151	< 50
Endrin	33 – 144	< 50
Endrin Aldehyde	65 – 160	< 50
Heptachlor	35 – 138	< 50
Heptachlor Epoxide	43 – 144	< 50
Methoxychlor	63 – 152	< 50
Toxaphene	31 – 136	< 50
Surrogates:		
DCBP	25 – 143	
TCMX	35 – 135	
Polychlorinated Biphenyls – 8082		
PCB-1016	44 – 127	< 50
PCB-1221	31 – 136	< 50
PCB-1232	31 – 136	< 50
PCB-1242	29 – 160	< 50
PCB-1248	31 – 136	< 50
PCB-1254	25 – 141	< 50
PCB-1260	31 – 136	< 50
Surrogates:		
DCBP	25 – 143	

Notes:
LCS – Laboratory Control Sample
MS/MSD – Matrix Spike/Matrix Spike Duplicate
RPD – Relative Percent Difference

~~Table 7-7~~
~~Acceptance Limits for Spiked Samples~~
~~Volatile Organic Compounds in Water (Equipment Rinsate Blanks)~~

~~Analyte~~	~~USEPA Method 8260 Water Samples~~		
	~~MS/MSD~~		~~LCS~~
	~~Accuracy: Recovery (%)~~	~~Precision: RPD (%)~~	~~Recovery (%)~~
~~Benzene*~~	~~65 - 140~~	~~20~~	~~65 – 130~~
~~Chlorobenzene*~~	~~75 - 130~~	~~20~~	~~75 – 125~~
~~Chloroform~~	~~60 - 150~~	~~20~~	~~65 – 135~~
~~1,1-Dichloroethane~~	~~55 - 160~~	~~20~~	~~60 – 140~~
~~1,2-Dichloroethane~~	~~40 - 160~~	~~20~~	~~55 – 135~~
~~1,1-Dichloroethene~~	~~45 - 165~~	~~50~~	~~55 – 145~~
~~Ethylbenzene~~	~~70 - 135~~	~~20~~	~~70 – 125~~
~~Tetrachloroethene~~	~~50 - 155~~	~~20~~	~~65 – 130~~
~~Toluene*~~	~~70 - 135~~	~~20~~	~~70 – 125~~
~~Trichloroethene~~	~~65 - 130~~	~~20~~	~~70 – 130~~
~~Vinyl chloride~~	~~25 - 190~~	~~20~~	~~40 – 145~~
~~m,p-Xylenes~~	~~65 - 140~~	~~20~~	~~70 – 130~~
~~o-Xylene~~	~~70 - 150~~	~~25~~	~~70 – 135~~

~~*Notes:*~~
~~* Method-specified spiking compound~~
~~LCS Laboratory Control Sample~~
~~MS/MSD Matrix Spike/Matrix Spike Duplicate~~
~~RPD Relative Percent Difference~~

~~Table 7-8~~
~~Acceptance Limits for Spiked Samples~~
~~CAM Metals in Water (Equipment Rinsate Blanks)~~

~~Analyte~~	~~USEPA Method 6010B/6020/7470A Water Samples – LCS AND MS/MSD~~	
	~~Accuracy: Recovery (%)~~	~~Precision: RPD (%)~~
~~Antimony~~	~~75 – 125~~	~~≤ 20~~
~~Arsenic – Method 6020~~	~~80 – 120~~	~~≤ 15~~
~~Barium~~	~~75 – 125~~	~~≤ 20~~
~~Beryllium~~	~~75 – 125~~	~~≤ 20~~
~~Cadmium~~	~~75 – 125~~	~~≤ 20~~
~~Chromium~~	~~75 – 125~~	~~≤ 20~~
~~Cobalt~~	~~75 – 125~~	~~≤ 20~~
~~Copper~~	~~75 – 125~~	~~≤ 20~~
~~Lead~~	~~75 – 125~~	~~≤ 20~~
~~Mercury – Method 7470A~~	~~77 – 120~~	~~≤ 15~~
~~Molybdenum~~	~~75 – 125~~	~~≤ 20~~
~~Nickel~~	~~75 – 125~~	~~≤ 20~~
~~Selenium~~	~~75 – 125~~	~~≤ 20~~
~~Silver~~	~~75 – 125~~	~~≤ 20~~
~~Thallium~~	~~75 – 125~~	~~≤ 20~~
~~Vanadium~~	~~75 – 125~~	~~≤ 20~~
~~Zinc~~	~~75 – 125~~	~~≤ 20~~

~~*Notes:*~~
~~LCS — Laboratory Control Sample~~
~~MS/MSD — Matrix Spike/Matrix Spike Duplicate~~
~~RPD — Relative Percent Difference~~

~~Table 7-9~~
~~Acceptance Limits for Spiked Samples~~
~~Semi-Volatile Organic Compounds in Water (Equipment Rinsate Blanks)~~

Analyte	USEPA Method 8270C Water Samples – LCS AND MS/MSD			
	Accuracy: Recovery (%)	Precision: RPD (%)	Associated Internal Standard	Associated Surrogate
SVOCs: Base/Neutral Extractables				
1,2,4-Trichlorobenzene	44 – 142	≤20	2	4
1,2-Dichlorobenzene	42 – 155	≤20	1	3
1,3-Dichlorobenzene	36 – 125	≤20	1	3
1,4-Dichlorobenzene	30 – 125	≤20	1	3
2,4-Dinitrotoluene	39 – 139	≤20	3	4
2,6-Dinitrotoluene	51 – 125	≤20	3	4
2-Chloronaphthalene	60 – 125	≤20	3	4
2-Methylnaphthalene	41 – 125	≤20	2	5
2-Nitroaniline	50 – 125	≤20	3	2
3-Nitroaniline	29 – 175	≤20	5	6
3,3'-Dichlorobenzidine	51 – 125	≤20	3	2
4-Bromophenyl phenyl ether	53 – 127	≤20	4	1
4-Chloroaniline	45 – 136	≤20	2	5
4-Chlorophenyl phenyl ether	51 – 132	≤20	3	4
4-Nitroaniline	40 – 143	≤20	3	2
Acenaphthylene	47 – 125	≤20	3	4
Acenapthene	49 – 125	≤20	3	4
Anthracene	45 – 165	≤20	4	1
Benz(a)anthracene	51 – 133	≤20	5	6
Benzo(a)pyrene	41 – 125	≤20	6	6
Benzo(b)fluoranthene	37 – 125	≤20	6	6
Benzo(g,h,I)perylene	34 – 149	≤20	6	6
Benzyl alcohol	35 – 125	≤20	1	3
Bis(2-chloroethoxy)methane	49 – 125	≤20	2	5
Bis(2-chlorethyl) ether	44 – 125	≤20	1	3
Bis(2-chloroisopropyl)ether	36 – 166	≤20	1	3
Bis(2-ethylhexyl)phthalate	33 – 129	≤20	5	6
Butyl benzylphthalate	26 – 125	≤20	5	6
Chrysene	55 – 133	≤20	5	6
Di-n-butylphthalate	34 – 126	≤20	4	1
Di-n-octylphthalate	38 – 127	≤20	5	6
Dibenz(a,h)anthracene	50 – 125	≤20	6	6
Dibenzofuran	52 – 125	≤20	3	4
Diethyl phthalate	37 – 125	≤20	3	4
Dimethyl phthalate	25 – 175	≤20	3	4
Fluoranthene	47 – 125	≤20	4	1
Fluorene	48 – 139	≤20	3	2
Hexachlorobenzene	46 – 133	≤20	4	1
Hexachlorobutadiene	25 – 125	≤20	2	5
Hexachlorocyclopentadiene	41 – 125	≤20	3	2
Hexachloroethane	25 – 153	≤20	1	3

~~Table 7-9 (continued)~~
~~Acceptance Limits for Spiked Samples~~
~~Semi-Volatile Organic Compounds in Water (Equipment Rinsate Blanks)~~

Analyte	USEPA Method 8270C Water Samples – LCS AND MS/MSD			
	Accuracy: Recovery (%)	Precision: RPD (%)	Associated Internal Standard	Associated Surrogate
Indeno(1,2,3-cd)pyrene	27 – 160	≤20	5	6
Isophorone	26 – 175	≤20	2	5
n-Nitrosodiphenylamine	37 – 125	≤20	1	3
n-Nitrosodi-n-propylamine	27 – 125	≤20	4	1
Naphthalene	50 – 125	≤20	2	5
Nitrobenzene	46 – 133	≤20	2	4
Phenanthrene	54 – 125	≤20	4	1
Pyrene	47 – 136	≤20	5	6
SVOCs: Acid Extractables				
2,4,5-Trichlorophenol	25 – 175	≤20	3	1
2,4,6-Trichlorophenol	39 – 128	≤20	3	1
2,4-Dichlorophenol	46 – 125	≤20	2	5
2,4-Dimethylphenol	45 – 139	≤20	2	5
2,4-Dinitrophenol	30 – 151	≤20	3	4
2-Chlorophenol	41 – 125	≤20	1	3
2-Methylphenol	25 – 125	≤20	1	3
2-Nitrophenol	44 – 125	≤20	2	4
4,6-Dinitro-2-methylphenol	26 – 134	≤20	4	1
4-Chloro-3-methylphenol	44 – 125	≤20	2	5
4-Methylphenol	33 – 125	≤20	1	3
4-Nitrophenol	25 – 131	≤20	3	2
Benzoic Acid	25 – 162	≤20	2	5
Pentachlorophenol	28 – 136	≤20	4	1
Phenol	25 – 125	≤20	1	5
Surrogates:				Number
2,4,6-Tribromophenol	25 – 134			1
2-Fluorobiphenyl	43 – 125			2
2-Fluorophenol	25 – 125			3
Nitrobenzene-D5	32 – 125			4
Phenol-D5	25 – 125			5
Terphenyl-D14	42 – 126			6
Internal Standards:				
1,4-Dichlorobenzene-D4				1
Naphthalene-D8				2
Acenaphthalene-D8				3
Phenanthrene-D10				4
Chrysene-D12				5
Perylene-D12				6

Notes:
LCS ---------- Laboratory Control Sample
MS/MSD ---------- Matrix Spike/Matrix Spike Duplicate
RPD ---------- Relative Percent Difference

~~Table 7-10~~
~~Acceptance Limits for Spiked Samples~~
~~Pesticides and Polychlorinated Biphenyls in Water (Equipment Rinsate Blanks)~~

Analyte	USEPA Method 8081A/8082 Water Samples – LCS AND MS/MSD	
	Accuracy: Recovery (%)	Precision: RPD (%)
Organochlorine Pesticides – 8081A		
α-BHC	75 – 125	≤30
β-BHC	51 – 125	≤30
δ-BHC	75 – 126	≤30
γ-BHC (Lindane)	73 – 125	≤30
α-Chlordane	41 – 125	≤30
γ-Chlordane	41 – 125	≤30
4,4'-DDD	48 – 136	≤30
4,4'DDE	45 – 139	≤30
4,4'-DDT	34 – 143	≤30
Aldrin	47 – 125	≤30
Dieldrin	42 – 132	≤30
Endosulfan I	49 – 143	≤30
Endosulfan II	75 – 159	≤30
Endosulfan Sulfate	46 – 141	≤30
Endrin	43 – 134	≤30
Endrin Aldehyde	75 – 150	≤30
Heptachlor	45 – 128	≤30
Heptachlor Epoxide	53 – 134	≤30
Methoxychlor	73 – 142	≤30
Toxaphene	41 – 126	≤30
Surrogates:		
DCBP	34 – 133	
TCMX	45 – 125	
Polychlorinated Biphenyls - 8082		
PCB-1016	54 – 125	≤30
PCB-1221	41 – 126	≤30
PCB-1232	41 – 126	≤30
PCB-1242	39 – 150	≤30
PCB-1248	41 – 126	≤30
PCB-1254	29 – 131	≤30
PCB-1260	41 – 126	≤30
Surrogates:		
DCBP	34 – 133	

Notes:
LCS ———— Laboratory Control Sample
MS/MSD ———— Matrix Spike/Matrix Spike Duplicate
RPD ———— Relative Percent Difference

Section 8
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~~Appendix A~~
~~Screening Level Calculations~~

Appendix A~~B~~
Health and Safety Plan

CDM

Appendix ~~B~~C
Standard Operating Procedures

Soil Boring and Rock Coring

Subsurface Soil Sampling

Duplicate and Split Sample Preparation

Chain-of-Custody Procedures

Field Logbook

Field Sampling Equipment Decontamination

Air Sampling for Summa Canisters

Appendix ~~D~~ C
Field Forms

Boring Log and Sampling Record

Chain-of-Custody Record

Sample Label

Appendix ~~E~~ D
Equipment Operation and Calibration Procedures

Photoionization Detector

Flame Ionization Detector

Combustible Gas Indicator

Particulate Monitor