

DRAFT
FIELD SAMPLING PLAN ADDENDUM NO. 1
FOR SAN GABRIEL VALLEY NPL AREA 3
REMEDIAL INVESTIGATION
FIELD ACTIVITIES

SAN GABRIEL BASIN
LOS ANGELES COUNTY, CALIFORNIA

EPA CONTRACT NO. 68-W-98-225
EPA WORK ASSIGNMENT NO. 141-RICO-09ES
CH2M HILL PROJECT NO. 175859.FL01

Prepared for
U.S. Environmental Protection Agency
Region IX
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October 2004

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U.S. ENVIRONMENTAL PROTECTION AGENCY REGION IX

Sample Plan Title: Draft Field Sampling Plan Addendum No. 1 for San Gabriel Valley
NPL Area 3 Remedial Investigation Field Activities

Site Name: NPL Area 3

Site Location: San Gabriel Valley

City/State/Zip: Los Angeles County, California

Site EPA ID#: CAD980818579

Anticipated Sampling Dates: November 2004 to September 2005

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S U P E R F U N D	Received by Superfund Remedial Project Manager: _____	Date	S U P E R F U N D
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Field Sampling Plan Addendum No. 1

NPL Area 3

This Field Sampling Plan (FSP) Addendum No. 1 provides supplemental information for field and laboratory activities associated with remedial investigation (RI) activities for National Priorities List (NPL) Area 3 of the San Gabriel Valley Superfund Site in Los Angeles County, California (Area 3). This work is being performed for the U.S. Environmental Protection Agency (EPA) under EPA Contract No. 68-W-98-225 and EPA Work Assignment No. 141-RICO-09ES.

Because this FSP Addendum is a supplement to an existing, detailed FSP, not all sections are included as required in the *EPA Region IX, Guidance for Preparation of a U.S. EPA Region IX, Field Sampling Plan for EPA-Lead Superfund Projects* (EPA, 1993). Where required information would be repetitive, the original FSP is referenced. The installation of one conventional, one cluster, and three multiport (MP) groundwater monitoring wells and subsequent initial and quarterly groundwater sampling through January 2005 was described in the February 2003 FSP and Quality Assurance Project Plan (QAPP) for NPL Area 3, and was approved by EPA Region IX Quality Assurance Office (QAO). This FSP Addendum was prepared to describe the installation of two additional conventional and one additional MP groundwater monitoring well(s), associated initial groundwater sampling, and quarterly groundwater sampling at all existing and new groundwater monitoring wells and two production wells from February through August 2005. The sampling described in this FSP Addendum is intended to result in data that can be used to refine the preliminary site conceptual model sufficiently so that it can be used to support: (1) preparation of a Feasibility Study (FS) for the Area 3 Operable Unit (OU) and selection of a remedy (i.e., Record of Decision), and (2) identification by EPA of potentially responsible parties (PRPs) who would perform the FS and remedial action.

1. Background

EPA installed one conventional (MW1-1), one cluster (MW1-2A and MW1-2B), and three MP (MW1-3, MW1-4, and MW1-5) groundwater monitoring wells in Area 3 in 2003. Quarterly groundwater samples have been collected from the wells between March 2003 and August 2004. Based on these sampling results, routine production well sampling results, and facility groundwater monitoring well sampling results, areas of predominantly trichloroethene (TCE), tetrachloroethene (PCE), and 1,2,3-trichloropropane (1,2,3-TCP) contamination have been delineated.

Table 1-1 summarizes water quality data for the existing RI monitoring wells in Area 3. The horizontal and vertical extent of contamination thus far delineated is described in more detail in the *San Gabriel Valley NPL Area 3 Remedial Investigation Data Needs* memorandum (CH2M HILL, 2004), included as Appendix A. Figure 1 of Appendix A illustrates the

distribution of volatile organic compounds (VOCs) detected in shallow and deep groundwater wells in Area 3, along with the locations of existing RI monitoring wells.

To date, little PRP site assessment work has been conducted in Area 3. However, at the request of EPA, the Los Angeles Regional Water Quality Control Board (LARWQCB) has increased efforts to identify the potential sources of VOC contamination detected in groundwater in Area 3. Currently, groundwater monitoring data are available at six sites within Area 3: the Temple City Sheriff's Station and Norge Village Cleaners, located in the eastern portion of Area 3, and Reidon, Inc., Pemaco, Ideal Wire Works, and Charter Communications, located in the southwestern portion of Area 3.

2. Objectives

CH2M HILL is planning to install two conventional and one MP groundwater monitoring well(s) within the Area 3 OU. In addition, initial groundwater sampling will be performed at new groundwater monitoring wells and quarterly groundwater sampling will be performed at new and existing groundwater monitoring wells as well as two production wells.

The data uses from the results of the field activities described in this FSP Addendum are listed below:

- Refine the three-dimensional nature and extent of VOC contamination in Area 3.
- Refine EPA's understanding of the groundwater flow directions in Area 3.
- Verify the location of the fault in the western OU and assess whether contaminant migration occurs across the fault.

The remainder of this FSP Addendum discusses the site background (Section 1), lists relevant maps and figures (Section 3), discusses the sampling rationale (Section 4), presents requests for analyses for the various field sampling activities (Section 5), and describes the field and laboratory methods and procedures that will be used during the RI activities (Section 6). Figures and tables are provided at the end of the document.

3. Maps and Figures

- The following is a list of maps and figures pertinent to this FSP Addendum.
- Figure 6-1
 - Typical Design Detail for Conventional Monitoring Wells

4. Rationale for Sample Locations, Number of Samples, and Laboratory Analyses

This section presents a summary description of the additional sampling activities that EPA is planning to conduct as a part of the Area 3 RI. The data needs and rationale for sample locations, number of samples, and laboratory analyses are described in more detail in the *San Gabriel Valley NPL Area 3 Remedial Investigation Data Needs* memorandum, included as Appendix A.

4.1 Groundwater Monitoring

During RI field activities in 2003, one conventional (MW1-1), one cluster (MW1-2A and MW1-2B), and three MP (MW1-3, MW1-4, and MW1-5) groundwater monitoring wells were installed in Area 3. As part of the RI field activities discussed in this FSP Addendum, one MP (MW1-6) and two conventional (MW1-7 and MW1-8) monitoring wells will be installed to further assess the lateral and vertical extent of contamination and hydrogeology in Area 3, and to further identify potential contaminant source areas. Initial groundwater samples will be collected at new groundwater monitoring wells and quarterly groundwater samples will be collected at new and existing groundwater monitoring wells and at two existing production wells in Area 3.

4.1.1 Sampling Locations

Figure 1 of Appendix A shows the locations of the proposed conventional and MP monitoring wells and proposed production well sampling locations (01900547 and 01902979) in Area 3. Proposed screen intervals for conventional and MP monitoring wells are shown in Table 4-1. Note that there are several screen intervals at the MP monitoring well location.

The conventional wells (MW1-7 and MW1-8) will be located in the western portion of Area 3 to collect groundwater data between existing production wells with VOC contamination toward the east and suspected sources in the west.

The proposed MP well (MW1-6) will be installed between the contamination source area identified near the Temple City Sheriff's Station and downgradient production wells impacted with PCE. The proposed MP well will be constructed with seven depth discrete groundwater sampling intervals. Groundwater data collected from the MP well will be used to assess the lateral and vertical nature and extent of this contamination.

The rationale for the proposed conventional and MP well locations and screen intervals is described in the *San Gabriel Valley NPL Area 3 Remedial Investigation Data Needs* memorandum (CH2M HILL, 2004), included as Appendix A.

The two existing production wells are located at the San Gabriel Valley Country Club and are used to irrigate the golf course. Most production wells in Area 3 are sampled approximately annually. Groundwater samples have not been previously collected at production well 01900547 and have not been collected at production well 01902979 since 1987. These production wells have narrow screen intervals compared to other production

wells in Area 3. Therefore, samples from these wells will provide current water quality data from relatively specific depths.

4.1.2 Number of Samples

An initial groundwater sampling event will be conducted at new RI monitoring wells roughly 2 weeks after the completion of each monitoring well. Ongoing groundwater sampling events will be conducted on a quarterly basis at new and existing RI monitoring wells and proposed production well sampling locations for the remainder of a 6-month period, for a total of two quarterly sampling events. The quarterly sampling events at existing RI monitoring wells will be for VOCs. For new RI monitoring wells, the first quarterly groundwater sampling event will be for VOCs, and the second quarterly groundwater sampling event will be for the expanded analyte list (VOCs, dissolved metals, semivolatile organic compounds [SVOCs], n-nitrosodimethylamine [NDMA], perchlorate, nitrate, 1,4-dioxane, hexavalent chromium, and 1,2,3-TCP). These sampling events will be used to evaluate temporal changes in the nature and extent of VOC contamination in Area 3 that might be related to groundwater production, to evaluate any exceedances of regulatory limits, assist in identifying contaminant source areas, and assess the need for continued monitoring or future treatment. Future sampling for the expanded analyte list will depend on the results of the second quarterly sampling event at the new wells. At least one additional confirmation sample will be collected if the analyte is detected.

Groundwater sampling at production wells 01900547 and 01902979 will occur contemporaneous with quarterly monitoring well sampling for a total of two quarterly events. The schedule for groundwater sampling at the production wells will be coordinated with the San Gabriel Valley Country Club to occur while the wells are in use. The production well groundwater samples will be analyzed for the same analytes as the new RI monitoring wells.

Collection of field quality assurance (QA) samples is described in Section 4.1.2 of this FSP (EPA, 2003a).

It is likely that quarterly sampling will occur beyond the two events described in this FSP Addendum. However, these activities will be conducted on a new work assignment.

4.1.3 Laboratory Analyses

Analysis of VOCs with low-detection limits will be used to assess the magnitude of groundwater contamination in the monitoring and production wells and to determine whether any of the VOCs detected exceed regulatory limits. Sampling for VOCs will be included in each of the sampling events. In addition, sampling for dissolved metals, SVOCs, NDMA, perchlorate, nitrate, 1,4-dioxane, hexavalent chromium, and 1,2,3-TCP will be conducted during one sampling event at new RI monitoring wells to evaluate exceedances of regulatory limits and to assess the need for continued monitoring or future treatment for these analytes. The rationale for these analyses is described in the FSP (EPA, 2003a).

4.2 Investigation-Derived Wastes

Investigation-derived waste sampling is described in Section 4.2 of the FSP (EPA, 2003a). Drill cuttings and drilling mud samples previously collected during field investigation

activities at Area 3 indicated an elevated pH due to the installation of cement seals during well construction. Therefore, in addition to the investigation-derived waste sampling described in the FSP (EPA, 2003a), the drill cuttings and drilling mud will be analyzed for the California Department of Health Services (DHS) 96-hour acute aquatic toxicity, according to local landfill requirements for samples with elevated pH.

A quick turnaround time (7 days) will be necessary for characterization and disposal of the drill cuttings and drilling mud to avoid costs associated with long-term storage of the wastes.

Since groundwater sampling at the two existing production wells will occur while the wells are in use, purge water will be used by San Gabriel Valley Country Club as irrigation water for the golf course. Therefore, samples for purge water disposal will not be collected.

5. Request for Analyses

5.1 Analytical Parameters

This section presents the requests for analyses (RFAs) for the drill cuttings, drilling mud, well development water, and groundwater samples that will be collected during the RI field activities. Analytical parameters, test methods, and target detection limits for the well development and groundwater samples, drill cuttings, and drilling mud are discussed in Section 5.1 of the FSP (EPA, 2003a). Supplemental test methods and target detection limits for parameters not included in the FSP (EPA, 2003a) are summarized in Table 5-1. Unless otherwise noted, laboratory analyses will be performed by the EPA Region IX laboratory. In some instances (such as short sample holding times or unique analytical method requirements), a laboratory other than the EPA Region IX laboratory will be used.

Table 5-2. Tables 5-2a through 5-2c represent the RFAs for the monitoring and production wells in NPL Area 3. Because there are three types of groundwater sampling events (initial, expanded quarterly, and typical quarterly), three tables are included. Table 5-2a is the RFA for the initial sampling event at the new wells. The initial sampling event will be conducted within approximately 2 weeks of completion of a well. Table 5-2b is the RFA for a typical quarterly event, which will involve sampling for VOCs only. A typical quarterly sampling event will include both new and existing RI monitoring wells, as well as the two San Gabriel Valley Country Club production wells. Table 5-2c is the RFA for the expanded quarterly sampling event at the new RI monitoring wells and San Gabriel Valley Country Club production wells. The expanded quarterly sampling event will be approximately 6 months after installation of the wells and will involve a more comprehensive list of analyses compared to the initial or typical quarterly sampling events. Existing RI monitoring wells will be sampled for VOCs only (typical quarterly RFA [Table 5-2b]) during this second quarterly sampling event.

Table 5-3a. Table 5-3a is the RFA for collection of samples for analyses of drill cuttings and drilling mud. As discussed in the data quality objectives (DQOs) presented in Appendix A of the QAPP (EPA, 2003b), these samples will be used to determine if the drill cuttings and/or the drilling mud are to be disposed of as hazardous or nonhazardous waste. The

laboratory is expected to meet the specified detection limits for these compounds shown in Table A-3 of the QAPP (EPA, 2003b) and Table A-3 of the QAPP Addendum (EPA, 2004).

Table 5-3b. Table 5-3b is the RFA for collection of quick turnaround time (i.e., 72-hour) samples for analysis of well-development water. As discussed in the DQOs presented in Appendix A of the QAPP (EPA, 2003b), these samples will be used to determine if development water is to be disposed of as hazardous or nonhazardous waste. One duplicate sample also will be collected. The number of blank samples collected will be equal to 10 percent of the total development and purge water samples collected, or one per week, whichever is greater. The blank samples will be analyzed according to Table 5-3b.

5.2 Schedule

Sampling of investigation-derived wastes is expected to begin in January 2005, will occur periodically (see Tables 5-3a and 5-3b), and will last through February 2005.

An initial groundwater sampling event for VOCs will be conducted within approximately 2 weeks of completion of each monitoring well. It is anticipated that the initial sampling event will occur in two phases: one for well MW1-6 during January 2005 and one for wells MW1-7 and MW1-8 during February 2005. Ongoing groundwater sampling events (i.e., at new and existing wells) will be conducted on a quarterly basis for VOCs for 6 months, for a total of two quarterly sampling events, with the last event occurring in August 2005.

During the second quarterly sampling event at the new wells and San Gabriel Valley Country Club production wells, anticipated to take place in August 2005, additional groundwater sampling will be conducted at each well for dissolved metals, SVOCs, NDMA, perchlorate, nitrate, 1,4-dioxane, hexavalent chromium, and 1,2,3-TCP. Additional or continued sampling for these analytes will depend on the results of the second quarterly sampling event. For example, one additional confirmation sample will be collected if an analyte is detected in a well.

6. Field Methods and Procedures

This section of the FSP Addendum provides information on field activities associated with the Area 3 RI. Included in this section are methods and procedures for the following:

- Monitoring well drilling and construction
- Sample collection
- Use of sample containers and preservatives
- Decontamination
- Containment and disposal of investigation-derived wastes
- Sample management and documentation
- Quality control (QC) sample collection

6.1 Monitoring Well Drilling and Construction

6.1.1 Drilling

Drilling methods and requirements are described in Section 6.1.1 of the FSP (EPA, 2003a).

6.1.2 Borehole Drill Cuttings Collection

Borehole drill cuttings collection is described in Section 6.1.2 of the FSP (EPA, 2003a).

6.1.3 Well Installation and Construction

Well installation and construction, including typical MP and conventional monitoring well design, are described in Section 6.1.3 of the FSP (EPA, 2003a). The two 4-inch-diameter conventional monitoring wells, MW1-7 and MW1-8, will be drilled to a depth of approximately 300 feet below ground surface (bgs). The typical conventional monitoring well design is shown in Figure 6-1.

Immediately upon completion of the drilling, boreholes will be geophysically logged. Results from the geophysical logging will help determine which zones to monitor. The following geophysical logs will be run:

- Resistivity (16- and 64-inch lateral)
- Spontaneous potential (SP)
- Focused resistivity
- Natural gamma
- Caliper
- Sonic

6.2 Groundwater Sample Collection

Groundwater samples will be collected from new and existing conventional, cluster, and MP monitoring wells installed as part of the RI field activities and at two San Gabriel Valley Country Club production wells. Groundwater sample collection at MP, cluster, and conventional groundwater monitoring wells is described in Section 6.2 of the FSP (EPA, 2003a). Production wells will be sampled using the conventional sampling method described in Section 6.2 of the FSP (EPA, 2003a).

6.3 Sample Containers and Preservatives

Sample container requirements and preservation methods for each analysis are described in Section 6.3 of the FSP (EPA, 2003a) and are summarized in Tables 5-2 (a through c) and 5-3 (a and b) of this FSP Addendum.

6.4 Decontamination

Decontamination methods and requirements are described in Section 6.4 of the FSP (EPA, 2003a).

6.5 Containment and Disposal of Investigation-Derived Waste

Containment and disposal of investigation-derived wastes are described in Section 6.5 of the FSP (EPA, 2003a). Purge water from production well sampling will be used by the San Gabriel Valley Country Club as irrigation water.

6.6 Sample Management Procedures and Documentation

Sample management and documentation procedures, including sample labeling, sample packaging, cooler packaging, cooler shipment, chain-of-custody documentation, and documentation of field notes, are described in Section 6.6 of the FSP (EPA, 2003a).

6.7 Quality Control Samples

QC sample requirements are described in Section 6.7 of the FSP (EPA, 2003a) and are summarized in Tables 5-2 (a through c) and 5-3 (a and b) of this FSP Addendum.

7. Health and Safety Plan

The Health and Safety Plan for the activities described in this FSP Addendum is provided in Appendix C.

8. References

U.S. Environmental Protection Agency. 1993. *Guidance for Preparation of a U.S. EPA Region IX, Field Sampling Plan for EPA-Lead Superfund Project.*

_____. 2003a. *Field Sampling Plan for San Gabriel Valley NPL Area 3 Remedial Investigation Field Activities.* Prepared by CH2M HILL. February.

_____. 2003b. *Quality Assurance Project Plan for San Gabriel Valley NPL Area 3 Remedial Investigation Field Activities.* Prepared by CH2M HILL. February.

_____. 2004. *Quality Assurance Project Plan Addendum No. 1 for San Gabriel Valley NPL Area 3 Remedial Investigation Field Activities.* Prepared by CH2M HILL. October.

Tables

**Table 1-1
Groundwater Sampling Results
San Gabriel Valley NPL Area 3
Preliminary**

Well Name	Well/ Station ID	Well Depth (ft bgs)	Screened Interval(s) (ft bgs)	Date Sampled	Depth to Water (feet bgs)	Volatile Organic Compounds														Semi Volatile Organic Compounds				Anions		Metals				
						µg/L														µg/L				mg/L	µg/L	µg/L				
						TCE	PCE	1,1-DCE	cis-1,2-DCE	CCL	1,2-DCA	Carbon Disulfide	Benzene	Toluene	Chloromethane	2-Butanone	DFM	Chloroform	1,2,3-Trichloropropane	Acetone	NDMA	1,4-Dioxane	bis (2-Ethylhexyl) phthalate	Butyl benzy phthalate	Nitrate-N	Perchlorate	Hexavalent Chromium			
MW1-5	EPAMW15_06	800	325-335	07/17/03	294.07	2.6	2.5	<1	<1	<0.5	<0.5	-	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-	-	-		
				11/07/03	296.74	3.9	2.8	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-	-	-
				02/04/04	294.37	2.6	2.4	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	<1	<4	<1	<1	<1	0.413	<4	0.000699J	1.9	11	1.4J	19	2.7	2.7
				05/20/04	294.71	4	4.2	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-	-	-
				08/04/04	298.01	3.3	3.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<4	<1	<1	<1	<4	-	-	-	-	-	-	-	-
	EPAMW15_05	400-410	07/17/03	296.24	1.7	7.6	<1	<1	<0.5	<0.5	-	<1	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-	-	-		
			11/07/03	298.04	1.6	21	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-	-	-		
			02/04/04	295.18	1.4	18	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	<4	<1	<1	<1	0.15	<4	0.000397J	<1.3	8.2	0.6J	16	2.4	4.7		
			05/20/04	296.22	1.8	20	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-	-	-		
			08/04/04	299.84	0.89/1.5	14/22	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	2.4J/1.6J	<0.5/<0.5	<0.5/0.12	-	2.4J/<5	-	-	-	-	-	-	-	
	EPAMW15_04	480-490	07/17/03	301.99	2	2.2	<1	<1	<0.5	<0.5	-	<1	<1	<1	<1	<4	<1	<1	<1	<4	2.8J	-	-	-	-	-	-	-		
			11/07/03	302.10	<1	0.8J/1	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-	-			
			02/04/04	299.22	<1	<1	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	2J	<1	<1	<1	0.0102	<4	0.000519J	<1.1	3.2	1.8J	2	<2	7.1		
			05/20/04	301.39	<1	<1	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	<4	<1	<1	<1	<4	2.7J	-	-	-	-	-	-			
			08/04/04	305.01	<0.5	0.35J	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<4	<1	<1	<4	<5	-	-	-	-	-	-			
	EPAMW15_03	590-600	07/17/03	323.70	2.2	3.5	<1	<1	<0.5	<0.5	-	<1	<1	<1	<1	<4	<1	<1	<1	<4	2.6J	-	-	-	-	-	-			
			11/07/03	315.40	<1	<1	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-				
			02/04/04	311.18	<1	<1	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	2J	<1	<1	<1	0.00356	<4	0.000661J	<1.1	6.1	1.7J	1.2	<2	8.1		
			05/20/04	319.60	<1	0.7J	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-				
	EPAMW15_02	670-680	08/04/04	323.45	<0.5	0.73	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<4	<1	<1	<4	<5	-	-	-	-	-	-				
			07/17/03	323.91	1.2	1.3	<1	<1	<0.5	<0.5	-	<1	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-				
			11/07/03	317.11	<1	<1	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-				
			02/04/04	310.58	<1	<1	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	2J	<1	<1	<1	0.00495	<4	0.000462J	<1.1	6.8	1.9J	0.06J	<2	0.32J		
			05/20/04	319.78	<1	<1	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-				
EPAMW15_01	770-780	08/04/04	323.84	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<4	<1	<1	<4	<5	-	-	-	-	-	-					
		07/17/03	318.23	2.3	2.5	<1	<1	<0.5	<0.5	-	<1	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-					
		11/07/03	309.56	0.5J	0.6J/1	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-					
		02/04/04	303.79	<1	<1	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	2J	<1	<1	<1	0.034	<4	0.00314	<1.1	5.5	2J	<0.1	<2	<1			
		05/20/04	314.47	<1	<1	<1	<1	<0.5	<0.5	<1	<1	<1	<1	<1	<4	<1	<1	<1	<4	-	-	-	-	-	-					
					08/04/04	318.76	0.11J	0.17J	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	-	-	-	-	-	-					
MCL (µg/L; mg/L for dissolved metals and nitrate)						5 ¹	5 ¹	6 ¹	6 ¹	0.5 ¹	0.5 ¹	160 ⁴	1 ¹	150 ¹	None	None	1 ⁴	None	0.005 ⁴	None	0.010 ⁴	3 ⁴	4 ¹	None	10 ¹	6 ⁴	None			

NOTES: TCE=Trichloroethene; PCE=Tetrachloroethene; CCL=Carbon Tetrachloride; 1,1,-DCE=1,1-Dichloroethene; cis-1,2-DCE=cis-1,2-Dichloroethene; 1,2-DCA=1,2-Dichloroethane; NDMA=N-Nitrosodimethylamine; DFM=Dichlorodifluoromethane.
 -- = Not sampled.
 Except for calcium, magnesium, potassium, and sodium, only compounds with a state or federal regulatory level and detected concentrations are shown.
 MCL=EPA or California Maximum Contaminant Level (whichever is lower).
¹ = California
² = EPA
³ = Secondary MCL
⁴ = California Action Level
 J-Indicates results that are considered estimates because they fall between the instrument detection limit and the contract-required quantitation limit.
 All other reported VOCs were not detected above laboratory detection limits (generally 1 µg/L).
 Not all analytes are sampled for each quarter. The analyses performed each quarter are based on rationales provided in EPA's FSP.
 Monitoring well MW1-2B has not been sampled due to the groundwater level falling below the screen interval.

TABLE 4-1
Proposed Screen Intervals for Cluster and Multiport Monitoring Wells

Well Name	MW1-6	MW1-7	MW1-8
Well Type	Multiport	Conventional	Conventional
Screen Intervals (feet bgs)	270-290 350-360 440-450 520-530 600-610 680-690 770-780	270-290	270-290

TABLE 5-1
Supplemental Method and Detection Limit Information for Drill Cuttings and Drilling Mud

Parameter	Method ^a	Target Detection Limit
DHS 96-Hour Acute Aquatic Toxicity Screening Test	Cal-DHS	Not Applicable

^a Project standard operating procedure (SOP) is provided in Appendix B, as this analysis may be performed by laboratories other than the EPA Regional laboratory or its contractors.

Table 5-2a
Request for Analyses: Initial Groundwater Sampling Event
Area 3 Remedial Investigation
(Matrix = Water)

Anticipated Laboratory Performing Analysis						Organics
						EPA
Method						EPA 524.2 ^(a)
Specific Analyses Requested						VOCs
Preservatives						HCl to pH <2; chill to 4C; no headspace
Analytical Holding Time						Hold <14 days
Contract Holding Time						Hold <10 days
						# bottles/ analysis
Well Number	Sample Location	Sample ID	Concentration	Schedule	Turn-Around Time	3x40 mL glass vial
MW1-6 (zone 1)	Zone		Low	Week 10	Normal	X
MW1-6 (zone 2)	"		"	"	"	X
MW1-6 (zone 3)	"		"	"	"	X
MW1-6 (zone 4)	"		"	"	"	X
MW1-6 (zone 5)	"		"	"	"	X
MW1-6 (zone 6)	"		"	"	"	X
MW1-6 (zone 7)	"		"	"	"	X
MW1-6 (zone 7)	"	Duplicate	"	"	"	X
Blank	Equip.		"	"	"	X
Blank	Temp ^b		"	"	"	
MW1-7	Well Head	Lab QC	"	Week 18	"	X
MW1-8	"		"	"	"	X
MW1-8	"	Duplicate	"	"	"	X
Blank	Equip.		"	"	"	X
Blank	Temp ^b		"	"	"	
Total Well Samples						9
Total Duplicates						2
Total Field/Equipment Blanks						2
Total Laboratory QC (MS/MSD) Samples						1
Total Analyses						13
Notes						
(a) pH readings to be reported for individual samples						
(b) Temperature (Temp) blanks will be prepared and sent with each cooler each day						
Labs: EPA = EPA Region IX Lab (Oakland, CA)						
Lab QC = Matrix spike/matrix spike duplicate sample set which will be twice the normal sample volume						

Table 5-2b
Request for Analyses: Typical Quarterly Sampling Event
Area 3 Remedial Investigation
(Matrix = Water)

Anticipated Laboratory Performing Analysis						Organics
Method						EPA
Specific Analyses Requested						EPA 524.2 ^(a)
Preservatives						VOCs
Analytical Holding Time						HCl to pH <2; chill to 4C; no headspace
Contract Holding Time						Hold <14 days
						Hold <10 days
						# bottles/ analysis
Well Number	Sample Location	Sample ID	Concentration	Schedule	Turn-Around Time	3x40 mL glass vial
MW1-1	Well Head	Lab QC	Low	Day 1	Normal	X
MW1-2 Shallow	"		"	"	"	X
MW1-2 Shallow	"	Duplicate	"	"	"	X
MW1-2 Deep	"		"	"	"	X
MW1-7	"		"	"	"	X
MW1-8	"		"	"	"	X
01900547	"		"	"	"	X
01902979	"		"	"	"	X
Blank	Field		"	"	"	X
Blank	Temp ^b		"	"	"	
MW1-3 (zone 1)	Zone		"	Day 2	"	X
MW1-3 (zone 2)	"		"	"	"	X
MW1-3 (zone 3)	"		"	"	"	X
MW1-3 (zone 4)	"		"	"	"	X
MW1-3 (zone 5)	"		"	"	"	X
MW1-4 (zone 1)	"		"	"	"	X
MW1-4 (zone 2)	"		"	"	"	X
MW1-4 (zone 2)	"	Duplicate	"	"	"	X
MW1-4 (zone 3)	"	Lab QC	"	"	"	X
MW1-4 (zone 4)	"		"	"	"	X
Blank	Equip.		"	"	"	X
Blank	Temp ^b		"	"	"	
MW1-5 (zone 1)	Zone		"	Day 3	"	X
MW1-5 (zone 2)	"		"	"	"	X
MW1-5 (zone 2)	"	Duplicate	"	"	"	X
MW1-5 (zone 3)	"		"	"	"	X
MW1-5 (zone 4)	"		"	"	"	X
MW1-5 (zone 5)	"		"	"	"	X
MW1-5 (zone 6)	"		"	"	"	X

Table 5-2b
Request for Analyses: Typical Quarterly Sampling Event
Area 3 Remedial Investigation
(Matrix = Water)

Anticipated Laboratory Performing Analysis						Organics
Method						EPA
Specific Analyses Requested						EPA 524.2 ^(a)
Preservatives						VOCs
Analytical Holding Time						HCl to pH <2; chill to 4C; no headspace
Contract Holding Time						Hold <14 days
						Hold <10 days
						# bottles/ analysis
Well Number	Sample Location	Sample ID	Concentration	Schedule	Turn-Around Time	3x40 mL glass vial
MW1-6 (zone 1)	"		"	"	"	X
MW1-6 (zone 2)	"		"	"	"	X
MW1-6 (zone 3)	"		"	"	"	X
MW1-6 (zone 4)	"		"	"	"	X
MW1-6 (zone 5)	"		"	"	"	X
MW1-6 (zone 6)	"		"	"	"	X
MW1-6 (zone 7)	"		"	"	"	X
Blank	Equip.		"	"	"	X
Blank	Temp ^b		"	"	"	
Total Well Samples						29
Total Duplicates						3
Total Field/Equipment Blanks						3
Total Laboratory QC (MS/MSD) Samples						2
Total Analyses						35
Notes						
(a) pH readings to be reported for individual samples						
(b) Temperature (Temp) blanks will be prepared and sent with each cooler each day						
Labs: EPA = EPA Region IX Lab (Oakland, CA)						
Lab QC = Matrix spike/matrix spike duplicate sample set which will be twice the normal sample volume						

Table 5-3b
Request for Analyses: Investigation-Derived Wastes
Area 3 Remedial Investigation
(Matrix = Water)

Anticipated Laboratory Performing Analysis						Organics					Inorganics			
						EPA			PA	EPA	EPA (EMAX)	EPA	EPA	EPA
Method						EPA 524.2 ^(a)	EPA 8270	Cal. DHS liquid extraction C/MS or Cal. DHS purge and trap GC/MS	Mod EPA 1625	EPA 8270/SIM	EPA 218.6	EPA 200.7, EPA 200.8, EPA 200.9, EPA 245.1	EPA 314	EPA 300.0
Specific Analyses Requested						VOCs	SVOCs	1,2,3-trichloropropane	NDMA	1,4-Dioxane	Hexavalent Chromium	Dissolved Metals	Perchlorate	Nitrate
Preservatives						HCl to pH <2; chill to 4C; no headspace	Chill to 4° C	HCl to pH <2; chill to 4C; no headspace	Chill to 4° C	Chill to 4° C	Chill to 4° C	0.45-um filter, HNO3 to pH<2, chill to 4° C	Chill to 4° C	Chill to 4° C
Analytical Holding Time						Hold <14 days	Hold < 7 days prior to extraction; <40 days after	Hold <14 days	Hold <7days prior to extraction; <40 days after extraction	Hold <7days prior to extraction; <40 days after extraction	< 24 Hours	<28 days for Hg <6 months for others	< 28 days	<48 hours
Contract Holding Time						Hold <10 days	Hold < 7 days prior to extraction; <40 days after	Hold <10 days	Hold <7days prior to extraction; <40 days after extraction	Hold <7days prior to extraction; <40 days after extraction	< 12 Hours	<26 days for Hg <6 months for others	< 26 days	<12 hours
						# bottles/ analysis					# bottles/ analysis			
Well Number	Sample Location	Sample ID	Concentration	Schedule	Turn-Around Time	3x40 mL glass vial	2x1-L amber bottle	3x40 mL glass vial	2x1-L amber bottle	2x1-L amber bottle	1x125 mL poly bottle	1x1-L poly bottle	1x250 mL poly bottle	
MW1-6	Baker Tank	MW1-6-DW1 (Lab QC)	Low	Week 8	72 hours	X	X	X	X	X	X	X	X	
MW1-6	Baker Tank	MW1-6-DW2	"	"	"	X	X	X	X	X	X	X	X	
MW1-6	Baker Tank	MW1-6-DW3	"	"	"	X	X	X	X	X	X	X	X	
Blank	Field		"	"	"	X	X	X	X	X	X	X	X	
Blank	Temp ^b		"	"	"									
MW1-7	Baker Tank	MW1-7-DW1	"	Week 12	"	X	X	X	X	X	X	X	X	
MW1-7	Baker Tank	MW1-7-DW2 (Dup of DW1)	"	"	"	X	X	X	X	X	X	X	X	
Blank	Field		"	"	"	X	X	X	X	X	X	X	X	
Blank	Temp ^b		"	"	"									
MW1-8	Baker Tank	MW1-8-DW1	"	Week 16	"	X	X	X	X	X	X	X	X	
Blank	Field		"	"	"	X	X	X	X	X	X	X	X	
Blank	Temp ^b		"	"	"									
Total Well Samples						5	5	5	5	5	5	5	5	
Total Duplicates						1	1	1	1	1	1	1	1	
Total Field/Equipment Blanks						3	3	3	3	3	3	3	3	
Total Laboratory QC (MS/MSD) Samples						1	1	1	1	1	1	1	1	
Total Analyses						9	9	9	9	9	9	9	9	
Notes														
(a) pH readings to be reported for individual samples														
(b) Temperature (Temp) blanks will be prepared and sent with each cooler each day														
Labs: EPA = EPA Region IX Lab (Oakland, CA); PA = Pacific Analytical (Carlsbad, CA); EPA (EMAX) = EMAX (Torrance, CA), an EPA Region IX Contract Lab														
Lab QC = Matrix spike/matrix spike duplicate sample set which will be twice the normal sample volume														

Figure

GROUND SURFACE

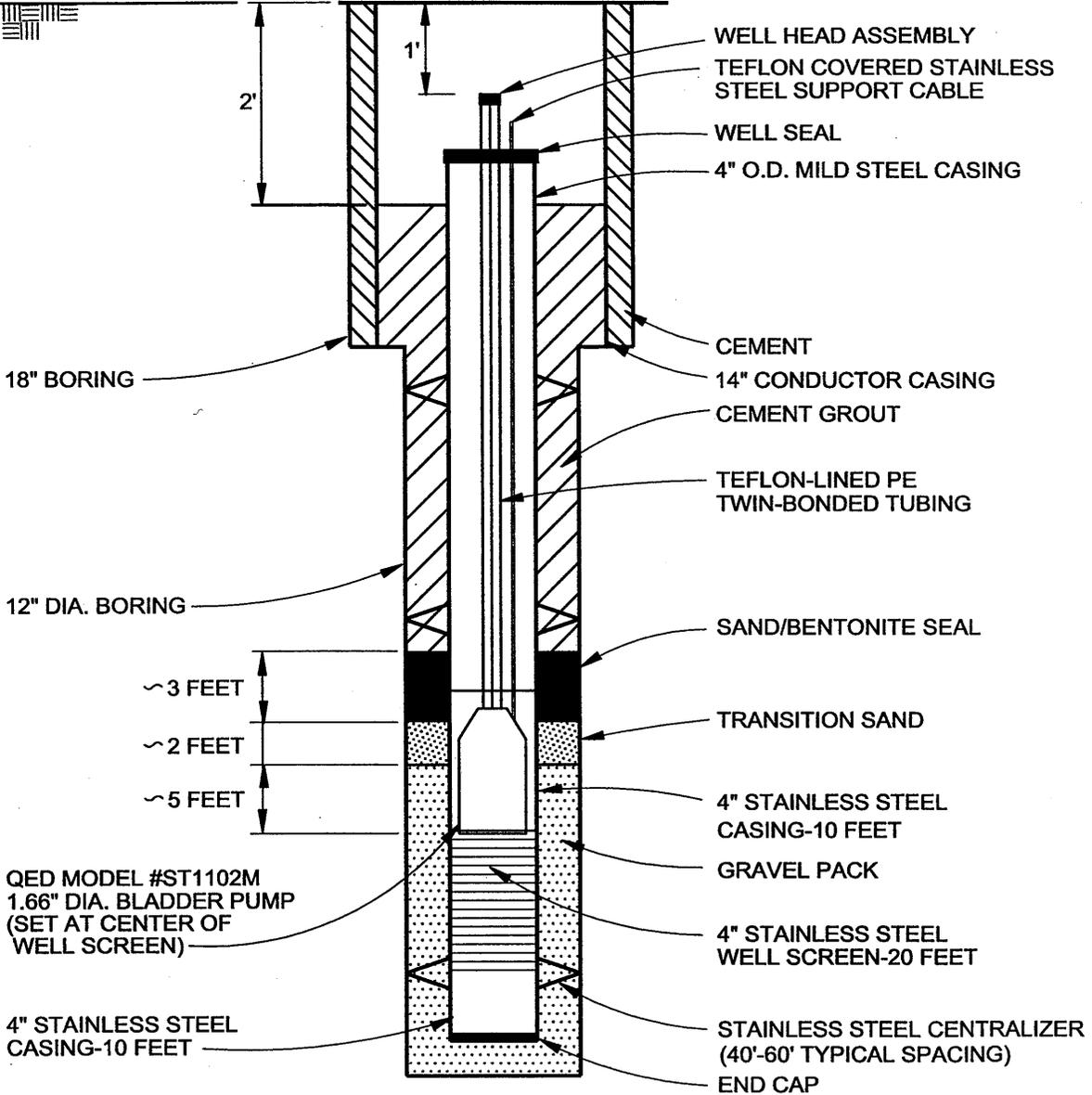


Figure 6-1
Typical Design Detail for
Conventional Monitoring Well
FSP Addendum No. 1

NOT TO SCALE

Appendix A
San Gabriel Valley NPL Area 3 Remedial Investigation
Data Needs

MEMORANDUM

CH2MHILL

San Gabriel Valley NPL Area 3 Remedial Investigation Data Needs

TO: Lisa Hanusiak/U.S. EPA Region IX
COPIES: File
FROM: Bob Collar/CH2M HILL/SCO
DATE: June 30, 2004

The purpose of this memorandum is to briefly status and summarize Remedial Investigation (RI) information collected to date in San Gabriel Valley NPL Area 3 and to recommend additional information needed for completion of the RI.

Key RI activities performed to date include:

- Preparation of the January 2001 draft Data Evaluation Report (functional equivalent of an RI work plan), including land use information
- Installation (completed in July 2003) and sampling of five deep monitoring wells
- Preparation of groundwater level elevation contours for the Area 3 OU
- Preparation of hydrogeologic cross sections through the Area 3 OU, including the interpreted extent of VOC contamination
- Preparation of two VOC contamination maps for the 1) shallow and 2) deeper aquifers in the Area 3 OU
- Preparation of charts for numerous production wells showing PCE, TCE, and pumping data versus time

The information above and limited facility-specific data available have been used to develop a conceptual model of VOC contamination in the Area 3 OU. The ultimate goal of the RI is to refine this model sufficiently so that it can be used to support: 1) preparation of a Feasibility Study (FS) for the Area 3 OU and selection of a remedy (i.e., Record of Decision) and 2) identification of potentially responsible parties (PRPs) who would perform the FS and remedial action.

At this point in the RI, it is most convenient to describe the Area 3 conceptual model relative to specific geographic areas, which are based on the distribution of various contaminants such as TCE, PCE, and 1,2,3-trichloropropane. These conceptual sub-models are described below, along with current data gaps, and data needs identified as key to completing the RI as soon as possible. Selected and supporting RI information is shown in attached Figure 1, and recommended actions, including approximate costs, are summarized in Table 1.

WESTERN AREA 3

Conceptual Model

VOC contamination source areas have been identified in the Mission Triangle portion of the western Area 3 OU (Figure 1). TCE groundwater contamination has been identified in both facility and EPA monitoring wells in this sub-area, which is west of production wells impacted by TCE. Thus, this area is likely a source area for TCE observed in production wells to the east and northeast. While TCE is the predominant VOC in production wells in the western portion of Area 3 and is found in facility monitoring wells in the Mission Triangle area, an evaluation of soil gas data shows that PCE is also present in facility monitoring wells and at relatively higher concentrations in soil gas beneath the same facilities. Although PCE use has been documented at these facilities, the reason for the greater concentrations of TCE in groundwater are not fully understood. Given the relatively greater age of PCE use at one of the Mission Triangle facilities, it is possible that biologically-mediated degradation of PCE has occurred, leading to elevated TCE in groundwater, along with other degradation by-products such as cis-1,2-dichloroethylene.

A fault that acts as an impedence to groundwater flow from west to east has been identified between the Mission Triangle area and production wells to the east. Historic groundwater flow was from the Mission Triangle Area towards production wells to the east. Groundwater levels east of the fault, tentatively associated with the Whittier Fault Zone (see Lamar, D.L., *Geology of the Elysian Park-Repetto Hills Area, Los Angeles County, California*, California Division of Mines and Geology Special Report 101, 1970), have declined more than 100 feet over the last 75 years, while groundwater levels in the Mission Triangle area appear to have declined less and at a lower rate. Current groundwater flow in the Mission Triangle area may be to the southeast, as opposed to toward production wells east of the fault. However, groundwater monitoring well data in the Mission Triangle area and to the east are very limited. And, some of the monitoring wells are close to shallow bedrock, which may affect the direction of groundwater flow. As discussed below, the groundwater flow direction may be different from what is currently interpreted, particularly near the fault noted above and shown on Figure 1. Multipoint monitoring well and other data suggest that TCE contamination is limited in vertical extent. The current conceptual model of the western OU suggests that containment of TCE-contaminated groundwater emanating from the Mission Triangle area using new and/or existing extraction wells may be an interim remedial measure to be considered for the western Area 3 OU.

Data Gap(s)/ Need(s)

Although potential contaminant sources have been identified in the Mission Triangle area, contaminant migration across the Whittier Fault Zone has not yet been confirmed. Moreover, although historic groundwater level elevation maps show suggest west to east groundwater flow across the trace of the fault, such flow has not been documented. Thus, understanding past and current groundwater flow conditions near the fault is necessary to 1) assist with selection of remedial alternatives and 2) assist in naming of PRPs in the western Area 3 OU.

Sources of TCE in groundwater have tentatively been identified in the Mission Triangle area, though the relationship between PCE use at some facilities and TCE in groundwater needs to be better understood. EPA requested that CH2M HILL evaluate this relationship. In doing so, CH2M HILL has determined that this is not a high priority data need in terms of identifying sources of groundwater contamination. This is partly because PCE is also present in the groundwater, which is consistent with documented PCE use at some of the Mission Triangle facilities. Nevertheless, understanding this relationship will be useful in confirming whether or not such facilities are in fact sources of relatively high concentrations of TCE in groundwater in the Mission Triangle area.

Recommended Action(s)

We recommend that EPA's FEFLOW groundwater model be updated to adequately simulate the newly documented fault and to be used in assessing historic and current groundwater flow between the Mission Triangle area and the rest of the OU (see Table 1, item 6). In addition, we recommend the installation of two additional monitoring wells to be used to assess current groundwater flow directions west of and near the fault separating the Area 3 OU (Figure 1). Data from these wells will help assess the groundwater flow direction between the Mission Triangle area and production wells to the east. This information will help to 1) assess whether or not contamination in the Mission Triangle area is a continuing source of TCE contamination observed in nearby production wells and 2) link contaminant sources in the Mission Triangle area to the contamination to the east. The evaluation of soil gas data in the Mission Triangle area should be expanded to assess the relationship between PCE use at facilities and the predominant TCE groundwater contamination beneath the facilities. This would involve characterization of the soil gas and groundwater chemistry with respect to VOCs to assess whether biologically-mediated degradation of PCE could have resulted in the observed groundwater contamination. The recommended actions are summarized in Table 1.

CENTRAL AREA 3

Conceptual Model

1,2,3-trichloropropane is a VOC that is not as readily removed from groundwater as other VOCs such as TCE and PCE. As a result of this, and the stringent treatment goals related to a low Action Level (AL), treatment costs can increase if this chemical is present in groundwater. 1,2,3-trichloropropane has been detected below the California DHS AL in one out of four EPA monitoring wells located just east of the fault in the western portion of the OU. On the other hand, 1,2,3-trichloropropane in excess of the AL of 5 ng/L exists in groundwater in the central portion of the OU (Figure 1). The highest concentrations have been found in EPA's multiport monitoring well MW1-5 and are in the shallowest two intervals, consistent with the detection of VOCs in only these two intervals. Lower concentrations have been measured in a few nearby production wells. These lower concentrations are likely the result of mixing of the relatively shallow 1,2,3-trichloropropane contamination over the relatively long screened intervals of production wells. The

prevalence of 1,2,3-trichloropropane in the shallower intervals of the central portion of the OU suggests that the source for the 1,2,3-trichloropropane contamination lies in the central or eastern portion of the OU and that it may be relatively close to the affected wells. Most of the wells with detected 1,2,3-trichloropropane, which are slightly east of center in the OU, are also impacted by PCE. However, the relationship between these two contaminants and their source(s) is not understood. PCE contamination in this portion of the OU appears to be coming from a source, or sources, near the Temple City Sheriffs Station, though this has not been confirmed.

Data Gap(s)/ Need(s)

Data collected to date suggest that VOC contamination in the central portion of the Area 3 OU may be limited to the upper part of the groundwater aquifer and hence amenable to focused extraction, containment, and treatment. However, the location of any future optimal remedial action is uncertain due to uncertainty about the source for 1,2,3-trichloropropane contamination and its relationship to PCE contamination. Thus, understanding the source of 1,2,3-trichloropropane contamination is necessary to: 1) assist with selection of a remedial action and 2) assist in naming of PRPs in the central Area 3 OU. To date, only limited testing of production wells in Area 3 using low-detection-limit 1,2,3-trichloropropane analyses has been performed as directed by DHS. Additional production well data are needed to better define the extent of 1,2,3-trichloropropane contamination. In addition, low-detection-limit 1,2,3-trichloropropane analyses are needed at potential PRP facilities to facilitate source identification.

Recommended Action(s)

EPA's January 2001 Draft Data Evaluation Report identified an area of industrial land use associated with a rail corridor near the central OU (Figure 1). This area, and other surrounding commercial and industrial areas, should be evaluated to identify potential 1,2,3-trichloropropane and PCE sources/PRPs. In addition, evaluation of 1,2,3-trichloropropane sources can be facilitated by developing a profile of typical businesses who have used or use this chemical. EPA may wish to coordinate Area 3 remedial investigation activities with DHS in an effort to expedite the testing of production wells in Area 3 for 1,2,3-trichloropropane using low (<5 ng/L) detection limit analytical methods. EPA should request that low-detection-limit 1,2,3-trichloropropane analyses be conducted at the Temple City Sheriffs Station monitoring wells and at other potential PRP wells in the OU. The recommended actions are summarized in Table 1.

EASTERN AREA 3

Conceptual Model

A VOC contamination source area has been identified near the Temple City Sheriff's station (Figure 1). PCE groundwater contamination exceeding 100x the MCL of 5 ug/L has been identified in monitoring wells at this facility, to the east of production wells impacted by PCE contamination. Current groundwater flow in this area is from east to west, suggesting a causative relationship between contamination beneath the sheriff's station and

contamination in production wells to the west. Multiport monitoring well data from the central OU suggest that PCE contamination may be limited in vertical extent.

Data Gap(s)/ Need(s)

Although PCE is the most prevalent VOC in production wells in the eastern portion of the OU, the vertical distribution is not fully understood. San Gabriel County Water District (SGCWD) well 01902786 was sampled in the late 1980s to evaluate the vertical distribution of nitrate and other contaminants. However, the sampling results were somewhat inconclusive and have not been evaluated in light of more recent data and the history of operation of this well. In addition, a few of the production wells (i.e., 01902786) in the eastern OU have apparently not been sampled in several years. There is a potential for other sources in the vicinity of the Temple City Sheriff's station area. In the eastern OU, time series charts of PCE in production wells in the area do not necessarily confirm that the Temple City Sheriff's station area is the only source for PCE contamination in the eastern OU. Because the vertical distribution of VOC contamination in the eastern portion of the OU is not clearly understood, and because other PCE source areas may exist, containment using new and/or existing extraction wells may or may not be a suitable interim remedial measure.

Recommended Action(s)

EPA should obtain and evaluate any available data for SGCWD wells 01902785 and 01902786 (e.g., vertical sampling data and more recent sampling results). CH2M HILL previously prepared charts showing PCE, TCE, and groundwater pumping versus time at many of the production wells in the OU. These charts have proved useful in 1) evaluating the relative impact of TCE versus PCE on production wells, 2) evaluating the effects of pumping of production wells on contamination migration, and 3) interpreting the vertical distribution of contaminants in the OU. These charts should be updated with the latest VOC and pumping data since they were last prepared about 3 years ago. In updating these charts, EPA should contact either the California Department of Health Services (DHS) or well owners to obtain purveyor-collected water quality data not routinely furnished to EPA. Similar information was recently obtained from DHS for the South El Monte OU, where in one instance DHS had approximately 3 times more data for a production well compared to EPA's database. Particular emphasis should be placed on obtaining water quality data collected by well owners from inactive production wells, as this information is not readily available or regularly provided to EPA. Having owner-collected data will facilitate EPA's efforts to develop a clear and recent portrayal of groundwater contamination in the OU.

A multiport monitoring well should be installed west of the Temple City Sheriff's station, between the station and production wells to the west. This well will be used to evaluate and monitor the vertical distribution of VOC contamination and to assist in identifying contaminant sources near the Temple City Sheriff's station. The recommended actions are summarized in Table 1.

NORTH CENTRAL AREA 3

Conceptual Model

Well 01901679, which is just north of Huntington Drive and east of Garfield Avenue in the north central portion of the OU, is the only well in the western half of the OU impacted by just PCE (Figure 1). Other wells in the western portion of Area 3 are impacted by essentially TCE groundwater contamination. This difference in VOC contamination suggests that a separate source area exists for well 01901679. The observation that other wells in the area are not impacted by PCE contamination suggests that the PCE source area may be relatively small and close to well 01901679. If this is the case, source control and wellhead treatment may be the preferred alternatives for dealing with this contamination.

Data Gap(s)/ Need(s)

No source for PCE in the north central portion of the OU has been clearly identified. In addition, whether or not VOC contamination in Area 3 originates in groundwater north of the Raymond Fault (Figure 1) has not been assessed.

Recommended Action(s)

EPA's January 2001 Draft Data Evaluation Report identified several small areas of commercial land use near well 01901679 (Figure 1). These areas should be evaluated to identify potential PCE sources/PRPs, such as a dry cleaning facility. Additionally, potential sources of groundwater contamination in the Raymond Basin should be identified. This would involve some research and contacting the water agency (Raymond Basin Management Board [RBMB]) responsible for managing groundwater in the Raymond Basin. The RBMB can be contacted at: 4536 Hampton Road, PO Box 686, La Canada Flintridge, CA 91012 (818) 790-4036. In addition, other information on the Raymond Basin is available at the Agency for Toxic Substances and Disease Registry (http://www.atsdr.cdc.gov/HAC/PHA/jetprop/jpl_toc.html), the Los Angeles Regional Water Quality Control Board (<http://www.swrcb.ca.gov/rwqcb4/html/perchlorate/>) and the California Department of Water Resources (http://www.dpla2.water.ca.gov/publications/groundwater/bulletin118/basins/4-23_Raymond.pdf). The recommended actions are summarized in Table 1.

ENTIRE AREA 3 OU: ADDITIONAL ACTION(S)

In addition to updating of time-series plots for wells in the eastern OU, as described above, all production wells should be evaluated throughout the OU to ensure that no data gaps are present (i.e., well 01901679, with PCE contamination in the north-central portion of the OU). An additional concern is that there is no clear picture (i.e., snapshot) of which wells have been impacted, and how, by VOC contamination in the OU. This information will be particularly useful if existing production wells are contemplated as components of a remedial action. Based on previous discussions between EPA and CH2M HILL, the need to obtain this information from DHS has been identified. EPA has initiated a request with DHS and this information is forthcoming. It will be used together with other information (e.g., maps showing the distribution of VOCs, groundwater level elevation contours, and charts of VOC contamination and groundwater pumping at production wells) to further refine the conceptual model of the entire OU. The recommended actions are summarized in Table 1.

Table 1. San Gabriel Valley NPL Area 3 Data Needs

Item	Recommended Action	Location of Action Within OU	Purpose or Objective	Work Completed?	Consequence(s) if Not Done (if new work or work not completed)	Within Scope of RAC IX Contract?	Budgeted for in Work Plan?	Approximate Cost (if new work within scope of RAC IX work plan)	Comment(s)	Priority (for new recommendations; 1 = highest or soonest)	
										Relative Importance	Proposed Schedule
Draft Data Evaluation Report Recommendations											
1	Spinner logging and depth-specific sampling of 4 production wells	West and Central	Evaluate vertical extent of TCE and PCE contamination and help locate and design (e.g., screen intervals and depths) RI monitoring wells	No	without prior knowledge of the vertical distribution, may result in increased cost of RI monitoring wells due to constructing screen intervals in and monitoring portions of the aquifer not impacted by contamination	Yes	Yes	--	no suitable production wells were identified from review of applicable data; this task will likely not be performed	--	--
2	Aquifer testing of 4 production wells	West and Central	Obtain aquifer property data to update groundwater model	No	adds to uncertainty in remedy costs because potential extraction well locations and rates are from groundwater model where aquifer parameters (e.g., aquifer hydraulic conductivity) are based on approximations rather than field measurements and estimates	Yes	Yes	--	recommend obtaining these data from purveyors, Watermaster, or power utility coincident with model update	--	--
3	Install 3 deep multipoint monitoring wells and 2 shallow monitoring well clusters	West and Central	Evaluate lateral and/or vertical extent of contamination throughout impacted portion of OU; link source area contamination to production well contamination	Yes	--	Yes	Yes	--	--	--	--
4	Update conceptual model of site	Throughout	Support remedy selection process	Ongoing	--	Yes	Yes	--	--	--	--
5	Investigate contamination at facilities	Throughout	Identify contamination source(s)	Ongoing by LARWQCB	can not identify sources and PRPs; limits remedy options to containment, instead of source control	No	No	--	--	--	--
New Recommendations											
6	Update groundwater model	Throughout	Identify contamination source area(s); link identified sources to regional contamination in production and RI monitoring wells; support remedy selection remedial design	No	significantly inhibits ability to link PRPs to regional groundwater contamination, to prepare risk assessment and feasibility study, and to select a remedy and perform remedial design	Yes	Yes	--	--	--	--
7	Install 2 shallow wells in western OU	West	Assess link between PRPs in the Mission Triangle area and impacted production wells east of the Whittier Fault Zone-both under current and historical groundwater flow conditions; this will also aid significantly in identifying contamination source areas	No	may be difficult to demonstrate link between PRPs in Mission Triangle area and regional contamination to the east, which will make it very challenging to negotiate implementation of the FS and RD/RA by PRPs, who will cite lack of documented connection between contamination at facilities and production wells to east; limits the ability to validate the groundwater model in the vicinity of the fault that acts as a partial barrier to groundwater flow and contamination, which will impact the ability to conduct the FS and remedial design;	Yes*	Yes	\$ 50,000	use \$ scoped for installation of facility monitoring wells; amend SAP, community relations support; assess whether alternative data collection activities are planned as part of facility-specific or other investigation to avoid spending EPA \$	3	3
8	Evaluate Mission Triangle study area soil gas and groundwater data	West	Confirm suspected link between shallow contamination at PRP facilities and underlying groundwater contamination by evaluating natural chemical degradation processes in the unsaturated and saturated zones	No	places burden for naming PRPs on other forms of evidence such as chemical usage and confirmed contamination	Yes*	No	\$ 2,500	--	10	10
9	Evaluate industrial areas in central OU for contamination sources	Central	Identify source area(s) of 1,2,3-trichloropropane and PCE impacting production wells in Central OU	No	may not be able to identify major sources and PRPs, which will shift FS and RD/RA costs on to EPA and other PRPs; not knowing location of 1,2,3-trichloropropane sources limits remedy options to containment, instead of source control	No	No	--	to be performed by other EPA contractor and LARWQCB	--	--
10	Develop profile of which industries use 1,2,3-trichloropropane	Throughout	Developing profile will cost effectively focus search for 1,2,3-trichloropropane sources in the Central OU	No	without focusing search, costs to identify sources and PRPs will increase due to investigation of unlikely sources	Yes	No	\$ 5,000	could conduct work under same subtask as LARWQCB meetings and PRP naming action plan	9	4

Table 1. San Gabriel Valley NPL Area 3 Data Needs

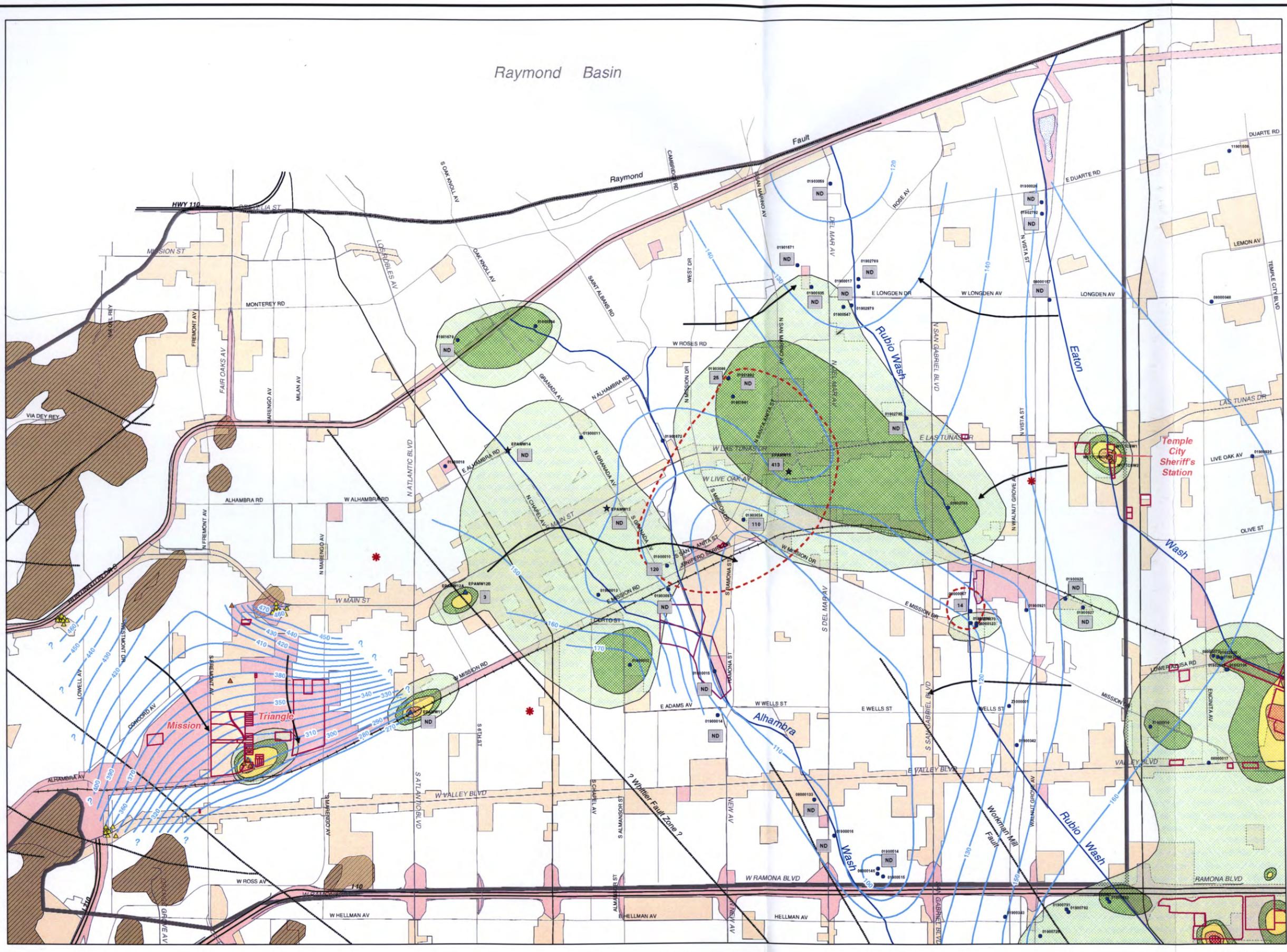
Item	Recommended Action	Location of Action Within OU	Purpose or Objective	Work Completed?	Consequence(s) if Not Done (if new work or work not completed)	Within Scope of RAC IX Contract?	Budgeted for in Work Plan?	Approximate Cost (if new work within scope of RAC IX work plan)	Comment(s)	Priority (for new recommendations; 1 = highest or soonest)	
										Relative Importance	Proposed Schedule
11	Work with DHS to ensure that all production wells in OU are sampled for 1,2,3-trichloropropane	Throughout	Further refine currently understood lateral and vertical extent of 1,2,3-trichloropropane contamination; this will cost-effectively facilitate source identification and will focus remedy options	No	without refining understanding of the extent of 1,2,3-trichloropropane contamination, source identification and remedy selection process will be more costly	Yes	No	\$ 2,500	--	4	5
12	Sample facility monitoring wells for 1,2,3-trichloropropane	Throughout	Rule out and identify source(s) of 1,2,3-trichloropropane impacting production wells in Central OU	No	may not be able to identify key sources and PRPs, which will shift FS and RD/RA costs on to EPA and other PRPs; not knowing location of 1,2,3-trichloropropane sources limits remedy options to containment, instead of source control	No	No	--	should be required by LARWQCB	--	--
13	Evaluate water quality data from SGCWD wells	East	Evaluate vertical extent of PCE contamination in eastern OU, which will allow for selection of appropriate remedy	No	by being less certain of vertical distribution of contamination, there is more uncertainty in the OU conceptual model, which may lead to a more costly remedy (e.g., conservatively-designed extraction wells and treatment systems)	Yes	Maybe	\$ 5,000	--	5	6
14	Obtain recent data for production wells from DHS	Throughout	Cost-effectively fill data gap by using inactive and active production well data collected by others to evaluate lateral and vertical extent of contamination, contamination migration, source area identification, and current status of production wells throughout the OU	No	might otherwise spend money to evaluate sampling of active or inactive production wells where data actually exist; by being less certain of horizontal and vertical distribution of contamination, there is more uncertainty in the OU conceptual model, which may lead to a more costly remedy (e.g., conservatively-designed extraction wells and treatment systems); will make source identification more costly and may shift cost of FS and RD/RA on to EPA and other PRPs	Yes	Maybe	\$ 4,000	--	6	7
15	Update TCE, PCE, and pumping time-series plots for production wells	Throughout	Evaluate lateral and vertical extent of contamination using data from impacted production wells; evaluate contamination migration using data from impacted and non-impacted production wells	No	by being less certain of distribution of contamination, there is more uncertainty in the OU conceptual model, which may lead to a more costly remedy (e.g., conservatively-designed extraction wells and treatment systems); will make source identification more costly and shift cost of FS and RD/RA on to EPA and other PRPs	Yes	Maybe	\$ 4,000	--	7	8
16	Install 1 deep multiport monitoring well west of Temple City Sheriff's station	East	Evaluate lateral and vertical extent of PCE contamination in eastern OU and link source area PCE contamination to production well contamination; this will allow for selection of appropriate remedy	No	by not establishing a link between PCE-impacted production wells and likely source(s) near the Temple City Sheriff's station, identification of source(s) and PRPs will be more difficult and costly; costs of the FS and RD/RA will potentially be shifted on to EPA and other PRPs; by not knowing the source(s) of PCE contamination in production wells, will significantly increase the difficulty in developing appropriate remedial actions; by being less certain of vertical distribution of contamination, there is more uncertainty in the OU conceptual model, which may lead to a more costly remedy (e.g., conservatively-designed extraction wells and treatment systems)	Yes*	No	\$ 350,000	see item 7 for amended SAP cost; includes 3 sampling events of 800-foot-deep well; assess whether alternative data collection activities are planned as part of facility-specific or other investigation to avoid spending EPA \$	2	2

Table 1. San Gabriel Valley NPL Area 3 Data Needs

Item	Recommended Action	Location of Action Within OU	Purpose or Objective	Work Completed?	Consequence(s) if Not Done (if new work or work not completed)	Within Scope of RAC IX Contract?	Budgeted for in Work Plan?	Approximate Cost (if new work within scope of RAC IX work plan)	Comment(s)	Priority (for new recommendations; 1 = highest or soonest)	
										Relative Importance	Proposed Schedule
17	Evaluate commercial areas in north-central OU for contamination sources	North central	Identify or rule out source area(s) of PCE impacting production well in north-central OU	No	may not be able to identify key sources and PRPs, which will shift FS and RD/RA costs on to EPA and other PRPs; not knowing location of PCE sources limits remedy options to containment, instead of source control	No	No	--	to be performed by other EPA contractor and LARWQCB	--	--
18	Evaluate area beyond and north of OU boundary (i.e., Raymond Fault) for contamination sources	North central	Identify or rule out source area(s) of PCE and TCE impacting production wells in western and north-central OU	No	leaves open to question possible source area with significant implications on remedy selection, which will make negotiation with PRPs to implement the FS and RD/RA more challenging	Yes*	No	\$ 10,000	--	8	9
19	Assess impact of contamination on production wells (update status)	Throughout	Evaluate seriousness of water supply problems and establish level of urgency for remedy selection; assess possible future use of wells as remedy components	No	will be more difficult to justify need for remedial action and may lead to cost-ineffective decisions; limits key information needed to select remedy	Yes	Maybe	\$ 5,000	--	1	1

* indicates work plan amendment is required to adjust scope and/or budget

Raymond Basin

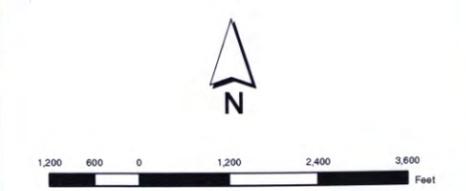


Legend

- ★ Proposed Monitoring Well
- Production Well
- ★ Multipoint Monitoring Well
- ▲ Cluster Monitoring Well
- ▲ WIP Monitoring Well
- ▲ UST Monitoring Well
- 1, 2, 3-Trichloropropane Concentration in ng/L
- 1, 2, 3-Trichloropropane Contamination > AL (5 ng/L)
- General Direction of Groundwater Flow
- Groundwater Elevation Contour, Winter 2004
- VOCs (Composite, 2002)**
- VOCs Contamination Potentially Exceeding 1000X MCLs
- VOCs Contamination Potentially Ranging From 100X To < 1000X MCLs
- VOCs Contamination Potentially Ranging From 20X To < 100X MCLs
- VOCs Contamination Potentially Ranging From 10X To < 20X MCLs
- VOCs Contamination Potentially Ranging From AL To < 10X MCLs
- VOCs Contamination Potentially Ranging From Laboratory Detection Limits to MCLs
- Facilities
- Landfills
- Land-Use (1978 - 1980)**
- Commercial
- Industrial
- Agricultural, Open Space, Residential, and Unclassified
- Operable Unit Boundary
- Railway
- Streets
- Faults
- Streams
- Lakes
- Spreading Grounds
- Bedrock

NOTES:

- RESULTS NOT AVAILABLE FOR ALL WELLS. DETECTION LIMIT FOR ANALYSES IS 6 NG/L.
- ND = NOT DETECTED ABOVE LABORATORY DETECTION LIMIT.
- BASED ON DATA COLLECTED BETWEEN SEPTEMBER 2002 AND JANUARY 2004.
- THE GROUNDWATER ELEVATION CONTOURS SHOWN REPRESENT GENERALIZED APPROXIMATIONS BASED ON DATA COLLECTED BY THE SAN GABRIEL BASIN WATERMASTER, U.S. EPA, LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS, AND LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD BETWEEN 12000S AND 22504 FROM MONITORING AND PRODUCTION WELLS. BECAUSE THE WELLS ARE NOT CONSISTENTLY SITED IN EITHER THE SHALLOW, INTERMEDIATE, OR DEEP ALLUVIAL AQUIFERS OR BEDROCK, AND VERTICAL HYDRAULIC GRADIENTS EXIST, THE WATER LEVEL ELEVATION CONTOURS DO NOT REPRESENT THE WATER TABLE BUT RATHER A WEIGHTED AVERAGE LINE OF EQUAL HYDRAULIC HEAD THAT ACTUALLY VARIES WITH DEPTH. BECAUSE WATER LEVELS WERE MEASURED IN SOME ACTIVE PRODUCTION WELLS SHORTLY AFTER SHUT DOWN OF THE WELLS, SOME WATER LEVEL ELEVATION MEASUREMENTS MAY NOT REPRESENT TRULY STATIC CONDITIONS. THE FIGURE SHOWS ONLY REGIONAL VARIABILITY IN GROUNDWATER LEVEL ELEVATIONS AND GENERALLY DOES NOT INCLUDE DATA FROM OUTSIDE SAN GABRIEL VALLEY NP, AREA 3. BECAUSE DISTANCES BETWEEN DATA POINTS ARE IN THE 1,000S OF FEET, THERE MAY BE SIGNIFICANT UNCERTAINTY IN THE TRUE LOCATION OF THE GROUNDWATER LEVEL ELEVATION CONTOURS. FOR THE ABOVE REASONS, AND AS A RESULT OF THE COMPLEXITY OF AQUIFER MATERIALS AND PROPERTIES, LOCAL GROUNDWATER LEVEL ELEVATIONS AND FLOW DIRECTIONS MAY VARY.
- THE AREAS OF CONTAMINATION SHOWN REPRESENT SIMPLIFIED APPROXIMATIONS BASED ON THE LAST AVAILABLE CONCENTRATION (THROUGH 03/06/03) OF ANY VOC. DATA POINTS MORE THAN FIVE YEARS OLD WERE GENERALLY NOT CONSIDERED. BECAUSE CONTAMINATION CONCENTRATIONS VARY WITH TIME, A WELL MAY AT TIMES PRODUCE WATER WITH DIFFERENT CONTAMINANT LEVELS THAN THOSE INDICATED. DIFFERENCES COULD ALSO BE CAUSED BY VERTICAL VARIATIONS IN CONTAMINATION (THE FIGURE IS A TWO-DIMENSIONAL DEPICTION OF CONTAMINATION THAT ACTUALLY VARIES WITH DEPTH). THE FIGURE SHOWS ONLY REGIONAL VARIABILITY IN CONTAMINATION. IN MUCH OF THE BASIN, DISTANCES BETWEEN DATA POINTS ARE IN THE 1000S OF FEET. THUS, THERE IS SIGNIFICANT UNCERTAINTY IN THE TRUE LOCATIONS OF THE CONCENTRATION CONTOURS.



ENFORCEMENT CONFIDENTIAL

Figure 1

Appendix B
DHS 96-Hour Acute Aquatic Toxicity Screening Test



DEPARTMENT OF HEALTH SERVICES
TITLE 22
96-HOUR ACUTE AQUATIC TOXICITY SCREEN TESTING

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- Initial Water Quality Measurements
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- Alkalinity and Hardness Analysis
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INTRODUCTION

Title 22, Article 3, Section 66261.24 (6) of the California Code of Regulations (CCR) establishes the criteria for the identification of hazardous and extremely hazardous waste. The Department of Health Services (DOHS) compiles and evaluates analytical data for compliance with the toxicity criteria for potentially hazardous waste.

The California DOHS 96-Hour Acute Aquatic Toxicity testing assures CCR compliance and minimizes risk to the environment or threat to public health.

Laboratory certification by the DOHS standardized the toxicity testing program by requiring certification of testing laboratories and by utilizing the procedures set forth in "Static Acute Bioassay Procedures for Hazardous Waste Samples." Department of Fish and Game, Water Pollution Control Laboratory (Nov. 1988). Following this methodology, a waste can be evaluated for potential hazardous waste declassification.

Currently; CCR, Title 22, Section 66261.24, Article 6 requires wastes to pass the 96-hour aquatic toxicity screen testing with greater than 50% survival at the 500 mg/l concentration. In addition to this regulation, the DOHS protocol requires wastes to pass the 96-hour aquatic toxicity screen testing with a minimum of 60% survival at the 750 mg/l concentration for compliance. When these screening criteria are not achieved, the DOHS test protocol requires additional definitive serial dilution toxicity testing with a minimum of five test concentrations prior to making a hazardous waste compliance determination.

Toxicity testing conducted under the CCR, Title 22, Section 66261.24, Article 6 requirements is a static non-renewal acute toxicity screen test following Standard Methods and the procedures in the "Static Acute Bioassay Procedures for Hazardous Waste Samples". Death is the effect measured and toxicity is reported as percent survivorship at 250 mg/l, 500 mg/l and 750 mg/l concentrations and a LC_{50} calculated from these data. Original data worksheets will remain on file at the lab for ten years.

MATERIALS AND METHODS

Facilities

The toxicity tests should be conducted in a laboratory located away from disturbances of non-laboratory personnel or other laboratory or heavy equipment.

Lighting should be provided by cool white fluorescent fixtures that are regulated by a 24-hour timer. The lighting remaining on for 16 hours and off for 8 hours.

The temperature of the toxicity testing laboratory should be maintained by a climate control unit which provides accuracy to ± 2 °C. The laboratory's temperature should be continuously monitored 24 hours per day, with "backup" provided. Maximum-minimum thermometers should be maintained within the laboratory to provide temperature variation information.

Low pressure, filtered air should be supplied to the laboratory for the purpose of slowly bubbling air into the exposure tanks to maintain an acceptable dissolved oxygen concentration. Air should be bubbled into the aquaria at a rate of approximately 30 ml/min following the guidelines of Kopperdahl (1976) and Peltier and Weber (1985).

Test Containers

Toxicity tests should be conducted in 5-gallon glass aquariums. For the definitive test, the aquariums contain a total of 10 liters of waste material and/or dilution softwater which provides a water depth within the test aquariums of approximately 14 cm.

Test containers should be cleaned thoroughly with commercial glassware detergent and warm tap water, rinsed five times with warm tap water, rinsed with reagent grade acetone, rinse five times with deionized water, rinsed with 5% HCl, and then rinsed three times with deionized water.

Determination of Water Quality Parameters

Water quality measurements should be taken and recorded for pH, dissolved oxygen and temperature after dosage of the appropriate concentration of waste sample to the test aquariums, and at 24, 48, 72, and 96 hours subsequent to initiation of the toxicity test exposures. Total alkalinity and hardness, both expressed as mg/l CaCO₃, should be determined from sub-samples of dilution water and the 750 mg/l concentration obtained immediately prior to initiation and at the completion of toxicity testing.

After stabilization of the reading, the pH should be recorded on the static toxicity test worksheet to the nearest 0.1 pH unit.

Dissolved oxygen concentrations (mg/l) should be recorded on the static toxicity test worksheet to the nearest 0.1 mg/l, only after stabilization of the reading.

Exposure temperature should be determined thermometer graduated to 0.1°C with calibration traceable to the National Institute of Standards and Technology (NIST).

Alkalinity values should be achieved by utilizing Method 2320B, *Standard Methods* (18th Edition) or EPA 310.1.

Hardness values should be achieved by utilizing Method 2340C, *Standard Methods* (18th Edition).

TOXICITY TEST PREPARATION

Receiving and Acclimating Fish

The fathead minnows, *Pimephales promelas*, should be received from the supplier at least 10 days prior to initiation of toxicity testing. Shipment of the test fish should be in insulated containers with freshwater and an atmosphere of bottled oxygen via Federal Express overnight. Upon receipt of the test fish, the plastic bags containing the fathead minnows should be floated on the surface of an appropriately sized aquarium containing aged local (hard) drinking water in the temperature controlled toxicity test laboratory. When the temperature of the water in the plastic bags containing the fathead minnows is within 0.5°C of the holding tank, each plastic bag is opened and the fish are gently eased into the

initial acclimation water containing penicillin. This antibiotic is effective against both gram-negative and gram-positive bacteria as well as fungus. The antibiotic is maintained in the acclimation water for 24 hours while the hardness is slowly decreased to that of the reconstituted moderately hardwater utilizing a reservoir and siphons to slowly change over the water following guidelines in *Standard Methods* (18th Edition). The test fish should be subsequently gently transferred using a fine mesh dip net to the holding tank for further acclimation until initiation of the toxicity testing.

During the acclimation period, up until 48 hours prior to initiation of the toxicity testing, the fathead minnows should be maintained on a consistent diet, while observing the behavior and monitoring the quality of the acclimating fish. The quantity of food delivered at each feeding should be based upon the quantity that the tank population would completely consume within approximately five minutes of feeding. During these observations, any sick or dead fish are removed and the numbers of each, as well as any observations, are noted in the acclimation tank log book.

Dilution Water Preparation

Dilution water for the toxicity tests should be prepared following the formulation of Kopperdahl (1976) and Horing and Weber (1985) for artificially reconstituted softwater. Table I indicates the quantities of reagent grade chemicals utilized in preparing the synthetic freshwater. Reconstituted softwater should be prepared by addition of the salts to deionized water followed by thorough mechanical mixing at least 48 hours prior to initiation of the toxicity testing. The reconstituted softwater should be maintained in an isolated area of the same temperature-controlled laboratory in which the test fish are acclimated and the toxicity tests are performed to ensure against any significant difference between acclimation and test water temperature that might induce additional stress in the test fish.

Table 1. Quantities of reagent grade chemicals required to prepare reconstituted softwater and expected water qualities.

NaHCO ₃ :	48.0 mg/l
CaSO ₄ 2H ₂ O:	30.0 mg/l
MgSO ₄ :	30.0 mg/l
KCl:	2.0 mg/l
pH:	7.2-7.8
Total Hardness:	40-48 mg/l CaCO ₃
Total Alkalinity:	30-35 mg/l CaCO ₃

WASTE SAMPLE PREPARATION

Dry Waste Material

Each sample should be identified as a Type i, Type ii or Type iii material. The samples should be weighed into pre-tared Erlenmeyer flasks to yield final replicate sample concentrations of 250 mg/l, 500 mg/l, and 750 mg/l. Approximately 200 ml of dilution water is added to each flask. The flasks should be capped with parafilm, a neoprene stopper and aluminum foil and mechanically shaken for six hours.

Liquid Waste of Low Viscosity

To determine the volume of a low viscosity liquid sample needed to dose the toxicity test, the specific gravity is measured.

The waste sample to be used in the toxicity test is first mechanically shaken or homogenized so as to evenly distribute any particulate matter in the sample. A known amount of sample, usually 20 ml, is drawn up through a volumetric pipette and dispensed into a 100 ml beaker that has previously been weighed on a Mettler balance to four decimal places. The beaker containing the known volume of sample is then re-weighed on the Mettler balance. The difference in weight of the beaker with the sample and the weight of the beaker when it is empty is divided by the known volume of the sample (in milliliters) to determine the specific gravity. This process is repeated in triplicate and the mean specific gravity is used in subsequent dosage determinations.

The sample is measured by pipette into pre-tared Erlenmeyer flasks to yield final replicate sample concentrations of 250 mg/l, 500 mg/l, and 750 mg/l. Approximately 200 ml of dilution water is added to each flask. The flasks are capped with parafilm, a neoprene stopper and aluminum foil and mechanically shaken for six hours.

TOXICITY TESTING

Dosing Test Aquaria

After shaking, the samples are dosed into the appropriately marked aquarium containing approximately 9 liters of dilution water. Dilution water is then added to the 10 liter mark to yield a final volume of 10 liters for all test conditions.

Reconstituted softwater (dilution water only) controls are established as a quality assurance measure. All test conditions and controls are run concurrently.

Initial Water Quality Measurements

Prior to the addition of the test fish, preliminary water quality measurements are taken for dissolved oxygen and pH to determine if adjustment is necessary (Polisini 1988).

An initial hardness and alkalinity test analysis is performed on the control and the 750 mg/l concentrations.

Addition of Test Fish

The test fish (fathead minnows) should be gently corralled and dip netted in small groups from the holding tank into smaller aquarium to confirm species identity and the healthy condition of each individual fish to be utilized in the test. Fish exhibiting any abnormalities, disease, wounds or unusual behavior or color patterns are removed and destroyed. Those fish that passed the individual screening inspection are randomly allocated to test and control aquariums.

Ten fathead minnows are gently released into each of the test replicate and the control aquariums, taking care not to allow the dip nets to contact the exposure media.

Observations

Water quality parameters, enumeration of live organisms and any ancillary observations pertinent to the conduct of the toxicity tests are taken and recorded on the toxicity test worksheets at initiation and subsequently at 24, 48, 72, and 96 hours after initiation of the toxicity test exposures. Daily water quality parameters, live organism enumeration, and ancillary observations are recorded on individual toxicity testing worksheets.

Alkalinity and Hardness Analysis

Total alkalinity and hardness, both expressed as mg/l CaCO_3 , are determined by replicate samples. Sub-samples of the dilution water control and the 750 mg/l concentration are obtained immediately prior to initiation and at the completion of toxicity testing and the results are presented on the toxicity test worksheets.

Determination of Test Fish Lengths and Weights

At the conclusion of testing, 20 of the surviving fish are wet weighed to the nearest 0.1 gram on an analytical balance and measured to the nearest millimeter. The data are recorded on a Fish Weight/Length Measurements form. All surviving fish are then destroyed following the procedures in *Standard Methods* (18th Edition).

RESULTS

Standard DOHS Toxicity Screen Testing

Death is the effect measured and toxicity is reported as percent survivorship at 250 mg/l, 500 mg/l and 750 mg/l concentrations and a LC_{50} calculated from these data. Original data worksheets will remain on file at the lab for ten years.

REFERENCES

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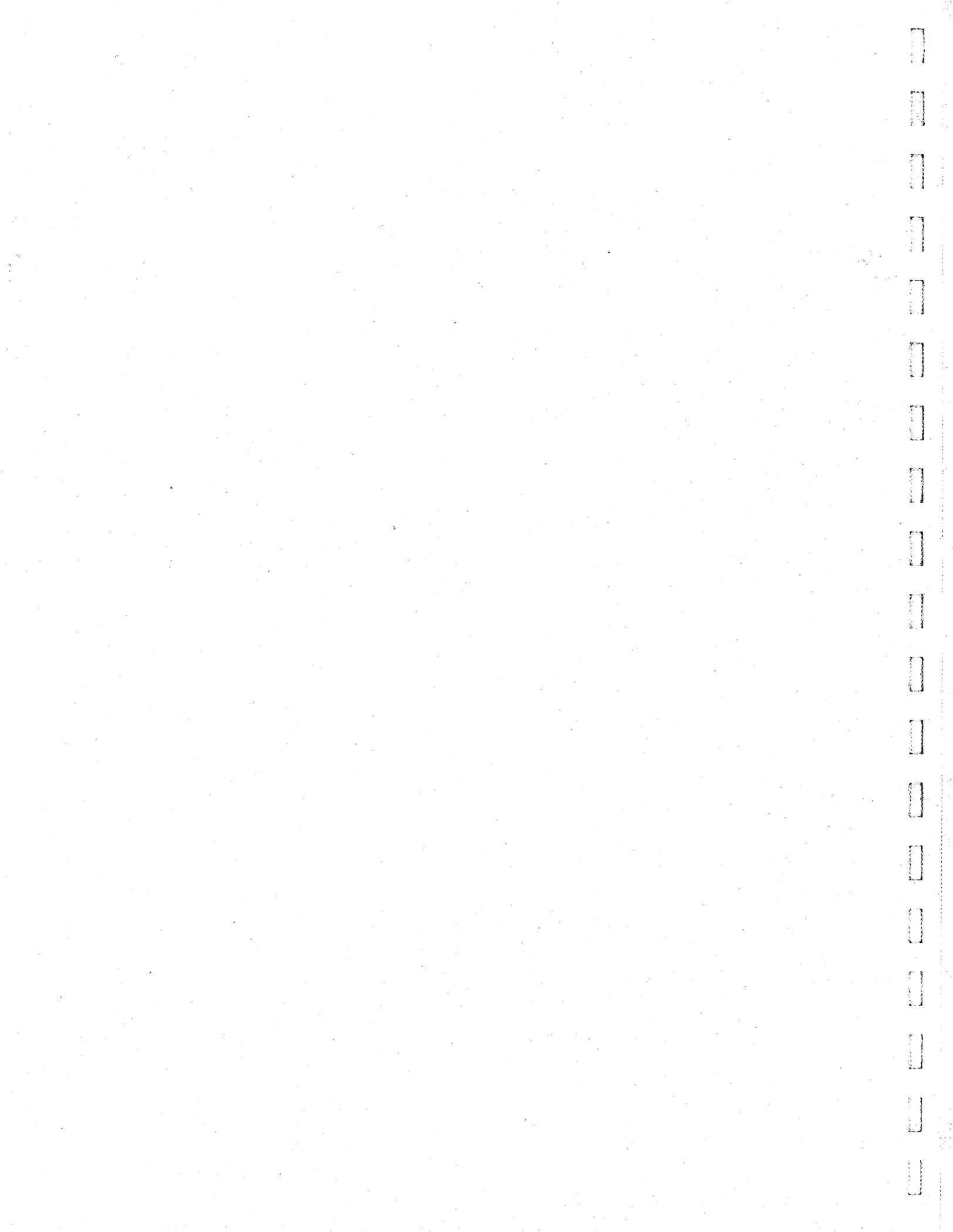
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Polisini, J. M. 1988. Static acute bioassay procedures for hazardous waste samples. California Fish and Game, Water Pollution Control Laboratory.

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Appendix C
Health and Safety Plan



CH2M HILL HEALTH AND SAFETY PLAN

This Health and Safety Plan (HSP) will be kept on the site during field activities and will be reviewed as necessary. The plan will be amended or revised as project activities or conditions change or when supplemental information becomes available. The plan adopts, by reference, the Standards of Practice (SOPs) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual*, as appropriate. In addition, this plan adopts procedures in the project Work Plan. The Site Safety Coordinator (SSC) is to be familiar with these SOPs and the contents of this plan. CH2M HILL's personnel and subcontractors must sign Attachment 1.

Project Information and Description

PROJECT NO: 175859

CLIENT: EPA Region 9

PROJECT/SITE NAME: NPL Area 3

SITE ADDRESS: Western portion of the San Gabriel Valley, CA

CH2M HILL PROJECT MANAGER: Bob Collar/SCO

CH2M HILL OFFICE: SCO

DATE HEALTH AND SAFETY PLAN PREPARED: September 28, 2004

DATE(S) OF SITE WORK: October 2004 to September 2005

SITE ACCESS: Various locations around the cities of Alhambra and San Gabriel, CA

SITE SIZE: 3 miles wide by 2 miles long

SITE TOPOGRAPHY: Flat, gently sloping elevation change of 550 feet (msl) to 300 feet (msl).

PREVAILING WEATHER: Warm and dry

SITE DESCRIPTION AND HISTORY: Area 3 is located in the western portion of the San Gabriel valley. The Raymond Fault forms the northern boundary. The Repetto Hills form the western edge and Rosemead Avenue and the Interstate 10 Freeway have been selected as the eastern and southern boundaries, respectively.

The scope of this project is to assess the extent and magnitude of VOC groundwater contamination. There will be no drilling within the potential source areas.

DESCRIPTION OF SPECIFIC TASKS TO BE PERFORMED: Drilling and constructing monitoring wells within the cities of Alhambra and San Gabriel. The drilling subcontractor will be hiring third tier subcontractors to remove any contaminated soils, mud, or water; to install sampling equipment in the MP wells, traffic control, sound control; and to perform subsurface utility clearance and geophysical logging.

A site surveyor will be contracted directly by CH2M HILL for well surveying at the completion of well installation.

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1 Tasks to be Performed Under this Plan

1.1 Description of Tasks

(Reference Field Project Start-up Form)

Refer to project documents (i.e., Field Sampling Plan) for detailed task information. A health and safety risk analysis (Section 1.2) has been performed for each task and is incorporated in this plan through task-specific hazard controls and requirements for monitoring and protection. Tasks other than those listed below require an approved amendment or revision to this plan before tasks begin. Refer to Section 8.2 for procedures related to "clean" tasks that do not involve hazardous waste operations and emergency response (Hazwoper).

1.1.1 Hazwoper-Regulated Tasks

- Drilling
- Groundwater monitoring
- Investigation-derived waste sampling and disposal
- Observation of material loading for offsite disposal

1.1.2 Non-Hazwoper-Regulated Tasks

Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-Hazwoper-trained personnel. **Prior approval from the Health and Safety Manager (HSM) is required before these tasks are conducted on regulated hazardous waste sites.**

TASKS

- Engineering testing/evaluation
- Waste removal/hauling
- Geophysical Logging
- Traffic Control
- Sound Control
- Utility Clearance
- Well Surveying

CONTROLS

- Brief on hazards, limits of access, and emergency procedures
- Post contaminant areas as appropriate (refer to Section 8.2 for details)
- Sample and monitor as appropriate (refer to Section 5.0)



1.2 Task Hazard Analysis

(Refer to Section 2 for hazard controls)

POTENTIAL HAZARDS	TASKS			
	Drilling and well installation	Groundwater monitoring	IDW sampling and disposal	Observation of loading material for offsite disposal
Flying debris/objects	X		X	X
Noise > 85dBA	X			X
Electrical	X	X		
Suspended loads	X			X
Buried utilities, drums, tanks	X			
Slip, trip, fall	X	X	X	X
Back injury	X	X	X	
Confined space entry				
Trenches / excavations				
Visible lightning	X	X	X	X
Vehicle traffic				X
Elevated work areas/falls				
Fires	X		X	
Entanglement	X			
Drilling	X			
Heavy equipment	X			X
Working near water				
Working from boat				
IDW Sampling			X	

2 Hazard Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the site or the particular hazard. CH2M HILL employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL employees and subcontractors who do not understand any of these provisions should contact the SSC for clarification.

In addition to the controls specified in this section, Project-Activity Self-Assessment Checklists are contained in Attachment 6. These checklists are to be used to assess the adequacy of CH2M HILL and subcontractor site-specific safety requirements. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. Self-assessment checklists should be completed early in the project, when tasks or conditions change, or when otherwise specified by the HSM. The self-assessment checklists, including documented corrective actions, should be made part of the permanent project records, and be promptly submitted to the HSM.

Project-specific frequency for completing self-assessments: WEEKLY

2.1 Project-Specific Hazards

2.1.1 Drilling (Reference CH2M HILL SOP HS-35, *Drilling*)

- Only authorized personnel are permitted to operate drill rigs.
- Stay clear of areas surrounding drill rigs during every startup.
- Stay clear of the rotating augers and other rotating components of drill rigs.
- Stay as clear as possible of all hoisting operations. Loads shall not be hoisted overhead of personnel.
- Do not wear loose-fitting clothing or other items such as rings or watches that could get caught in moving parts. Long hair should have it restrained.
- If equipment becomes electrically energized, personnel shall be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party shall be contacted to have line de-energized prior to approaching the equipment.
- Smoking around drilling operations is prohibited.

2.1.2 Heat Stress (Reference CH2M HILL SOP HS-09, *Heat and Cold Stress*)

- Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°F to 60°F should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons per day. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours.
- Acclimate yourself by slowly increasing workloads (e.g., do not begin with extremely demanding activities).
- Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
- Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.
- Provide adequate shelter/shade to protect personnel against radiant heat (sun, flames, hot metal).
- Maintain good hygiene standards by frequently changing clothing and showering.
- Observe one another for signs of heat stress. Persons who experience signs of heat syncope, heat rash, or heat cramps should consult the SSC/DSC to avoid progression of heat-related illness.

SYMPTOMS AND TREATMENT OF HEAT STRESS					
	Heat Syncope	Heat Rash	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool-but not cold-water. Call ambulance, and get medical attention immediately!

2.1.3 Exposure to Public Vehicular Traffic

The following precautions must be taken when working around traffic, and in or near an area where traffic controls have been established by a contractor.

- Exercise caution when exiting traveled way or parking along street – avoid sudden stops, use flashers, etc.
- Park in a manner that will allow for safe exit from vehicle, and where practicable, park vehicle so that it can serve as a barrier.
- All staff working adjacent to traveled way or within work area must wear reflective/high-visibility safety vests.
- Eye protection should be worn to protect from flying debris.
- Remain aware of factors that influence traffic related hazards and required controls – sun glare, rain, wind, flash flooding, limited sight-distance, hills, curves, guardrails, width of shoulder (i.e., breakdown lane), etc.
- Always remain aware of an escape route -- behind an established barrier, parked vehicle, guardrail, etc.
- Always pay attention to moving traffic – never assume drivers are looking out for you
- Work as far from traveled way as possible to avoid creating confusion for drivers.
- When workers must face away from traffic, a “buddy system” should be used, where one worker is looking towards traffic.
- When working on highway projects, obtain a copy of the contractor’s traffic control plan.
- Work area should be protected by a physical barrier – such as a K-rail or Jersey barrier.
- Review traffic control devices to ensure that they are adequate to protect your work area. Traffic control devices should: 1) convey a clear meaning, 2) command respect of road users, and 3) give adequate time for proper traffic response. The adequacy of these devices are dependent on limited sight distance, proximity to ramps or intersections, restrictive width, duration of job, and traffic volume, speed, and proximity.
- Either a barrier or shadow vehicle should be positioned a considerable distance ahead of the work area. The vehicle should be equipped with a flashing arrow sign and truck-mounted crash cushion (TMCC). All vehicles within 40 feet of traffic should have an orange flashing hazard light atop the vehicle.

- Except on highways, flaggers should be used when 1) two-way traffic is reduced to using one common lane, 2) driver visibility is impaired or limited, 3) project vehicles enter or exit traffic in an unexpected manner, or 4) the use of a flagger enhances established traffic warning systems.
- Lookouts should be used when physical barriers are not available or practical. The lookout continually watches approaching traffic for signs of erratic driver behavior and warns workers. Vehicles should be parked at least 40 feet away from the work zone and traffic. Minimize the amount of time that you will have your back to oncoming traffic.

2.2 General Hazards

2.2.1 General Practices and Housekeeping

(Reference CH2M HILL SOP HS-20, *General Practices*)

- Site work should be performed during daylight hours whenever possible. Work conducted during hours of darkness require enough illumination intensity to read a newspaper without difficulty.
- Good housekeeping must be maintained at all times in all project work areas.
- Common paths of travel should be established and kept free from the accumulation of materials.
- Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions.
- Provide slip-resistant surfaces, ropes, and/or other devices to be used.
- Specific areas should be designated for the proper storage of materials.
- Tools, equipment, materials, and supplies shall be stored in an orderly manner.
- As work progresses, scrap and unessential materials must be neatly stored or removed from the work area.
- Containers should be provided for collecting trash and other debris and shall be removed at regular intervals.
- All spills shall be quickly cleaned up. Oil and grease shall be cleaned from walking and working surfaces.

2.2.2 Hazard Communication

(Reference CH2M HILL SOP HS-05, *Hazard Communication*)

The SSC is to perform the following:

- Complete an inventory of chemicals brought on site by CH2M HILL using Attachment 2.
- Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available.
- Request or confirm locations of Material Safety Data Sheets (MSDSs) from the client, contractors, and subcontractors for chemicals to which CH2M HILL employees potentially are exposed.
- Before or as the chemicals arrive on site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly.
- Give employees required chemical-specific HAZCOM training using Attachment 3.
- Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

2.2.3 Shipping and Transportation of Chemical Products

(Reference CH2M HILL's *Procedures for Shipping and Transporting Dangerous Goods*)

Chemicals brought to the site might be defined as hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the HSM or the Equipment Coordinator for additional information.

2.2.4 Lifting

(Reference CH2M HILL SOP HS-29, *Lifting*)

- Proper lifting techniques must be used when lifting any object.
 - Plan storage and staging to minimize lifting or carrying distances.
 - Split heavy loads into smaller loads.
 - Use mechanical lifting aids whenever possible.
 - Have someone assist with the lift -- especially for heavy or awkward loads.
 - Make sure the path of travel is clear prior to the lift.

2.2.5 Fire Prevention

(Reference CH2M HILL SOP HS-22, *Fire Prevention*)

- Fire extinguishers shall be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet. When 5 gallons or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet. Extinguishers must:
 - be maintained in a fully charged and operable condition,
 - be visually inspected each month, and
 - undergo a maintenance check each year.
- The area in front of extinguishers must be kept clear.
- Post "Exit" signs over exiting doors, and post "Fire Extinguisher" signs over extinguisher locations.
- Combustible materials stored outside should be at least 10 feet from any building.
- Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.
- Flammable/combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet.

2.2.6 Electrical

(Reference CH2M HILL SOP HS-23, *Electrical*)

- Only qualified personnel are permitted to work on unprotected energized electrical systems.
- Only authorized personnel are permitted to enter high-voltage areas.
- Do not tamper with electrical wiring and equipment unless qualified to do so. All electrical wiring and equipment must be considered energized until lockout/tagout procedures are implemented.
- Inspect electrical equipment, power tools, and extension cords for damage prior to use. Do not use defective electrical equipment, remove from service.
- All temporary wiring, including extension cords and electrical power tools, must have ground fault circuit interrupters (GFCIs) installed.
- Extension cords must be:
 - equipped with third-wire grounding.
 - covered, elevated, or protected from damage when passing through work areas.
 - protected from pinching if routed through doorways.
 - not fastened with staples, hung from nails, or suspended with wire.
- Electrical power tools and equipment must be effectively grounded or double-insulated UL approved.
- Operate and maintain electric power tools and equipment according to manufacturers' instructions.
- Maintain safe clearance distances between overhead power lines and any electrical conducting material unless the power lines have been de-energized and grounded, or where insulating barriers have been installed to prevent physical contact. Maintain at least 10 feet from overhead power lines for voltages of 50 kV or less, and 10 feet plus ½ inch for every 1 kV over 50 kV.
- Temporary lights shall not be suspended by their electric cord unless designed for suspension. Lights shall be protected from accidental contact or breakage.
- Protect all electrical equipment, tools, switches, and outlets from environmental elements.

2.2.7 Stairways and Ladders

(Reference CH2M HILL SOP HS-25, *Stairways and Ladders*)

- Stairway or ladder is generally required when a break in elevation of 19 inches or greater exists.
- Personnel should avoid using both hands to carry objects while on stairways; if unavoidable, use extra precautions.
- Personnel must not use pan and skeleton metal stairs until permanent or temporary treads and landings are provided the full width and depth of each step and landing.
- Ladders must be inspected by a competent person for visible defects prior to each day's use. Defective ladders must be tagged and removed from service.
- Ladders must be used only for the purpose for which they were designed and shall not be loaded beyond their rated capacity.
- Only one person at a time shall climb on or work from an individual ladder.
- User must face the ladder when climbing; keep belt buckle between side rails
- Ladders shall not be moved, shifted, or extended while in use.

- User must use both hands to climb; use rope to raise and lower equipment and materials
- Straight and extension ladders must be tied off to prevent displacement
- Ladders that may be displaced by work activities or traffic must be secured or barricaded
- Portable ladders must extend at least 3 feet above landing surface
- Straight and extension ladders must be positioned at such an angle that the ladder base to the wall is one-fourth of the working length of the ladder
- Stepladders are to be used in the fully opened and locked position
- Users are not to stand on the top two steps of a stepladder; nor are users to sit on top or straddle a stepladder
- Fixed ladders \geq 24 feet in height must be provided with fall protection devices.
- Fall protection should be considered when working from extension, straight, or fixed ladders greater than six feet from lower levels and both hands are needed to perform the work, or when reaching or working outside of the plane of ladder side rails.

2.2.8 Cold Stress

(Reference CH2M HILL SOP HS-09, *Heat and Cold Stress*)

- Be aware of the symptoms of cold-related disorders, and wear proper, layered clothing for the anticipated fieldwork. Appropriate rain gear is a must in cool weather.
- Consider monitoring the work conditions and adjusting the work schedule using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- Wind-Chill Index is used to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it should only be used as a guideline to warn workers when they are in a situation that can cause cold-related illnesses.
- NSC Guidelines for Work and Warm-Up Schedules can be used with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; workers should be monitored for symptoms of cold-related illnesses. If symptoms are not observed, the work duration can be increased.
- Persons who experience initial signs of immersion foot, frostbite, hypothermia should consult the SSC/DSC to avoid progression of cold-related illness.
- Observe one another for initial signs of cold-related disorders.
- Obtain and review weather forecast – be aware of predicted weather systems along with sudden drops in temperature, increase in winds, and precipitation.

SYMPTOMS AND TREATMENT OF COLD STRESS			
	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Re-warm area quickly in warm-but not hot-water. Have victim drink warm fluids, but not coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but not coffee or alcohol. Get medical attention.

2.2.9 Compressed Gas Cylinders

- Valve caps must be in place when cylinders are transported, moved, or stored.
- Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.
- Cylinders must be secured in an upright position at all times.
- Cylinders must be shielded from welding and cutting operations and positioned to avoid being struck or knocked over; contacting electrical circuits; or exposed to extreme heat sources.
- Cylinders must be secured on a cradle, basket, or pallet when hoisted; they may not be hoisted by choker slings.

2.2.10 Procedures for Locating Buried Utilities

Local Utility Mark-Out Service

Name: Dig Alert

Phone: 1-800-227-2600

- Where available, obtain utility diagrams for the facility.
- Review locations of sanitary and storm sewers, electrical conduits, water supply lines, natural gas lines, and fuel tanks and lines.
- Review proposed locations of intrusive work with facility personnel knowledgeable of locations of utilities. Check locations against information from utility mark-out service.
- Where necessary (e.g., uncertainty about utility locations), excavation or drilling of the upper depth interval should be performed manually
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon).
- When the client or other onsite party is responsible for determining the presence and locations of buried utilities, the SSC should confirm that arrangement.

2.3 Biological Hazards and Controls

2.3.1 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings.

2.3.2 Poison Ivy and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.

2.3.3 Ticks

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray **only outside** of clothing with permethrin or permethrin and spray skin with only DEET; and check yourself frequently for ticks.

If bitten by a tick, grasp it at the point of attachment and carefully remove it. After removing the tick, wash your hands and disinfect and press the bite areas. Save the removed tick. Report the bite to human resources. Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash might appear that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, seek medical attention.

2.3.4 Bees and Other Stinging Insects

Bee and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform the SSC and/or buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops.

2.3.5 Bloodborne Pathogens

(Reference CH2M HILL SOP HS-36, *Bloodborne Pathogens*)

Exposure to bloodborne pathogens may occur when rendering first aid or CPR, or when coming into contact with landfill waste or waste streams containing potentially infectious material. Exposure controls and personal protective equipment (PPE) are required as specified in CH2M HILL SOP HS-36, *Bloodborne Pathogens*. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.

2.3.6 Other Anticipated Biological Hazards

None

2.4 Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

Contaminant	Location and Maximum ^a Concentration (ppm)	Exposure Limit ^b	IDLH ^c	Symptoms and Effects of Exposure	PIP ^d (eV)
1,1,2,2-Tetrachloroethane (Tetrachlorethane)	GW: 0.5 ug/L SB:ND D:ND	1 ppm	100 Ca	Nausea, vomiting, abdominal pain, finger tremors, jaundice, hepatitis, liver tenderness, monocytosis, kidney damage, dermatitis	11.10
Tetrachloroethylene (PCE)	GW: 23 ug/l SB:ND D:ND	25 ppm	150 Ca	Eye, nose, and throat irritation; nausea; flushed face and neck; vertigo; dizziness; sleepiness; skin redness; headache; liver damage	9.32
1,1,2-Trichloroethane	GW: 0.5 ug/L SB:ND D:ND	10 ppm	100 Ca	Eye and nose irritation, CNS depression, liver damage, dermatitis	11.00
Trichloroethylene (TCE)	GW: 260 ug/l SB:ND D:ND	50 ppm	1,000 Ca	Headache, vertigo, visual disturbance, eye and skin irritation, fatigue, giddiness, tremors, sleepiness, nausea, vomiting, dermatitis, cardiac arrhythmia, paresthesia, liver injury	9.45
Toluene	GW: 23 ug/L SB:ND D:ND	50 ppm	500	Eye and nose irritation, fatigue, weakness, confusion, dizziness, headache, dilated pupils, excessive tearing, nervousness, muscle fatigue, paresthesia, dermatitis, liver and kidney damage	8.82
Xylenes	GW: 0.5 ug/L SB:ND D:1.3 ug/kg	100 ppm	900	Irritated eyes, skin, nose, and throat; dizziness; excitement; drowsiness; incoherence; staggering gait; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; dermatitis	8.56

Footnotes:

^a Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums or Roll-Off Bins), GW (Groundwater), L (Lagoon), TK (Tank), S (Surface Soil), SL (Sludge), SW (Surface Water).

^b Appropriate value of PEL, REL, or TLV listed.

^c IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen.

^d PIP = photoionization potential

NA = Not applicable; UK = Unknown; ND = Not detected.

2.5 Potential Routes of Exposure

Dermal: Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 4.

Inhalation: Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in Sections 4 and 5, respectively.

Other: Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before drinking or smoking).

3 Project Organization and Personnel

3.1 CH2M HILL Employee Medical Surveillance and Training

(Reference CH2M HILL SOPs HS-01, *Medical Surveillance*, and HS-02, *Health and Safety Training*)

The employees listed below are enrolled in the CH2M HILL Comprehensive Health and Safety Program and meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated "SSC" have completed a 12-hour site safety coordinator course for hazardous waste, and have documented requisite field experience. An SSC with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones. Employees designated "FA-CPR" are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL's SOP HS-04, *Reproduction Protection*, including obtaining a physician's statement of the employee's ability to perform hazardous activities before being assigned fieldwork.

Employee Name	Office	Responsibility	SSC/FA-CPR
Bob Collar	SCO	Project Manager	Level C, SSC, FA/CPR
Paul Pongetti	SCO	Field Staff	Level D, SSC, FA/CPR
William Hannah	SCO	Field Staff	Level D
Amanda Berens	SCO	Field Staff	Level C, SSC, FA/CPR
Vikas Mathur	SCO	Task Manager, SSC	Level C, SSC, FA/CPR
Mike Ladeau	SCO	Field Staff	Level D, SSC, FA/CPR
James Laws	SCO	Field Staff	Level D, SSC, FA/CPR
Justin Zumbro	SCO	Field Staff	Level D, SSC, FA/CPR
Kim Waite	SCO	Field Staff	Level C
Chris Romero	SCO	Field Staff	Level D
Ghada Hamza	SCO	Field Staff	Level D
Elizabeth Bryant	SCO	Field Staff	Level C
Robert Hernandez	SCO	Field Staff	Level D
Kerang Sun	SCO	Field Staff	Level D, SSC, FA/CPR
Gary Bissonnette	SCO	Field Staff	Level C
Kevin Boggs	SDO	Field Staff	Level D, SSC, FA/CPR
Dan Jablonski	SCO	Field Staff	Level D
Benjamin Lechler	SCO	Field Staff	Level D, SSC, FA/CPR
Tom Perina	SCO	Field Staff	Level D

Dave Golles	SCO	Field Staff	Level D, SSC, FA/CPR
Randy Kellerman	SCO	Field Staff	Level D, SSC, FA/CPR
Tom Henderson	SDO	Field Staff	Level D, SSC, FA/CPR

3.2 Field Team Chain of Command and Communication Procedures

3.2.1 Client

Contact Name: Lisa Hanusiak, EPA Region 9

Phone: 415/972-3152

Facility Contact Name: N/A

Phone: N/A

3.2.2 CH2M HILL

Project Manager: Bob Collar/SCO

Health and Safety Manager: Rick Cavil/SFO

Field Team Leader: TBD

Site Safety Coordinator: Vikas Mathur/SCO

The SSC is responsible for contacting the Field Team Leader and Project Manager. In general, the Project Manager will contact the client. The Health and Safety Manager should be contacted as appropriate.

3.2.3 CH2M HILL Subcontractors

(Reference CH2M HILL SOP HS-55, *Subcontractor, Contractor, and Owner*)

Subcontractor: Water Development Corporation

Subcontractor Contact Name: Ray Quintero

Telephone: 800-974-2769

Subcontractor: Dulin Boynton

Subcontractor Contact Name: Bob Dupuy

Telephone: (562) 426-6464

The subcontractors listed above are covered by this HSP and must be provided a copy of this plan. However, this plan does not address hazards associated with the tasks and equipment that the subcontractor has expertise in (e.g., drilling, excavation work, electrical). Subcontractors are responsible for the health and safety procedures specific to their work, and are required to submit these procedures to CH2M HILL for review before the start of field work. Subcontractors must comply with the established health and safety plan(s). The CH2M HILL SSC should verify that subcontractor employee training, medical clearance, and fit test records are current and must monitor and enforce compliance with the established plan(s). CH2M HILL's oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

CH2M HILL should continuously endeavor to observe subcontractors' safety performance. This endeavor should be reasonable, and include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. CH2M HILL is not responsible for exhaustive observation for hazards and unsafe practices. In addition to this level of observation, the SSC is responsible for confirming CH2M HILL subcontractor performance against both the subcontractor's safety plan and applicable self-assessment checklists. Self-assessment checklists contained in Attachment 6 are to be used by the SSC to review subcontractor performance.

Health and safety related communications with CH2M HILL subcontractors should be conducted as follows:

- Brief subcontractors on the provisions of this plan, and require them to sign the Employee Signoff Form included in Attachment 1.
- Request subcontractor(s) to brief the project team on the hazards and precautions related to their work.
- When apparent non-compliance/unsafe conditions or practices are observed, notify the subcontractor safety representative and require corrective action – the subcontractor is responsible for determining and implementing necessary controls and corrective actions.
- When repeat non-compliance/unsafe conditions are observed, notify the subcontractor safety representative and stop affected work until adequate corrective measures are implemented.
- When an apparent imminent danger exists, immediately remove all affected CH2M HILL employees and subcontractors, notify subcontractor safety representative, and stop affected work until adequate corrective measures are implemented. Notify the Project Manager and HSM as appropriate.
- Document all oral health and safety related communications in project field logbook, daily reports, or other records.

4 Personal Protective Equipment (PPE)

(Reference CH2M HILL SOP HS-07, *Personal Protective Equipment*, HS-08, *Respiratory Protection*)

PPE Specifications ^a

Task	Level	Body	Head	Respirator ^b
General site entry	D	Work clothes; steel-toe, leather work boots; reflective safety vest & work glove.	Hardhat ^c Safety glasses Ear protection ^d	None required
Groundwater sampling Soil boring Investigation-derived waste (drum) sampling and disposal	Modified D	Coveralls: Uncoated Tyvek® Boots: Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat ^c Splash shield ^c Safety glasses Ear protection ^d	None required.
Tasks requiring upgrade	C	Coveralls: Polycoated Tyvek® Boots: Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat ^c Splash shield ^c Ear protection ^d Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; with GME-H cartridges or equivalent ^e .
Tasks requiring upgrade	B	Coveralls: Polycoated Tyvek® Boots: Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat ^c Splash shield ^c Ear protection ^d Spectacle inserts	Positive-pressure demand self-contained breathing apparatus (SCBA); MSA Ultralite, or equivalent.

Reasons for Upgrading or Downgrading Level of Protection

Upgrade ^f	Downgrade
<ul style="list-style-type: none"> Request from individual performing tasks. Change in work tasks that will increase contact or potential contact with hazardous materials. Occurrence or likely occurrence of gas or vapor emission. Known or suspected presence of dermal hazards. Instrument action levels (Section 5) exceeded. 	<ul style="list-style-type: none"> New information indicating that situation is less hazardous than originally thought. Change in site conditions that decreases the hazard. Change in work task that will reduce contact with hazardous materials.

^a Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.

^b No facial hair that would interfere with respirator fit is permitted.

^c Hardhat and splash-shield areas are to be determined by the SSC.

^d Ear protection should be worn when conversations cannot be held at distances of 3 feet or less without shouting.

^e Cartridge change-out schedule is at least every 8 hours (or one work day), except if relative humidity is > 85%, or if organic vapor measurements are > midpoint of Level C range (refer to Section 5)—then at least every 4 hours. If encountered conditions are different than those anticipated in this HSP, contact the HSM.

^f Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the HSM, and an SSC qualified at that level is present.

5 Air Monitoring/Sampling

(Reference CH2M HILL SOP HS-06, *Air Monitoring*)

5.1 Air Monitoring Specifications

Instrument	Tasks	Action Levels ^a		Frequency ^b	Calibration
PID: OVM with 10.6eV lamp or equivalent	Sampling of soils and groundwater	< 5 ppm > 5 ppm > 25 ppm	Level D Level C Stop work, call HSM	Initially and periodically during task	Daily
Nose-Level Monitor ^c :	Drilling operations	<85 dB(A) 85-120 dB(A) 120 dB(A)	No action required Hearing protection required Stop; re-evaluate	Initially and periodically during task	Daily

^a Action levels apply to sustained breathing-zone measurements above background.

^b The exact frequency of monitoring depends on field conditions and is to be determined by the SSC; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time, measurement results, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3", "at surface/SB-2", etc.).

^c If the measured percent of O₂ is less than 10, an accurate LEL reading will not be obtained. Percent LEL and percent O₂ action levels apply only to ambient working atmospheres, and not to confined-space entry. More-stringent percent LEL and O₂ action levels are required for confined-space entry (refer to Section 2).

^d Refer to SOP HS-10 for instructions and documentation on radiation monitoring and screening.

^e Noise monitoring and audiometric testing also required.

5.2 Calibration Specifications

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

Instrument	Gas	Span	Reading	Method
PID: OVM, 10.6 or 11.8 eV bulb	100 ppm isobutylene	RF = 1.0	100 ppm	1.5 lpm reg T-tubing
PID: MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF = 100	100 ppm	1.5 lpm reg T-tubing
PID: TVA 1000	100 ppm isobutylene	CF = 1.0	100 ppm	1.5 lpm reg T-tubing

5.3 Air Sampling

Sampling, in addition to real-time monitoring, may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

Method Description

N/A

Personnel and Areas

Results must be sent immediately to the HSM. Regulations may require reporting to monitored personnel. Results reported to:

HSM: N/A

Other: N/A

6 Decontamination

(Reference CH2M HILL SOP HS-13, *Decontamination*)

The SSC must establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified by the SSC. The SSC must ensure that procedures are established for disposing of materials generated on the site.

6.1 Decontamination Specifications

Personnel	Sample Equipment	Heavy Equipment
<ul style="list-style-type: none">• Boot wash/rinse• Glove wash/rinse• Outer-glove removal• Body-suit removal• Inner-glove removal• Respirator removal• Hand wash/rinse• Face wash/rinse• Shower ASAP• Dispose of PPE in municipal trash, or contain for disposal• Dispose of personnel rinse water to facility or sanitary sewer, or contain for offsite disposal	<ul style="list-style-type: none">• Wash/rinse equipment	<ul style="list-style-type: none">• Power wash• Steam clean• Dispose of equipment rinse water to facility or sanitary sewer, or contain for offsite disposal

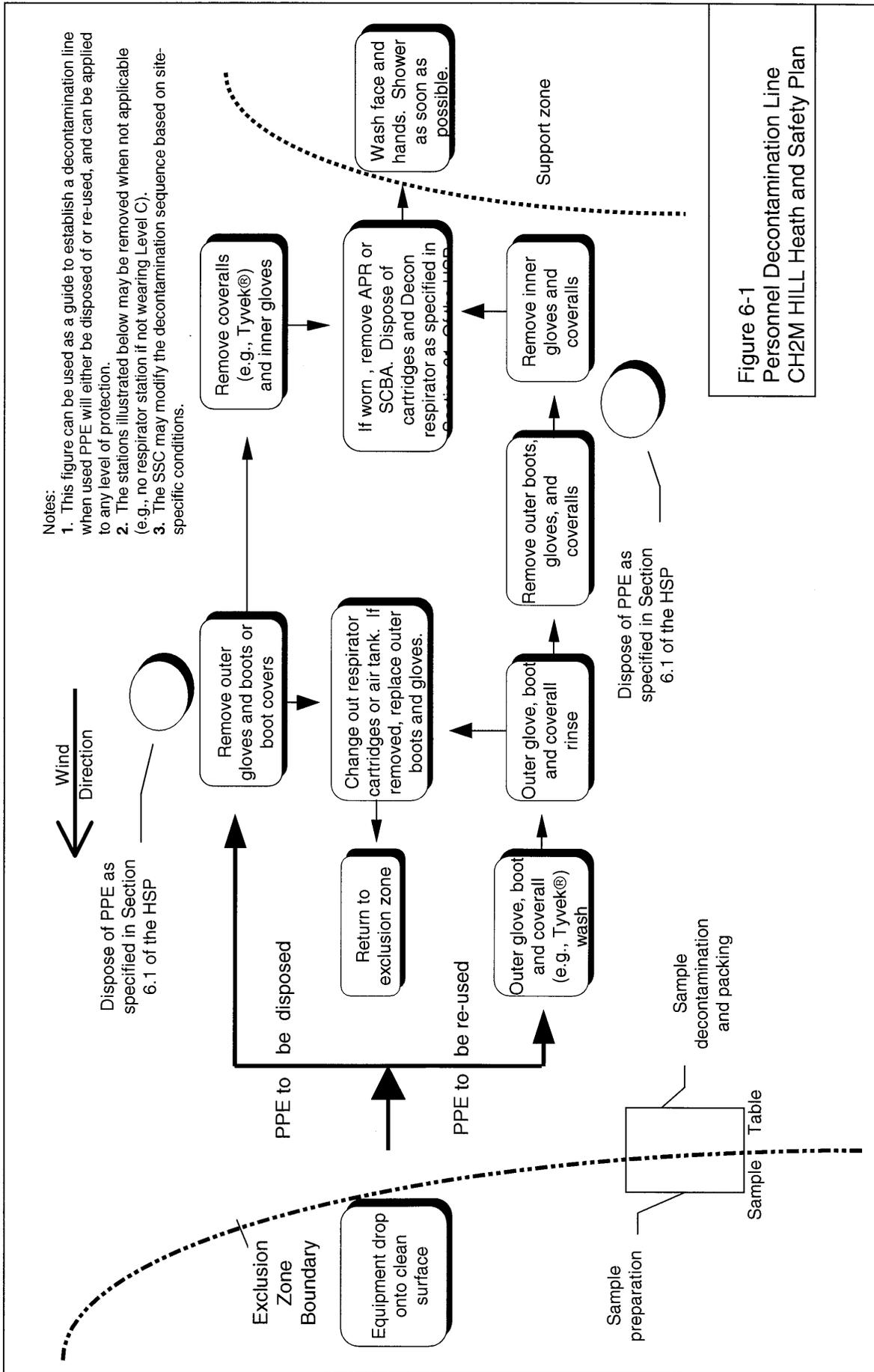
6.2 Diagram of Personnel-Decontamination Line

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SSC should establish areas for eating, drinking, and smoking. Contact lenses are not permitted in exclusion or decontamination zones.

Figure 6-1 illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SSC to accommodate task-specific requirements.

7 Spill-Containment Procedures

Sorbent material will be maintained in the support zone. Incidental spills will be contained with sorbent and disposed of properly.



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8 Site-Control Plan

8.1 Site-Control Procedures

(Reference CH2M HILL SOP HS-11, *Site Control*)

- The SSC will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of Health and Safety Plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies.
- The SSC records attendance at safety briefings in a logbook and documents the topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location in accordance with CH2M HILL SOP HS-71, *OSHA Postings*.
- Establish support, decontamination, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of the following:
 - Line-of-sight and hand signals
 - Air horn
 - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the "buddy system."
- Initial air monitoring is conducted by the SSC in appropriate level of protection.
- The SCC is to conduct periodic inspections of work practices to determine the effectiveness of this plan – refer to Sections 2 and 3. Deficiencies are to be noted, reported to the HSM, and corrected.

8.2 Hazwoper Compliance Plan

(Reference CH2M HILL SOP HS-19, *Site-Specific Written Safety Plans*)

Certain parts of the site work are covered by state or federal Hazwoper standards and therefore require training and medical monitoring. Anticipated Hazwoper tasks (Section 1.1.1) might occur consecutively or concurrently with respect to non-Hazwoper tasks. This section outlines procedures to be followed when approved activities specified in Section 1.1.2 do not require 24- or 40-hour training. Non-Hazwoper-trained personnel also must be trained in accordance with all other state and federal OSHA requirements.

- In many cases, air sampling, in addition to real-time monitoring, must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site, or while non-Hazwoper-trained staff are working in proximity to Hazwoper activities. Other data (e.g., soil) also must document that there is no potential for exposure. The HSM must approve the interpretation of these data. Refer to subsections 2.5 and 5.3 for contaminant data and air sampling requirements, respectively.
- When non-Hazwoper-trained personnel are at risk of exposure, the SSC must post the exclusion zone and inform non-Hazwoper-trained personnel of the:
 - nature of the existing contamination and its locations
 - limitations of their access
 - emergency action plan for the site
- Periodic air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to airborne contaminants.
- When exposure is possible, non-Hazwoper-trained personnel must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.
- Remediation treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the Hazwoper standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only Hazwoper-trained personnel (minimum of 24 hour of training) will be permitted to enter the site. All non-Hazwoper-trained personnel must not enter the TSDF area of the site.

9 Emergency Response Plan

(Reference CH2M HILL, SOP HS-12, *Emergency Response*)

9.1 Pre-Emergency Planning

The SSC performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate.

- Review the facility emergency and contingency plans where applicable.
- Determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Determine what offsite communication equipment is needed (e.g., nearest telephone, cell phone).
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases.
- Rehearse the emergency response plan before site activities begin, including driving route to hospital.
- Brief new workers on the emergency response plan.

The SSC will evaluate emergency response actions and initiate appropriate follow-up actions.

9.2 Emergency Equipment and Supplies

The SSC should mark the locations of emergency equipment on the site map and post the map.

Emergency Equipment and Supplies	Location
20 LB (or two 10-lb) fire extinguisher (A, B, and C classes)	Support Zone/Heavy Equipment
First aid kit	Support Zone/Field Vehicle
Eye Wash	Support & Decon Zone/Field Vehicle
Potable water	Support & Decon Zone/Field Vehicle
Bloodborne-pathogen kit	Support Zone/Field Vehicle
Additional equipment (specify):	

9.3 Incident Response

In fires, explosions, or chemical releases, actions to be taken include the following:

- Shut down CH2M HILL operations and evacuate the immediate work area.
- Notify appropriate response personnel.
- Account for personnel at the designated assembly area(s).
- Assess the need for site evacuation, and evacuate the site as warranted.

Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled.

9.4 Emergency Medical Treatment

The procedures listed below may also be applied to non-emergency incidents. Injuries and illnesses (including overexposure to contaminants) must be reported to Human Resources. If there is doubt about whether medical treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact the CH2M HILL medical consultant. During non-emergencies, follow these procedures as appropriate.

- Notify appropriate emergency response authorities listed in Section 9.8 (e.g., 911).
- The SCC will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury.
- Initiate first aid and CPR where feasible.
- Get medical attention immediately.
- Perform decontamination where feasible; lifesaving and first aid or medical treatment take priority.
- Make certain that the injured person is accompanied to the emergency room.
- When contacting the medical consultant, state that the situation is a CH2M HILL matter, and give your name and telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.
- Report incident as outlined in Section 9.7.

9.5 Evacuation

- Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map.
- Evacuation route(s) and assembly area(s) will be designated by the SSC before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The SSC and a "buddy" will remain on the site after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.
- The SSC will account for all personnel in the onsite assembly area.
- A designated person will account for personnel at alternate assembly area(s).
- The SSC will write up the incident as soon as possible after it occurs and submit a report to the Corporate Director of Health and Safety.

9.6 Evacuation Signals

Signal	Meaning
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

9.7 Incident Notification and Reporting

- Upon any project incident (fire, spill, injury, near miss, death, etc.), immediately notify the PM and HSM. Call emergency beeper number if HSM is unavailable.
- For CH2M HILL work-related injuries or illnesses, contact and help Human Resources administrator complete an Incident Report Form (IRF). IRF must be completed within 24 hours of incident.
- For CH2M HILL subcontractor incidents, complete the Subcontractor Accident/Illness Report Form and submit to the HSM.
- Notify and submit reports to client as required in contract.

10 Approval

This site-specific Health and Safety Plan has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

10.1 Original Plan

Written By: Rick Cavil/SJC

Date: 06/03/2002

Approved By: Rick Cavil/SJC

Date: 06/04/2002

10.2 Revisions

Revisions 1 Made By: Bob Collar

Date: 09/02/02

Revisions 2 Made By: Vikas Mathur

Date: 05/01/03

Revisions 3 Made By: Amanda Berens

Date: 9/28/04

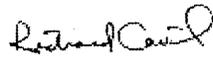
Revisions 1 to Plan: Introductory information, site staffing, contacts, contaminant levels

Revisions 2 to Plan: Project staff, emergency contacts, hospital map, revisions section

Revisions 3 to Plan: Work dates, site staffing, contacts, contaminant levels

Revisions 1 Approved By:

Date: 10/23/2002



Revisions 2 verbally approved by Rick Cavil/SJC (V. Mathur phone call 4/9/03)

Revisions 3 approved By: Rick Cavil/SFO

Date: 10/08/04

11 Attachments

- Attachment 1: Employee Signoff Form - Field Safety Instructions
- Attachment 2: Project-Specific Chemical Product Hazard Communication Form
- Attachment 3: Chemical-Specific Training Form
- Attachment 4: Emergency Contacts
- Attachment 5: Project Activity Self-Assessment Checklists
- Attachment 6: Applicable Material Safety Data Sheets

CHEMICAL-SPECIFIC TRAINING FORM

Location:	Project # :
HCC:	Trainer:

TRAINING PARTICIPANTS:

NAME	SIGNATURE	NAME	SIGNATURE

REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:

The HCC shall use the product MSDS to provide the following information concerning each of the products listed above.

- Physical and health hazards
- Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)
- Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants shall have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

Emergency Contacts

24-hour CH2M HILL Emergency Beeper - 888/444-1226

Medical Emergency - 911

Alhambra: (626) 570-1606
San Gabriel: (626) 289-5454

CH2M HILL Medical Consultant
Health Resources
Dr. Jerry H. Berke, M.D., M.P.H.
600 West Cummings Park, Suite 3400
Woburn, MA 01801-6350
1-781-938-4653 1-800-350-4511
(After hours calls will be returned within 20 minutes)

Fire/Spill Emergency - 911

Alhambra Fire Dept #: 626-570-5190
San Gabriel Fire Dept #: 626-308-2880

Local Occupational Physician

Alhambra: (626) 570-1606
San Gabriel: (626) 289-5454

Security & Police - 911

Alhambra Police #: 626-570-5151
San Gabriel Police #: 626-308-2828

Corporate Director Health, Safety & Environment

Name: Dave Waite/SEA
Phone: 425/453-5000
24-hour emergency beeper: 888-444-1226

Utilities Emergency

Water; Gas; Electric: Contact City
Alhambra: (626) 570-5062
San Gabriel: (626) 308-2800

Health & Safety Manager (HSM)

Name: Rick Cavil/SFO
Phone: 510/251-2426 x7502

Safety Coordinator (SC)

Name: Vikas Mathur/SCO
Phone: 714-429-2020, ext. 6110

Regional Human Resources Department

Name: Lisa Covey/SAC
Phone: 916/920-0300 x253

Project Manager (PM)

Name: Bob Collar/SCO
Phone: 714-429-2020, ext. 6274 (w)
714-838-2737 (h)

Corporate Human Resources Department

Name: Pete Hannan/COR
Phone: 303/771-0900

Federal Express Dangerous Goods Shipping

Phone: 800/238-5355

Worker's Compensation:

Contact Regional HR dept. to have form completed or
contact Julie Zimmerman after hours: 303/664-3304

CH2M HILL Emergency Number for Shipping Dangerous Goods

Phone: 800/255-3924

Automobile Accidents:

Rental: Carol Dietz/COR 303/713-2757

CH2M HILL owned vehicle:

Zurich Insurance Co. 800/987-3373

Contact the PM. Generally, the PM will contact relevant government agencies.

Hospital Name/Address:

Alhambra Hospital (for MW1-7 and MW1-8)
100 S. Raymond Ave., Alhambra CA 91801

Hospital Phone #:

626/570-1606

San Gabriel Valley Medical Center (for MW1-6)
438 W. Las Tunas Drive, San Gabriel, CA

626-289-5454

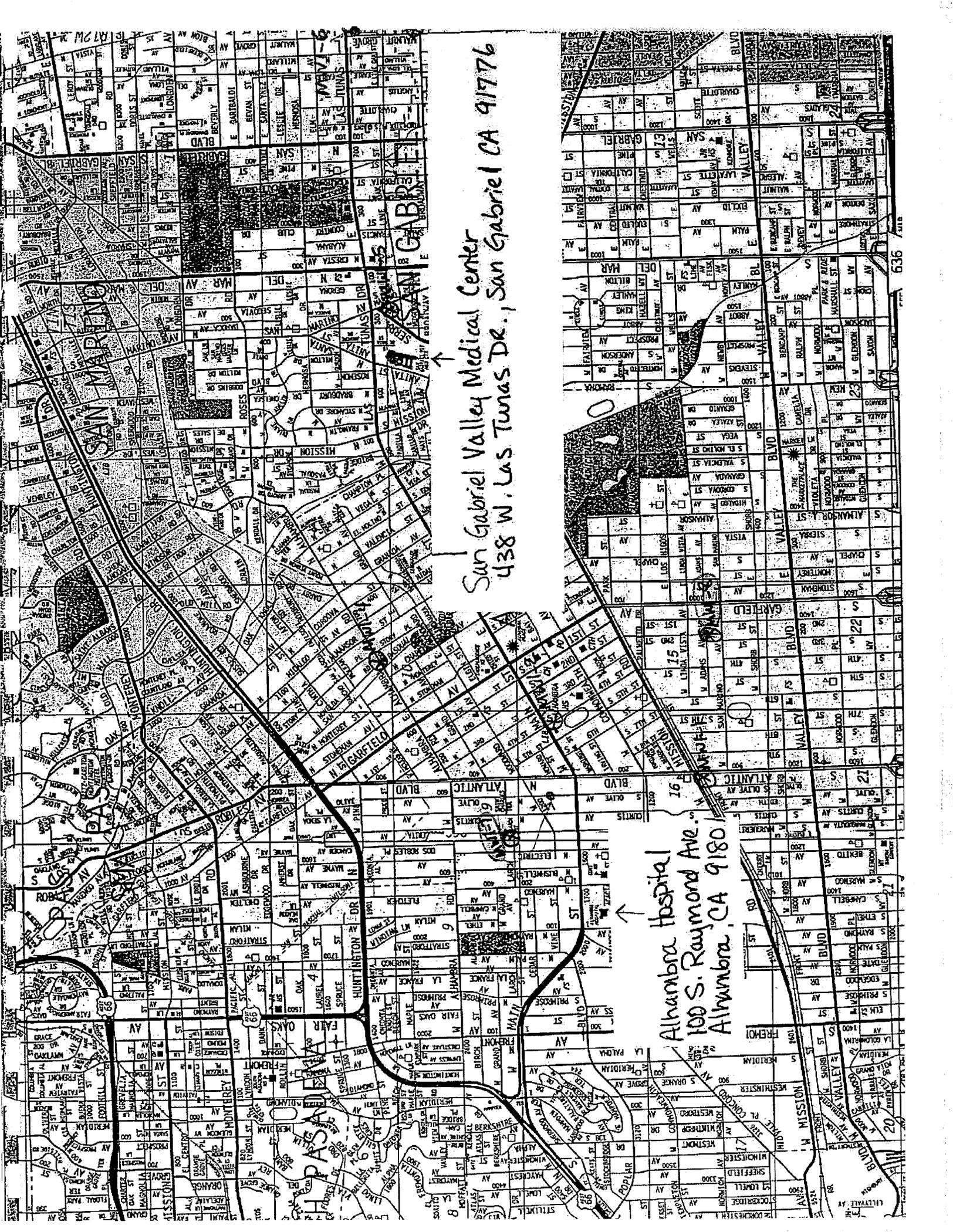
Directions to Hospitals

Include written directions here, and attach or post a highlighted map if needed.

Alhambra (from MW1-7): South on Olive, West on Main, South on Raymond

Alhambra (from MW1-8): West on Adams, North on 6th, West on Main, South on Raymond

San Gabriel (from MW1-6): North on Walnut Grove, West on Las Tunas Drive.



San Gabriel Valley Medical Center
438 W. Las Tunas Dr., San Gabriel CA 91776

Alhambra Hospital
100 S. Raymond Ave.,
Alhambra, CA 91801



CH2M HILL HEALTH AND SAFETY PLAN

Attachment 5

Project Activity Self-Assessment Checklists



CH2MHILL

H&S Self-Assessment Checklist - DRILLING

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees are potentially exposed to hazards associated with drilling operations (complete Sections 1 and 3), and/or 2) CH2M HILL oversight of a drilling subcontractor is required (complete entire checklist).

SSC/DSC may consult with drilling subcontractors when completing this checklist, but shall not direct the means and methods of drilling operations nor direct the details of corrective actions. Drilling subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Completed checklists shall be sent to the health and safety manager for review.

Project Name: _____	Project No.: _____	
Location: _____	PM: _____	
Auditor: _____	Title: _____	Date: _____

This specific checklist has been completed to:

- Evaluate CH2M HILL employee exposures to drilling hazards
- Evaluate a CH2M HILL subcontractor's compliance with drilling H&S requirements

Subcontractors Name: _____

- Check "Yes" if an assessment item is complete/correct.
 - Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the drilling subcontractor. Section 3 must be completed for all items checked "No."
 - Check "N/A" if an item is not applicable.
 - Check "N/O" if an item is applicable but was not observed during the assessment.
- Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-35.

<u>SECTION 1</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
PERSONNEL SAFE WORK PRACTICES (3.1)				
1. Only authorized personnel operating drill rig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Personnel cleared during rig startup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Personnel clear of rotating parts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Personnel not positioned under hoisted loads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Loose clothing and jewelry removed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Personnel instructed not to approach equipment that has become electrically energized	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Smoking is prohibited around drilling operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Personnel wearing appropriate PPE, per HSP/FSI	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>SECTION 2</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
GENERAL (3.2.1)				
9. Daily safety briefing/meeting conducted with crew	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Daily inspection of drill rig and equipment conducted before use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILL RIG PLACEMENT (3.2.2)				
11. Location of underground utilities identified	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Safe clearance distance maintained from overhead powerlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Drilling pad established, when necessary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Drill rig leveled and stabilized	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILL RIG TRAVEL (3.2.3)				
15. Rig shut down and mast lowered and secured prior to rig movement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Tools and equipment secured prior to rig movement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Only personnel seated in cab are riding on rig during movement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Safe clearance distance maintained while traveling under overhead powerlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Backup alarm or spotter used when backing rig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILL RIG OPERATION (3.2.4)				
20. Kill switch clearly identified and operational	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. All machine guards are in place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Rig ropes not wrapped around body parts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Pressurized lines and hoses secured from whipping hazards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Drill operation stopped during inclement weather	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Air monitoring conducted per HSP/FSI for hazardous atmospheres	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Rig placed in neutral when operator not at controls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILL RIG MAINTENANCE (3.2.5)				
27. Defective components repaired immediately	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Lockout/tagout procedures used prior to maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Cathead in clean, sound condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Drill rig ropes in clean, sound condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Fall protection used for fall exposures of 6 feet or greater	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Rig in neutral and augers stopped rotating before cleaning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Good housekeeping maintained on and around rig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILLING AT HAZARDOUS WASTE SITES (3.2.6)				
34. Waste disposed of according to HSP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Appropriate decontamination procedures being followed, per HSP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



CH2M HILL HEALTH AND SAFETY PLAN

Attachment 7

Applicable Material Safety Data Sheets



AIR LIQUIDE AMERICA CORP-FMLY BIG THREE INDUS -- ISOBUTYLENE - CALIBRATION GAS CYLI

MATERIAL SAFETY DATA SHEET

NSN: 6665012148247

Manufacturer's CAGE: 17688

Part No. Indicator: A

Part Number/Trade Name: ISOBUTYLENE

=====
General Information
=====

Item Name: CALIBRATION GAS CYLINDER

Company's Name: AIR LIQUIDE AMERICA CORP-FMLY BIG THREE INDUSTRIES

Company's Street: 3535 W 12TH ST

Company's P. O. Box: 3047

Company's City: HOUSTON

Company's State: TX

Company's Country: US

Company's Zip Code: 77253

Company's Emerg Ph #: 800-424-9300 CHEMTREC

Company's Info Ph #: 713-868-0440 FAX: 800-231-1366

Distributor/Vendor # 1: HNU SYSTEMS INC

Distributor/Vendor # 1 Cage: 57631

Record No. For Safety Entry: 001

Tot Safety Entries This Stk#: 005

Status: SE

Date MSDS Prepared: 20FEB97

Safety Data Review Date: 19AUG97

Supply Item Manager: CX

MSDS Preparer's Name: UNKNOWN

Preparer's Company: CHEMICAL SAFETY ASSOCIATES, INC

Preparer's St Or P. O. Box: 9163 CHESAPEAKE DR

Preparer's City: SAN DIEGO

Preparer's State: CA

Preparer's Zip Code: 92123-1002

MSDS Serial Number: CFCVY

Specification Number: NONE

Spec Type, Grade, Class: NONE

Hazard Characteristic Code: G3

Unit Of Issue: EA

Unit Of Issue Container Qty: 0.6 LB

Type Of Container: CYLINDER

Net Unit Weight: 0.6

=====
Ingredients/Identity Information
=====

Proprietary: NO

Ingredient: ISOBUTYLENE (CYLINDER CONTAINS 75 PPM IN AIR)

Ingredient Sequence Number: 01

Percent: <1

NIOSH (RTECS) Number: UD0890000

CAS Number: 115-11-7

OSHA PEL: NOT ESTABLISHED

ACGIH TLV: NOT ESTABLISHED

Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO

Ingredient: AIR

Ingredient Sequence Number: 02

Percent: 99

NIOSH (RTECS) Number: 1005486AI

OSHA PEL: NOT ESTABLISHED

ACGIH TLV: NOT ESTABLISHED

Other Recommended Limit: NONE RECOMMENDED
=====

Physical/Chemical Characteristics

=====
 Appearance And Odor: COLORLESS GAS: ODOR SIMILAR TO BURNING COAL.
 Boiling Point: 19.6F, -6.9C
 Melting Point: -220F, -140C
 Vapor Pressure (MM Hg/70 F): 1233
 Vapor Density (Air=1): 0.15LB/FT3
 Specific Gravity: 1.997
 Evaporation Rate And Ref: NOT APPLICABLE
 Solubility In Water: INSOLUBLE
 Autoignition Temperature: 869F
 =====

Fire and Explosion Hazard Data

=====
 Flash Point: 14F, -10C
 Lower Explosive Limit: 1.8
 Upper Explosive Limit: 9.6
 Extinguishing Media: SHUT OFF SOURCE OF GAS. USE WATER SPRAY TO COOL FIRE EXPOSED CYLINDERS, STRUCTURES AND EQUIPMENT.
 Special Fire Fighting Proc: STRUCTURAL FIREFIGHTERS MUST WEAR SELF-CONTAINED BREATHING APPARATUS. BECAUSE OF DANGER OF BLEVE, EVACUATION OF NON-EMERGENCY PERSONNEL IS ESSENTIAL.
 Unusual Fire And Expl Hazrds: DANGER! FIRES IMPINGING ON OUTSIDE SURFACE OF UNPROTECTED CYLINDERS CAN BE VERY DANGEROUS. EXPOSURE TO FIRE CAN CAUSE CATASTROPHIC FAILURE OF THE CYLINDER.
 =====

Reactivity Data

=====
 Stability: YES
 Cond To Avoid (Stability): CONTACT WITH INCOMPATIBLE MATERIALS AND EXPOSURE TO HEAT, SPARKS, OTHER SOURCES OF IGNITION.
 Materials To Avoid: STRONG OXIDIZING AGENTS (EG. CHLORINE, BROMINE PENTAFLUORIDE, OXYGEN, OXYGEN DIFLUORIDE, NITROGEN TRIFLUORIDE).
 Hazardous Decomp Products: WHEN IGNITED IN PRESENCE OF OXYGEN-CARBON MONOXIDE AND CARBON DIOXIDE.
 Hazardous Poly Occur: NO
 Conditions To Avoid (Poly): WILL NOT OCCUR.
 =====

Health Hazard Data

=====
 LD50-LC50 Mixture: LC50 (INHALATION, RAT)-620,000 MG/KG/4HR
 Route Of Entry - Inhalation: YES
 Route Of Entry - Skin: NO
 Route Of Entry - Ingestion: NO
 Health Haz Acute And Chronic: ISOBUTYLENE MAY CAUSE SOME IRRITATION OF MUCOUS MEMBRANES. IN ADDITION, CONTACT WITH RAPIDLY EXPANDING GASES CAN CAUSE FROSTBITE TO EXPOSED TISSUE. ISOBUTYLENE IS NOT KNOWN TO CAUSE SENSITIZATION IN HUMANS. CURRENTLY, BIOLOGICAL EXPOSURE INDICES (BEI'S) ARE NOT APPLICABLE FOR ISOBUTYLENE.
 Carcinogenicity - NTP: NO
 Carcinogenicity - IARC: NO
 Carcinogenicity - OSHA: NO
 Explanation Carcinogenicity: ISOBUTYLENE IS NOT FOUND ON THE FOLLOWING LISTS: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA.
 Signs/Symptoms Of Overexp: IRRITATION OF MUCOUS MEMBRANES; FROSTBITE TO EXPOSED TO TISSUE.
 Med Cond Aggravated By Exp: ACUTE OR CHRONIC RESPIRATORY CONDITIONS MAY BE AGGRAVATED BY OVEREXPOSURE TO THE COMPONENTS OF THIS PRODUCT.
 Emergency/First Aid Proc: ADMINISTER OXYGEN, IF NECESSARY; TREAT SYMPTOMS; REDUCE OR ELIMINATE EXPOSURE.
 =====

Precautions for Safe Handling and Use

=====
 Steps If Matl Released/Spill: EVACUATE IMMEDIATE AREA. UNCONTROLLED
 =====

RELEASES SHOULD BE RESPONDED TO BY TRAINED PERSONNEL USING PRE-PLANNED PROCEDURES. PROPER PROTECTIVE EQUIPMENT SHOULD BE USED. IN CASE OF GAS RELEASE, CLEAR THE AFFECTED AREA, PROTECT PEOPLE AND RESPOND.

Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.

Waste Disposal Method: WASTE DISPOSAL MUST BE IN ACCORDANCE WITH APPROPRIATE LOCAL, STATE AND FEDERAL REGULATIONS. RETURN CYLINDERS WITH ANY RESIDUAL PRODUCT TO AIR LIQUIDE. DO NOT DISPOSE OF LOCALLY.

Precautions-Handling/Storing: STORE UPRIGHT & FIRMLY SECURED TO PREVENT FALLING OR BEING KNOCKED OVER. STORE IN A COOL, DRY, WELL-VENTILATED PLACE AWAY FROM SOURCES OF HEAT.

Other Precautions: KEEP STORAGE AREA CLEAR OF MATERIALS WHICH MAY BURN. DO NOT ALLOW AREA WHERE CYLINDERS ARE STORED TO EXCEED 125F (52C). STORE CYLINDERS AWAY FROM HEAVILY TRAFFICKED AREAS AND EMERGENCY EXITS. PROTECT AGAINST PHYSICAL DAMAGE.

=====
Control Measures
=====

Respiratory Protection: MAINTAIN OXYGEN LEVELS ABOVE 19.5% IN THE WORKPLACE. USE SUPPLIED AIR RESPIRATORY PROTECTION IF OXYGEN LEVELS ARE BELOW 19.5% OR DURING EMERGENCY RESPONSE TO A RELEASE OF THIS PRODUCT. FOLLOW 29 CFR 1910.134 OR EQUIVALENT STATE STANDARDS.

Ventilation: USE EXPLOSION-PROOF LOCAL EXHAUST VENTILATION TO PREVENT ISOBUTYLENE CONCENTRATION FROM EXCEEDING LEL OF 1.8%.

Protective Gloves: LEATHER GLOVES WHEN HANDLING CYLINDERS.

Eye Protection: SAFETY GLASSES.

Other Protective Equipment: USE BODY PROTECTION APPROPRIATE FOR TASK. COTTON CLOTHING RECOMMENDED TO PREVENT STATIC BUILD-UP.

Work Hygienic Practices: WASH HANDS AFTER HANDLING AND BEFORE EATING, DRINKING, OR SMOKING. LAUNDRER CONTAMINATED CLOTHES BEFORE REUSE.

Suppl. Safety & Health Data: HNU P/N IS: 101-350-N. MSDS BY MFR WRITTEN FOR "PURE" ISOBUTYLENE; PHYSICAL & FIRE DATA AREAS ARE FOR PURE ISOBUTYLENE. THIS NSN IS FOR A CYLINDER CONTAINING 75-150 PPM (<1%) OF ISOBUTYLENE.

=====
Transportation Data
=====

Trans Data Review Date: 97231

DOT PSN Code: DQQ

DOT Proper Shipping Name: COMPRESSED GASES, N.O.S.

DOT Class: 2.2

DOT ID Number: UN1956

DOT Label: NONFLAMMABLE GAS

IMO PSN Code: EQH

IMO Proper Shipping Name: COMPRESSED GAS, N.O.S. o

IMO Regulations Page Number: 2124

IMO UN Number: 1956

IMO UN Class: 2(2.2)

IMO Subsidiary Risk Label: -

IATA PSN Code: HDO

IATA UN ID Number: 1956

IATA Proper Shipping Name: COMPRESSED GAS, N.O.S. *

IATA UN Class: 2.2

IATA Label: NON-FLAMMABLE GAS

AFI PSN Code: HDO

AFI Prop. Shipping Name: COMPRESSED GAS, N.O.S.

AFI Class: 2.2

AFI ID Number: UN1956

AFI Basic Pac Ref: A6.3,A6.5,A6.7

N.O.S. Shipping Name: CONTAINS ISOBUTYLENE AND AIR

Additional Trans Data: CYLINDER CONTAINS 75-150 PPM ISOBUTYLENE IN AIR.

WEIGHT OF GAS MIXTURE IN EACH CYLINDER IS 0.6 LBS. WT OF EMPTY CYLINDER IS 2.4 LBS.

=====
Disposal Data
=====

J.T. Baker SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)

Flammability Rating: 0 - None

Reactivity Rating: 2 - Moderate

Contact Rating: 3 - Severe (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD;
PROPER GLOVES

Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:

Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.

Ingestion:

Corrosive! Swallowing hydrochloric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea. Swallowing may be fatal.

Skin Contact:

Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and discolor skin.

Eye Contact:

Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Chronic Exposure:

Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

4. First Aid Measures**Inhalation:**

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes

while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Extreme heat or contact with metals can release flammable hydrogen gas.

Explosion:

Not considered to be an explosion hazard.

Fire Extinguishing Media:

If involved in a fire, use water spray. Neutralize with soda ash or slaked lime.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material

may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL):

5 ppm Ceiling

-ACGIH Threshold Limit Value (TLV):

5 ppm Ceiling

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye-wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Colorless, fuming liquid.

Odor:

Pungent odor of hydrogen chloride.

Solubility:

Infinite in water with slight evolution of heat.

Density:

1.18

pH:

For HCL solutions: 0.1 (1.0 N), 1.1 (0.1 N), 2.02 (0.01 N)

% Volatiles by volume @ 21C (70F):

100

Boiling Point:

53C (127F) Azeotrope (20.2%) boils at 109C (228F)

Melting Point:

-74C (-101F)

Vapor Density (Air=1):

No information found.

Vapor Pressure (mm Hg):

190 @ 25C (77F)

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products:

When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes. Thermal oxidative decomposition produces toxic chlorine fumes and explosive hydrogen gas.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

A strong mineral acid, concentrated hydrochloric acid is incompatible with many substances and highly reactive with strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials. Incompatible with materials such as cyanides, sulfides, sulfites, and formaldehyde.

Conditions to Avoid:

Heat, direct sunlight.

11. Toxicological Information

Inhalation rat LC50: 3124 ppm/1H; oral rabbit LD50: 900 mg/kg (Hydrochloric acid concentrated); investigated as a tumorigen, mutagen, reproductive effector.

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Hydrogen Chloride (7647-01-0)	No	No	3
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:

When released into the soil, this material is not expected to biodegrade. When released into the soil, this material may leach into groundwater.

Environmental Toxicity:

This material is expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: HYDROCHLORIC ACID

Hazard Class: 8

UN/NA: UN1789

Packing Group: II

Information reported for product/size: 475LB

International (Water, I.M.O.)

Proper Shipping Name: HYDROCHLORIC ACID

Hazard Class: 8

UN/NA: UN1789

Packing Group: II

Information reported for product/size: 475LB

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----

Ingredient	TSCA	EC	Japan	Australia
Hydrogen Chloride (7647-01-0)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----

Ingredient	Korea	--Canada--		Phil.
		DSL	NDSL	
Hydrogen Chloride (7647-01-0)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----

Ingredient	-SARA 302-		-SARA 313-	
	RQ	TPQ	List	Chemical Catg.
Hydrogen Chloride (7647-01-0)	5000	500*	Yes	No
Water (7732-18-5)	No	No	No	No

Ingredient	Federal, State & International Regulations - Part 2\		
	CERCLA	-RCRA-	-TSCA-
Hydrogen Chloride (7647-01-0)	5000	261.33	8 (d)
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
 SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
 Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2R

Poison Schedule: None allocated.

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0

Label Hazard Warning:

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

Label Precautions:

Do not get in eyes, on skin, or on clothing.

Do not breathe vapor or mist.

Use only with adequate ventilation.

Wash thoroughly after handling.

Store in a tightly closed container.

Remove and wash contaminated clothing promptly.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 16.

Disclaimer:

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

**Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)**

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 909-659-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-627-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-522-2537) for assistance.

NITRIC ACID FUMING

MSDS Number: N3662 --- Effective Date: 11/17/99

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 90%; Red fuming nitric acid
CAS No.: 7697-37-2
Molecular Weight: 63
Chemical Formula: HNO₃
Product Codes:
J.T. Baker: 9624
Mallinckrodt: 2713

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL):

2 ppm (TWA), 4 ppm (STEL)

-ACGIH Threshold-Limit Value (TLV):

2 ppm (TWA); 4 ppm (STEL)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Yellow to brownish-red fuming liquid.

Odor:

Suffocating, acrid.

Solubility:

Infinitely soluble.

Density:

1.5

pH:

No information found.

% Volatiles by volume @ 21C (70F):

100 (as water and acid)

Boiling Point:

85C (185F)

Melting Point:

ca. -50C (ca. -58F)

Vapor Density (Air=1):

2-3

Vapor Pressure (mm Hg):

48 @ 20C (68F)

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products:

When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate.

Will react with water or steam to produce heat and toxic and corrosive fumes.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

A dangerously powerful oxidizing agent, fuming nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.

Conditions to Avoid:

Heat, light, moisture.

11. Toxicological Information

For Nitric Acid: Oral (human) LDLo: 430 mg/kg; Inhalation, rat, LC50: 67 ppm (NO₂)/4H.; Investigated as a mutagen and reproductive effector.

-----\Cancer Lists\-----

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Nitric Acid (7697-37-2)	No	No	None

12. Ecological Information

Environmental Fate:
 No information found.
Environmental Toxicity:
 No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID, RED FUMING
Hazard Class: 8, 5.1, 6.1
UN/NA: UN2032
Packing Group: I
Information reported for product/size: 2.5L

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID, RED FUMING
Hazard Class: 8, 5.1, 6.1
UN/NA: UN2032
Packing Group: I
Information reported for product/size: 2.5L

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----				
Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----				
Ingredient	Korea	--Canada--		Phil.
		DSL	NDSL	
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----				
Ingredient	-SARA 302-		-SARA 313-	
	RQ	TPQ	List	Chemical Catg.
Nitric Acid (7697-37-2)	1000	1000	Yes	No

-----\Federal, State & International Regulations - Part 2\-----			
Ingredient	CERCLA	-RCRA-	-TSCA-
		261.33	8(d)
Nitric Acid (7697-37-2)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
 SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
 Reactivity: Yes (Pure / Liquid)

Australian Hazchem Code: 2PE

Poison Schedule: S6

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 4 Flammability: 0 Reactivity: 1 Other: Oxidizer

Label Hazard Warning:

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

Label Precautions:

- Do not get in eyes, on skin, or on clothing.
- Do not breathe vapor or mist.
- Use only with adequate ventilation.
- Wash thoroughly after handling.
- Keep from contact with clothing and other combustible materials.
- Do not store near combustible materials.
- Store in a tightly closed container.
- Remove and wash contaminated clothing promptly.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician.

Product Use:

Laboratory Reagent.

Revision Information:

New 16 section MSDS format, all sections have been revised.

Disclaimer:

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

**Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)**

Gasoline.txt

COLORADO REFINING -- GASOLINE - GASOLINE, UNLEADED
GASOLINE - GASOLINE, UNLEADED

MATERIAL SAFETY DATA SHEET

NSN: 9130012084172

Manufacturer's CAGE: COLOR

Part No. Indicator: A

Part Number/Trade Name: GASOLINE

General Information

Item Name: GASOLINE, UNLEADED

Company's Name: COLORADO REFINING COMPANY

Company's Street: 5800 BRIGHTON BLVD

Company's City: COMMERCE CITY

Company's State: CO

Company's Country: US

Company's Zip Code: 80022

Company's Emerg Ph #: 517-463-1164, CHEMTREC 800-424-9300

Company's Info Ph #: 303-295-4500

Record No. For Safety Entry: 001

Tot Safety Entries This Stk#: 064

Status: SE

Date MSDS Prepared: 29JAN91

Safety Data Review Date: 30APR93

Supply Item Manager: KY

MSDS Preparer's Name: M.N. MARTIN

MSDS Serial Number: BQNHW

Specification Number: VV-G-1690

Spec Type, Grade, Class: CIVGAS

Hazard Characteristic Code: F2

Unit Of Issue: DR

Unit Of Issue Container Qty: 55 GALLONS

Type Of Container: DRUM

Net Unit Weight: 320.6 LBS

Ingredients/Identity Information

Physical/Chemical Characteristics

Appearance And Odor: SILVER, GREY OR CLEAR LIQUID WITH CHARACTERISTIC GASOLINE ODOR

Boiling Point: <100F, <38C

Vapor Pressure (MM Hg/70 F): 400-900MM

Gasoline.txt

Vapor Density (Air=1): 3-4
Specific Gravity: 0.65-0.75
Decomposition Temperature: UNKNOWN
Evaporation Rate And Ref: <1 (ETHER=1)
Solubility In Water: INSOLUBLE
Percent Volatiles By Volume: 100
Corrosion Rate (IPY): UNKNOWN

=====
=====
Fire and Explosion Hazard Data
=====

=====
Flash Point: <-40F, <-40C
Lower Explosive Limit: 1.3%
Upper Explosive Limit: 6.0%
Extinguishing Media: USE CARBON DIOXIDE, FOAM, OR DRY CHEMICAL. USE WATER
TO COOL SURROUNDING CONTAINERS.
Special Fire Fighting Proc: WEAR FIRE FIGHTING PROTECTIVE EQUIPMENT AND
A FULL FACED SELF CONTAINED BREATHING APPARATUS. EVACUATE AREA. COOL FIRE
EXPOSED CONTAINERS WITH WATER SPRAY.
Unusual Fire And Expl Hazrds: CONTAINERS WILL EXPLODE IN FIRE. VAPORS
HEAVIER THAN AIR AND MAY TRAVEL A CONSIDERABLE DISTANCE TO SOURCE OF
IGNITION AND FLASH BACK.

=====
=====
Reactivity Data
=====

=====
Stability: YES
Cond To Avoid (Stability): HIGH HEAT, OPEN FLAMES AND OTHER SOURCES OF
IGNITION
Materials To Avoid: STRONG OXIDIZING AGENTS
Hazardous Decomp Products: CARBON MONOXIDE, CARBON DIOXIDE AND OTHER
HYDROCARBON COMPOUNDS DURING COMBUSTION.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT APPLICABLE

=====
=====
Health Hazard Data
=====

=====
LD50-LC50 Mixture: ORAL LD50 (RAT) IS UNKNOWN
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: ACUTE-INHALATION: IRRITATION OF UPPER
DERMATITIS, PNEUMOTITIS, POLYNEUROPATHY, PULMONARY EDEMA, AND KIDNEY
DAMAGE.

Gasoline.txt

Carcinogenicity - NTP: YES

Carcinogenicity - IARC: YES

Carcinogenicity - OSHA: YES

Explanation Carcinogenicity: CONTAINS Benzene [71-43-2] WHICH IS LISTED BY

NTP AND IARC AND REGULATED BY OSHA AS A CARCINOGEN.

Signs/Symptoms Of Overexp: COUGHING, DIFFICULTY IN BREATHING, NAUSEA, VOMITING, FATIGUE, DIZZINESS, HEADACHES, UNCONSCIOUSNESS, AND EYE IRRITATION, DRY SKIN.

Med Cond Aggravated By Exp: PERSONS WITH A SKIN AND PULMONARY DISORDERS

SHOULD USE CAUTION WHEN HANDLING OR USING THIS PRODUCT.

Emergency/First Aid Proc: SKIN: REMOVE CONTAMINATED CLOTHING. WASH WITH

SOAP AND WATER. GET MEDICAL ATTENTION IF IRRITATION PERSISTS.

INHALATION: REMOVE TO FRESH AIR & RESTORE BREATHING IF NECESSARY. GET MEDICAL ATTENTION. EYE: IMMEDIATELY FLUSH WITH WATER FOR 15 MINUTES WHILE

HOLDING EYELIDS OPEN. GET MEDICAL ATTENTION. INGESTION: GET IMMEDIATE MEDICAL ATTENTION. DO NOT INDUCE VOMITING. NOTHING BY MOUTH IF UNCONSCIOUS.

=====
=====
Precautions for Safe Handling and Use
=====

Steps If Matl Released/Spill: REMOVE SOURCES OF IGNITION & WEAR PROTECTIVE

EQUIPMENT. MINOR: ABSORB MATERIAL WITH CLAY, VERMICULITE, OR SIMILAR ABSORBENT MATERIAL. PLACE IN DISPOSAL CONTAINERS. MAJOR: DIKE & CONTAIN

SPILL: SHUT OFF LEAKS. REMOVE LIQUID BY VACUUM OR ABSORBENT.

Neutralizing Agent: NOT APPLICABLE

Waste Disposal Method: WASTE MAY BE BURNED IN AN APPROVED INCINERATOR OR

DISPOSED OF IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL LAWS

AND REGULATIONS.

Precautions-Handling/Storing: STORE IN A COOL, VENTILATED WORK AREA. KEEP

CONTAINERS CLOSED WHEN NOT IN USE. FLAMMABLE LIQUID; EMPTY CONTAINERS CAN

BE HAZARDOUS.

Other Precautions: THE SELECTION OF PERSONAL PROTECTIVE EQUIPMENT SHOULD

BE MADE BY THE MATERIAL USER BASED ON THE PARTICULAR CONDITIONS WHERE THE

MATERIAL IS TO BE USED TOGETHER WITH INFORMATION CONTAINED IN THIS MSDS.

Gasoline.txt
Control Measures

=====
Respiratory Protection: USE NIOSH APPROVED RESPIRATOR. AIR-SUPPLIED OR
FILTERING TYPE WITH ORGANIC VAPOR CARTRIDGES ARE RECOMMENDED.
Ventilation: LOCAL AND MECHANICAL EXHAUST RECOMMENDED. AVOID OPEN
ELECTRICAL SOURCES NEAR PRODUCT VAPOR AREAS.
Protective Gloves: NEOPRENE, NITRILE, OR POLYVINYL ALCOHOL
Eye Protection: USE CHEMICAL SAFETY GOGGLES & FACESHIELD
Other Protective Equipment: EYE WASH STATION & SAFETY SHOWER.
Work Hygienic Practices: DO NOT TAKE INTERNALLY. AVOID SKIN CONTACT. W
ASH
SKIN AFTER USING PRODUCT. DO NOT EAT, DRINK OR SMOKE IN WORK AREA.
Suppl. Safety & Health Data: NONE
=====

=====
Transportation Data
=====

=====
Trans Data Review Date: 93168
DOT PSN Code: GTN
DOT Proper Shipping Name: GASOLINE
DOT Class: 3
DOT ID Number: UN1203
DOT Pack Group: II
DOT Label: FLAMMABLE LIQUID
IMO PSN Code: HRV
IMO Proper Shipping Name: GASOLINE
IMO Regulations Page Number: 3141
IMO UN Number: 1203
IMO UN Class: 3.1
IMO Subsidiary Risk Label: -
IATA PSN Code: MUC
IATA UN ID Number: 1203
IATA Proper Shipping Name: GASOLINE
IATA UN Class: 3
IATA Label: FLAMMABLE LIQUID
AFI PSN Code: MUC
AFI Prop. Shipping Name: GASOLINE
AFI Class: 3
AFI ID Number: UN1203
AFI Pack Group: II
AFI Basic Pac Ref: 7-7
=====

=====
Disposal Data
=====

=====
Label Data

Gasoline.txt

=====
=====
Label Required: YES

Label Status: G

Common Name: GASOLINE

Special Hazard Precautions: ACUTE-INHALATION:IRRITATION OF UPPER
DERMATITIS, PNEUMOTITIS, POLYNEUROPATHY, PULMONARY EDEMA, AND KIDNEY
DAMAGE. COUGHING, DIFFICULTY IN BREATHING, NAUSEA, VOMTING, FATIGUE,
DIZZINESS, HEADACHES, UNCONSCIOUSNESS, AND EYE IRRITATION, DRY SKIN.

Label Name: COLORADO REFINING COMPANY

Label Street: 5800 BRIGHTON BLVD

Label City: COMMERCE CITY

Label State: CO

Label Zip Code: 80022

Label Country: US

Label Emergency Number: 517-463-1164, CHEMTREC 800-424-9300

THE UNIVERSITY OF CHICAGO
DIVISION OF THE PHYSICAL SCIENCES
DEPARTMENT OF CHEMISTRY
5700 SOUTH DICKENS STREET
CHICAGO, ILLINOIS 60637
TEL: 773-936-3700
FAX: 773-936-3700
WWW: WWW.CHEM.UCHICAGO.EDU

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 800-852-2151
CHEMTREC: 1-800-424-4300

National Response in Canada
CANUTEC: 613-896-6666

Outside U.S. and Canada
Chemtreat 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ALCONOX(R)

MSDS Number: A2052 --- Effective Date: 02/21/00

1. Product Identification

Synonyms: Proprietary blend of sodium linear alkylaryl sulfonate, alcohol sulfate, phosphates, and carbonates.

CAS No.: Not applicable.

Molecular Weight: Not applicable to mixtures.

Chemical Formula: Not applicable to mixtures.

Product Codes: A461

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Alconox (R) proprietary detergent mixture	N/A	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:

May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.

Ingestion:

May cause irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.

Skin Contact:

No adverse effects expected.

Eye Contact:

May cause irritation, redness and pain.

Chronic Exposure:

No information found.

Aggravation of Pre-existing Conditions:

No information found.

4. First Aid Measures

Inhalation:

Remove to fresh air. Get medical attention for any breathing difficulty.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Not expected to be a fire hazard.

Explosion:

No information found.

Fire Extinguishing Media:

Dry chemical, foam, water or carbon dioxide.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. When mixed with water, material foams profusely. Small amounts of residue may be flushed to sewer with plenty of water.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Moisture may cause material to cake. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL):

15 mg/m³ total dust, 5 mg/m³ respirable fraction for nuisance dusts.

- ACGIH Threshold Limit Value (TLV):

10 mg/m³ total dust containing no asbestos and < 1% crystalline silica for Particulates Not Otherwise Classified (PNOC).

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels

are not known, use a full-facepiece positive-pressure, air-supplied respirator.
WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

White powder interspersed with cream colored flakes.

Odor:

No information found.

Solubility:

Moderate (1-10%)

Specific Gravity:

No information found.

pH:

No information found.

% Volatiles by volume @ 21C (70F):

0

Boiling Point:

No information found.

Melting Point:

No information found.

Vapor Density (Air=1):

No information found.

Vapor Pressure (mm Hg):

No information found.

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

No information found.

Conditions to Avoid:

No information found.

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

-----\Cancer Lists\-----			
Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Alconox (R) proprietary detergent mixture	No	No	None

12. Ecological Information

Environmental Fate:

This product is biodegradable.

Environmental Toxicity:

No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----				
Ingredient	TSCA	EC	Japan	Australia
Alconox (R) proprietary detergent mixture	Yes	No	No	No

-----\Chemical Inventory Status - Part 2\-----				
Ingredient	--Canada--			
	Korea	DSL	NDSL	Phil.

Alconox(R) proprietary detergent mixture	No	No	Yes	No
---	----	----	-----	----

-----\Federal, State & International Regulations - Part 1\-----				
	-SARA 302-		-SARA 313-	
Ingredient	RQ	TPQ	List	Chemical Catg.

Alconox(R) proprietary detergent mixture	No	No	No	No
---	----	----	----	----

-----\Federal, State & International Regulations - Part 2\-----			
		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)

Alconox(R) proprietary detergent mixture	No	No	No
---	----	----	----

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
 SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
 Reactivity: No (Pure / Solid)

Australian Hazchem Code: No information found.

Poison Schedule: No information found.

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 0 Flammability: 0 Reactivity: 0

Label Hazard Warning:

CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.

Label Precautions:

Avoid contact with eyes.

Keep container closed.

Use with adequate ventilation.

Avoid breathing dust.

Wash thoroughly after handling.

Label First Aid:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. In all cases, get medical attention.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16.

Disclaimer:

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

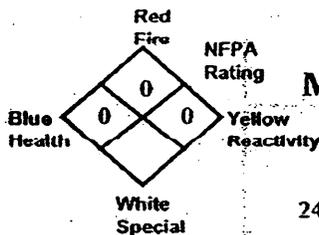
**Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)**

1. The first part of the document is a letter from the Secretary of the State to the Governor, dated 10th March 1870. It contains a report on the state of the State and the progress of the various departments. The letter is signed by the Secretary and is addressed to the Governor.

2. The second part of the document is a report on the state of the State, dated 10th March 1870. It contains a detailed account of the various departments and the progress of the State. The report is signed by the Secretary and is addressed to the Governor.

3. The third part of the document is a report on the state of the State, dated 10th March 1870. It contains a detailed account of the various departments and the progress of the State. The report is signed by the Secretary and is addressed to the Governor.

4. The fourth part of the document is a report on the state of the State, dated 10th March 1870. It contains a detailed account of the various departments and the progress of the State. The report is signed by the Secretary and is addressed to the Governor.



Liqui-Nox®

MATERIAL SAFETY DATA SHEET

Alconox, Inc.
30 Glenn Street, Suite 309
White Plains, NY 10603

24 Hour Emergency Number - Chem-Tel (800) 255-3924

I. IDENTIFICATION

Product Name (as appears on label)	LIQUI-NOX
CAS Registry Number:	Not Applicable
Effective Date:	January 1, 1999
Chemical Family:	Anionic Liquid Detergent
Manufacturer Catalog Numbers for sizes	1232, 1201, 1215 and 1255

II. HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

There are no hazardous ingredients in LIQUI-NOX™ as defined by the OSHA Standard and Hazardous Substance List 29 CFR 1910 Subpart Z.

III. PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point (°F):	214°F
Vapor Pressure (mm Hg):	No Data
Vapor Density (AIR=1):	No Data
Specific Gravity (Water=1):	1.075
Melting Point:	Not Applicable
Evaporation Rate (Butyl Acetate=1):	Slower
Solubility in Water:	Completely soluble in all proportions.
Appearance:	Yellow liquid, nearly odorless

IV. FIRE AND EXPLOSION DATA

Flash Point:	None (Cleveland Open Cup)
Flammable Limits:	LEL: No Data UEL: No Data
Extinguishing Media:	Water, dry chemical, CO ₂ , foam
Special Fire fighting Procedures:	Self-contained positive pressure breathing apparatus and protective clothing should be worn when fighting fires involving chemicals.
Unusual Fire and Explosion Hazards:	None

V. REACTIVITY DATA

Stability:	Stable
Conditions To Avoid:	None
Incompatibility (Materials To Avoid):	Oxidizing agents.
Hazardous Decomposition or Byproducts:	May release SO ₂ on burning.

VI. HEALTH HAZARD DATA

Route(s) of Entry:	Inhalation? No Skin? Yes Ingestion? Yes
Health Hazards (Acute and Chronic):	Skin contact may prove locally irritating, causing drying and/or chapping. Ingestion may cause discomfort and/or diarrhea.
Carcinogenicity:	NTP? No IARC Monographs? No OSHA Regulated? No
Signs and Symptoms of Exposure:	Prolonged skin contact may cause drying and/or chapping.
Medical Conditions Generally Aggravated by Exposure:	Not established. Unnecessary exposure to this product or any industrial chemical should be avoided.
Emergency and First Aid Procedures:	Eyes: Immediately flush eyes with water for at least 15 minutes. Call a physician. Skin: Flush with plenty of water. Ingestion: Drink large quantities of water or milk. Do not induce vomiting. If vomiting occurs administer fluids. See a physician for discomfort.

VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken if Material is Released or Spilled:	Material foams profusely. For small spills recover as much as possible with absorbent material and flush remainder to sewer. Material is biodegradable.
Waste Disposal Method:	Small quantities may be disposed of in sewer. Large quantities should be disposed of in accordance with local ordinances for detergent products.
Precautions to be Taken in Storing and Handling:	No special precautions in storing. Use protective equipment when handling undiluted material.
Other Precautions:	No special requirements other than the good industrial hygiene and safety practices employed with any industrial chemical.

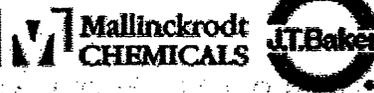
VIII. CONTROL MEASURES

Respiratory Protection (Specify Type):	Not Required
Ventilation:	Local Exhaust-Normal Special-Not Required Mechanical-Not Required Other-Not Required
Protective Gloves:	Impervious gloves are recommended.
Eye Protection:	Goggles and/or splash shields are recommended.
Other Protective Clothing or Equipment:	Not required
Work/Hygienic Practices:	No special practices required

THE INFORMATION HEREIN IS GIVEN IN GOOD FAITH BUT NO WARRANTY IS EXPRESSED OR IMPLIED.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-959-2151
CHEMTREC: 1-800-424-6300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-627-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

TRICHLOROETHYLENE

MSDS Number: T4940 --- Effective Date: 09/14/00

1. Product Identification

Synonyms: Trichloroethene; TCE; acetylene trichloride; Ethinyl trichloride

CAS No.: 79-01-6

Molecular Weight: 131.39

Chemical Formula: C₂HCl₃

Product Codes:

J.T. Baker: 5376, 9454, 9458, 9464, 9473, 9474

Mallinckrodt: 8598, 8600, 8633

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Trichloroethylene	79-01-6	100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS HEART, CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. CAUSES SEVERE SKIN IRRITATION. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer

depends on level and duration of exposure.

J.T. Baker SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)

Flammability Rating: 1 - Slight

Reactivity Rating: 1 - Slight

Contact Rating: 2 - Moderate

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD;
PROPER GLOVES

Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:

Vapors can irritate the respiratory tract. Causes depression of the central nervous system with symptoms of visual disturbances and mental confusion, incoordination, headache, nausea, euphoria, and dizziness. Inhalation of high concentrations could cause unconsciousness, heart effects, liver effects, kidney effects, and death.

Ingestion:

Cases irritation to gastrointestinal tract. May also cause effects similar to inhalation. May cause coughing, abdominal pain, diarrhea, dizziness, pulmonary edema, unconsciousness. Kidney failure can result in severe cases. Estimated fatal dose is 3-5 ml/kg.

Skin Contact:

Cause irritation, redness and pain. Can cause blistering. Continued skin contact has a defatting action and can produce rough, dry, red skin resulting in secondary infection.

Eye Contact:

Vapors may cause severe irritation with redness and pain. Splashes may cause eye damage.

Chronic Exposure:

Chronic exposures may cause liver, kidney, central nervous system, and peripheral nervous system effects. Workers chronically exposed may exhibit central nervous system depression, intolerance to alcohol, and increased cardiac output. This material is linked to mutagenic effects in humans. This material is also a suspect carcinogen.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders, cardiovascular disorders, impaired liver or kidney or respiratory function, or central or peripheral nervous system disorders may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:

Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.

5. Fire Fighting Measures

Fire:

Autoignition temperature: 420C (788F)

Flammable limits in air % by volume:

lcl: 8; ucl: 12.5

Explosion:

A strong ignition source, e. g., a welding torch, can produce ignition. Sealed containers may rupture when heated.

Fire Extinguishing Media:

Use water spray to keep fire exposed containers cool. If substance does ignite, use CO₂, dry chemical or foam.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Combustion by-products include phosgene and hydrogen chloride gases. Structural firefighters' clothing provides only limited protection to the combustion products of this material.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

Trichloroethylene:

-OSHA Permissible Exposure Limit (PEL):

100 ppm (TWA), 200 ppm (Ceiling),

300 ppm/5min/2hr (Max)

-ACGIH Threshold Limit Value (TLV):

50 ppm (TWA) 100 ppm (STEL);

listed as A5, not suspected as a human carcinogen.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). This substance has poor warning properties. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene is a recommended material for personal protective equipment.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Clear, colorless liquid.

Odor:

Chloroform-like odor.

Solubility:

Practically insoluble in water. Readily miscible in organic solvents.

Specific Gravity:

1.47 @ 20C/4C

pH:

No information found.

% Volatiles by volume @ 21C (70F):

100

Boiling Point:

87C (189F)

Melting Point:

-73C (-99F)

Vapor Density (Air=1):

4.5

Vapor Pressure (mm Hg):

57.8 @ 20C (68F)

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. Will slowly decompose to hydrochloric acid when exposed to light and moisture.

Hazardous Decomposition Products:

May produce carbon monoxide, carbon dioxide, hydrogen chloride and phosgene when heated to decomposition.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Strong caustics and alkalis, strong oxidizers, chemically active metals, such as barium, lithium, sodium, magnesium, titanium and beryllium, liquid oxygen.

Conditions to Avoid:

Heat, flame, ignition sources, light, moisture, incompatibles

11. Toxicological Information

Toxicological Data:

Trichloroethylene: Oral rat LD50: 5650 mg/kg; investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:

This material has been linked to mutagenic effects in humans.

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Trichloroethylene (79-01-6)	No	Yes	2A

12. Ecological Information

Environmental Fate:

When released into the soil, this material may leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released to water, this material is expected to quickly evaporate. This material has an experimentally-determined bioconcentration factor (BCF) of less than 100. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days.

Environmental Toxicity:

The LC50/96-hour values for fish are between 10 and 100 mg/l. This material is expected to be slightly toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TRICHLOROETHYLENE

Hazard Class: 6.1

UN/NA: UN1710

Packing Group: III

Information reported for product/size: 5GL

International (Water, I.M.O.)

Proper Shipping Name: TRICHLOROETHYLENE

Hazard Class: 6.1

UN/NA: UN1710

Packing Group: III

Information reported for product/size: 5GL

International (Air, I.C.A.O.)

Proper Shipping Name: TRICHLOROETHYLENE

Hazard Class: 6.1

UN/NA: UN1710

Packing Group: III

Information reported for product/size: 5GL

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----

Ingredient	TSCA	EC	Japan	Australia
Trichloroethylene (79-01-6)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----

Ingredient	Korea	Canada DSL	NDSL	Phil.
Trichloroethylene (79-01-6)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----

Ingredient	-SARA 302- RQ	TPQ	-SARA 313- List	Chemical Catg.
Trichloroethylene (79-01-6)	No	No	Yes	No

-----\Federal, State & International Regulations - Part 2\-----

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Trichloroethylene (79-01-6)	100	U228	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
 SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
 Reactivity: No (Pure / Liquid)

WARNING:

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: No information found.

Poison Schedule: S6

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 2 Flammability: 1 Reactivity: 0

Label Hazard Warning:

WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS HEART, CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. CAUSES SEVERE SKIN IRRITATION. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

Label Precautions:

Do not get in eyes, on skin, or on clothing.

Do not breathe vapor.

Keep container closed.

Use only with adequate ventilation.

Wash thoroughly after handling.

Keep away from heat and flame.

Label First Aid:

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician. Note to physician: Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 8, 11.

Disclaimer:

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

M Mallinckrodt
CHEMICALS



24 Hour Emergency Telephone: 900-951-2151
CHEMTREC: 1-800-424-6300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3607

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-592-2537) for assistance.

TETRACHLOROETHYLENE

MSDS Number: T0767 --- Effective Date: 08/02/00

1. Product Identification

Synonyms: ethylene tetrachloride; tetrachloroethene; perchloroethylene; carbon bichloride; carbon dichloride

CAS No.: 127-18-4

Molecular Weight: 165.83

Chemical Formula: Cl₂C:CCl₂

Product Codes:

J.T. Baker: 9218, 9360, 9453, 9465, 9469

Mallinckrodt: 1933, 8058

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Tetrachloroethylene	127-18-4	99 - 100%	Yes

3. Hazards Identification**Emergency Overview**

WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER

AND KIDNEYS. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

J.T. Baker SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)

Flammability Rating: 0 - None

Reactivity Rating: 1 - Slight

Contact Rating: 2 - Moderate

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:

Irritating to the upper-respiratory tract. Giddiness, headache, intoxication, nausea and vomiting may follow the inhalation of large amounts while massive amounts can cause breathing arrest, liver and kidney damage, and death. Concentrations of 600 ppm and more can affect the central nervous system after a few minutes.

Ingestion:

Not highly toxic by this route because of low water solubility. Used as an oral dosage for hookworm (1 to 4 ml). Causes abdominal pain, nausea, diarrhea, headache, and dizziness.

Skin Contact:

Causes irritation to skin. Symptoms include redness, itching, and pain. May be absorbed through the skin with possible systemic effects.

Eye Contact:

Causes irritation, redness, and pain.

Chronic Exposure:

May cause liver, kidney or central nervous system damage after repeated or prolonged exposures. Suspected cancer risk from animal studies.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems or impaired liver or kidney function may be more susceptible to the effects of the substance. The use of alcoholic beverages enhances the toxic effects.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Aspiration hazard. If swallowed, **DO NOT INDUCE VOMITING**. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention.

immediately.

Skin Contact:

Wash skin with soap or mild detergent and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:

Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.

5. Fire Fighting Measures

Fire:

Not considered to be a fire hazard but becomes hazardous in a fire situation because of vapor generation and possible degradation to phosgene (highly toxic) and hydrogen chloride (corrosive). Vapors are heavier than air and collect in low-lying areas.

Explosion:

Not considered to be an explosion hazard. Containers may explode when involved in a fire.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Store in a cool, dry, ventilated area away from sources of heat or ignition. Isolate from flammable materials. Protect from direct sunlight. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure

levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL):

100 ppm (TWA), 200 ppm (ceiling),

300 ppm/5min/3-hour (max)

-ACGIH Threshold Limit Value (TLV):

25 ppm (TWA), 100 ppm (STEL); listed as A3, animal carcinogen

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Clear, colorless liquid.

Odor:

Ethereal odor.

Solubility:

0.015 g in 100 g of water.

Specific Gravity:

1.62 @ 20C/4C

pH:

No information found.

% Volatiles by volume @ 21C (70F):

100

Boiling Point:

121C (250F)

Melting Point:

-19C (-2F)

Vapor Density (Air=1):

5.7

Vapor Pressure (mm Hg):

18 @ 25C (77F)

Evaporation Rate (BuAc=1):

0.33 (trichloroethylene = 1)

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. Slowly decomposed by light.

Deteriorates rapidly in warm, moist climates.

Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hydrogen chloride gas and phosgene gas may be formed upon heating. Decomposes with moisture to yield trichloroacetic acid and hydrochloric acid.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Strong acids, strong oxidizers, strong alkalis, especially NaOH, KOH; finely divided metals, especially zinc, barium, lithium. Slowly corrodes aluminum, iron and zinc.

Conditions to Avoid:

Moisture, light, heat and incompatibles.

11. Toxicological Information

Oral rat LD50: 2629 mg/kg; inhalation rat LC50: 34.2 g/m³/8H; investigated as a tumorigen, mutagen, reproductive effector.

-----\Cancer Lists\-----

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Tetrachloroethylene (127-18-4)	No	Yes	2A

12. Ecological Information

Environmental Fate:

When released into the soil, this material is expected to quickly evaporate. When released into the soil, this material may leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into water, this material is not expected to biodegrade. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals.

Environmental Toxicity:

The LC50/96-hour values for fish are between 1 and 10 mg/l. The LC50/96-hour values for fish are between 10 and 100 mg/l. This material is expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TETRACHLOROETHYLENE

Hazard Class: 6.1

UN/NA: UN1897

Packing Group: III

Information reported for product/size: 20L

International (Water, I.M.O.)

Proper Shipping Name: TETRACHLOROETHYLENE

Hazard Class: 6.1

UN/NA: UN1897

Packing Group: III

Information reported for product/size: 20L

International (Air, I.C.A.O.)

Proper Shipping Name: TETRACHLOROETHYLENE

Hazard Class: 6.1

UN/NA: UN1897

Packing Group: III

Information reported for product/size: 20L

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----
 Ingredient TSCA EC Japan Australia

 Tetrachloroethylene (127-18-4) Yes Yes Yes Yes

-----\Chemical Inventory Status - Part 2\-----
 Ingredient Korea DSL NDSL Phil.

 Tetrachloroethylene (127-18-4) Yes Yes No Yes

-----\Federal, State & International Regulations - Part 1\-----
 Ingredient -SARA 302- -SARA 313-
 RQ TPQ List Chemical Catg.

 Tetrachloroethylene (127-18-4) No No Yes No

-----\Federal, State & International Regulations - Part 2\-----
 Ingredient -RCRA- -TSCA-
 CERCLA 261.33 8(d)

 Tetrachloroethylene (127-18-4) 100 U210 No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
 SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
 Reactivity: No (Pure / Liquid)

WARNING:

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 2[Z]

Poison Schedule: No information found.

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 2 Flammability: 0 Reactivity: 0

Label Hazard Warning:

WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

Label Precautions:

Do not get in eyes, on skin, or on clothing.

Do not breathe vapor or mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.

Label First Aid:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician.

Product Use:

Laboratory Reagent.

Revision Information:

No changes.

Disclaimer:

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