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MCAS EL TORO
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Contract No. N68711-95-D-7526

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

CLEAN 3

FINAL
TECHNICAL MEMORANDUM
IRP SITES 16 AND 24
INDOOR AIR RISK EVALUATION
FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

CTO-0045/0072
June 2004

Prepared by:

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Signature: _____ Date: June 4/04
Andrea Temeshy, PhD, Risk Assessment Manager

CLEAN 3 Program
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June 8, 2004

Contracting Officer
Naval Facilities Engineering Command
Southwest Division
Mr. Chon S. Son, Code 02R1.CS
1220 Pacific Highway
San Diego, CA 92132-5190

Subject: Final Technical Memorandum, IRP Sites 16 and 24, Indoor Air Risk Evaluation
Former Marine Corps Air Station, El Toro, California – Dated June 2004

Dear Mr. Son:

It is our pleasure to submit this copy of the Final Technical Memorandum, IRP Sites 16 and 24, Indoor Air Risk Evaluation, Former Marine Corps Air Station, El Toro, California. At SWDIV direction, the Final Technical Memorandum has been distributed to the recipients indicated on the attached transmittal sheet.

The Final Technical Memorandum addresses all agency comments received on the draft version of this document during the comment period. Per SWDIV direction, the Navy's responses to agency comments on the Draft Technical Memorandum have been submitted and distributed to recipients under separate cover.

Please contact me at (619) 744-3004 if you have any questions.

Sincerely,

Thurman L. Heironimus, R.G.
Project Manager

TLH/sp
Enclosure

BECHTEL ENVIRONMENTAL, INC.

CLEAN 3 TRANSMITTAL/DELIVERABLE RECEIPT

Contract No. N-68711-95-D-7526 **Document Control No.:** CTO-0045/0072

File Code: 0214

TO: Contracting Officer
Naval Facilities Engineering Command
Southwest Division
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1220 Pacific Highway
San Diego, CA 92132-5190

DATE: June 8, 2004
CTO #: 045
LOCATION: MCAS El Toro

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Dated June 2004

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ACRONYMS/ABBREVIATIONS

ASTM	American Society for Testing and Materials
bgs	below ground surface
BNI	Bechtel National, Inc.
Cal/EPA	California Environmental Protection Agency
CLEAN	Comprehensive Long-Term Environmental Action Navy
COPC	chemical of potential concern
CSF	cancer slope factor
CTO	contract task order
DTSC	(Cal/EPA) Department of Toxic Substances Control
EPC	exposure point concentration
IRIS	Integrated Risk Information System
IRP	Installation Restoration Program
MCAS	Marine Corps Air Station
NCEA	National Center for Environmental Assessment
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
RME	reasonable maximum exposure
SVE	soil vapor extraction
TCE	trichloroethene
TM	technical memorandum
UCL	upper confidence limit
U.S. EPA	United States Environmental Protection Agency
VOC	volatile organic compound

TECHNICAL MEMORANDUM – IRP SITES 16 AND 24 INDOOR AIR RISK EVALUATION

This Technical Memorandum (TM) describes the risk evaluation of indoor air for Installation Restoration Program (IRP) Sites 16 and 24 at Former Marine Corps Air Station (MCAS) El Toro, California. Bechtel Environmental, Inc., prepared this TM in accordance with Contract Task Order 0045, issued by Southwest Division Naval Facilities Engineering Command under the Comprehensive Long-Term Environmental Action Navy 3 Program, Contract No. N68711-95-D-7526.

1 INTRODUCTION

A human-health risk evaluation was performed for Sites 16 and 24 at Former MCAS El Toro to evaluate the potential exposure to indoor air vapors that could accumulate in buildings constructed at these sites (Figure 1). Measured soil gas concentrations were used to calculate indoor air concentrations. All data used in this risk evaluation were obtained from Former MCAS El Toro Federal Facilities Agreement-approved documents (BNI 1997, 1998, 2002a, 2002b; Earth Tech 2003). Risk from exposure to indoor air was evaluated under residential and industrial worker land-use scenarios.

This TM presents the methodology used in the risk evaluation and tabulates the risk estimate results. Attachments, figures, and tables are presented at the end of this TM.

2 METHODOLOGY FOR EVALUATING HUMAN-HEALTH RISK

The risk evaluation was conducted in accordance with Risk Assessment Guidance for Superfund: Part A (U.S. EPA 1989) and Part B (U.S. EPA 1991) and supporting documents and guidelines published by the California Environmental Protection Agency (Cal/EPA) (1992). Exposure conditions used in the risk evaluation were chosen to represent reasonable maximum exposure (RME) conditions. Use of these RME conditions tends to deliberately overestimate risk, providing risk managers a safety margin when making risk-management decisions.

3 EVALUATION OF ANALYTICAL RESULTS

This section discusses the soil gas data sets that were used in the risk evaluation, along with the exposure point concentrations (EPCs) and chemicals of potential concern (COPCs) used in evaluating potential exposure to contaminants in soil gas at Sites 16 and 24.

3.1 Site 16

The soil gas data set for Site 16 consisted of analytical results from the eight confirmation soil gas samples collected from the soil vapor extraction (SVE) and vapor monitoring wells at Site 16 (BNI 2002b). The samples were collected in January 2002, approximately 10 months after the system for the multiphase extraction pilot study was shut down to confirm postremediation soil gas concentrations in the vadose zone. The samples were collected near the water table, between 145 and 160 feet below ground surface (bgs), because all monitoring wells were screened in the vadose zone within that

depth range (the depth to water was approximately 160 feet bgs). The wells were installed where the highest reported concentrations of volatile organic compounds (VOCs) before remediation were present at the site (at depths below the main firefighting training pit). Before remediation, VOC concentrations were increasing below 100 feet bgs, with the highest VOC concentrations reported at 154 feet bgs, a depth just above the water table (BNI 2002a). Data for Site 16 are presented in Attachment A.

3.2 Site 24

The soil gas data set for Site 24 consisted of analytical results from the 30 closure soil gas samples collected systemwide from the 27 SVE wells at Site 24. The samples were collected in September 2000, approximately 7 months after the remediation system was shut down to assess whether any rebound concentrations were above the cleanup threshold, in accordance with the approved closure strategy for the vadose-zone source area (Earth Tech 2003). The SVE wells were installed at various depths within the three vadose-zone depth intervals described in the Site 24 Engineering Design Report (BNI 1998). Concentrations of VOCs in soil gas at Site 24 were reported at depths from 15 to 111 feet bgs, where the deepest sample was collected. Data for Site 24 are presented in Attachment B.

3.3 Exposure Point Concentrations and Chemicals of Potential Concern

To evaluate potential exposure to soil gas VOCs at these two sites, concentrations of indoor chemical vapors were calculated on the basis of EPCs of the COPCs in soil gas. All VOCs reported above laboratory detection limits were identified as COPCs. Table 1 presents the COPCs and soil gas EPCs used in the indoor air modeling calculations.

4 EXPOSURE ASSESSMENT

For adult-resident and industrial-worker receptors exposed to VOCs in indoor air, exposure assumptions incorporated standard U.S. EPA and Cal/EPA default assumptions that were available at the time the risk evaluation was conducted (Table 2).

The residential exposure scenario assumed that a U.S. EPA-default residential structure (U.S. EPA 2003a) was located within the boundaries of each site. Since U.S. EPA does not specify building dimensions under an industrial-worker exposure scenario, the risk assessment assumed that the industrial worker occupied a 2-story, 200-foot-long by 100-foot-wide (20,000 square feet) building at each site.

4.1 Exposure Quantification

The exposure assessment process quantified exposure for the indoor air inhalation pathway. This two-step process entailed estimating EPCs and estimating dose rates.

4.2 Estimation of Exposure Point Concentrations for Soil Gas

Because of the uncertainty associated with any EPC estimate, U.S. EPA recommends using the 95 percent upper confidence limit (UCL) of the average measured chemical concentration when estimating the RME (U.S. EPA 1989, 1991). In calculating the 95 percent UCLs, data are tested for normality and lognormality, as shown in the flowchart presented as Figure 2. Data sets that are neither normally nor lognormally distributed are analyzed using a nonparametric approach (bootstrap procedure).

The bootstrap method is an approach implemented by resampling a data set with replacement to form new data sets (bootstrap samples) with the same sample size as the original data set. This process is repeated multiple times (1,000). The statistics of interest are then calculated for each bootstrap sample; these statistics are referred to as replicates. Each replicate is considered in calculating statistics that represent the population.

With the exception of trichlorotrifluoroethane and trichloroethene (TCE) at Site 16, the soil gas COPCs at both Sites 16 and 24 were characterized by a nonparametric distribution. At Site 16, trichlorotrifluoroethane and TCE exhibited a lognormal distribution. However, because the 95 percent UCL exceeded the highest reported result, the maximum reported value was used as the EPC for these COPCs. Attachments C and D present probability plots for each chemical and summarize reporting range, frequency of reporting, and 95 percent UCLs for Sites 16 and 24, respectively.

4.3 Estimation of Indoor Vapor-Phase Emissions

The Johnson and Ettinger model was used to estimate the volatile emissions from contaminated soil gas (U.S. EPA 2003a). For this risk evaluation, the advanced model was used. All air modeling input parameters are summarized in Table 3. The soil gas EPCs used as input are listed in Table 1. Resultant indoor air concentrations are also listed in Table 1.

4.4 Estimation of Dose Rate

Dose rate is the amount of chemical to which a receptor is exposed per unit body weight and time. Dose rates were estimated by integrating intake variables such as inhalation rate, body weight, and exposure duration with the contaminant concentration. The combination of all intake variables resulted in an estimate of exposure for the indoor air inhalation pathway.

Exposure assumptions describe the rate of contact that the receptors could have with COPCs in air. U.S. EPA guidelines on upper-bound exposure assumptions are conservatively designed to address the behavior or activity patterns of approximately 90 to 95 percent of the receptor populations. The intent is to estimate an RME.

The specific equation for the inhalation exposure pathway is provided below. The values assigned to the parameters in the dose formula are presented in Table 2.

Inhalation of Indoor Chemical Vapors

$$D_v = (C_a \times IR_a \times ET \times EF \times ED)/(BW \times AT)$$

where

Dv = dose resulting from inhalation of chemical vapors (milligrams per kilogram per day)
Ca = chemical concentration in air (milligrams per cubic meter) (predicted based on modeling)
IR_a = air intake rate by inhalation (cubic meters per hour)
ET = exposure time (hours per day)
EF = exposure frequency (days per year)
ED = exposure duration (years)
BW = body weight (kilograms)
AT = averaging time (days)

5 TOXICITY ASSESSMENT

Cancer risk was estimated using the results of the dose calculations and both U.S. EPA (1997b, 2002, 2004) and Cal/EPA (2003) cancer slope factors (CSFs). Use of Cal/EPA toxicity values in addition to U.S. EPA CSFs permits dual tracking of the cancer risk. Dual tracking consisted of evaluating risk using only U.S. EPA toxicity values and evaluating risk separately using Cal/EPA toxicity values. A noncancer hazard index was calculated for each exposure scenario using dose calculation results and the federal reference dose (U.S. EPA 1997b, 2002, 2004). U.S. EPA and Cal/EPA toxicity values are presented in Tables 4 and 5, respectively.

6 RISK CHARACTERIZATION RESULTS

The following sections present risk evaluation results for hypothetical receptors exposed to COPCs in indoor air at Sites 16 and 24. Cancer risks and hazard indices are summarized in Table 6.

6.1 Site 16 – Residential Scenario

The estimated cancer risk for a hypothetical resident adult exposed to indoor-air COPCs at Site 16 for 350 days a year over 30 years was quantified at 3.2×10^{-6} (using U.S. EPA criteria) and 5.7×10^{-8} (using Cal/EPA criteria) (Table 6). The difference in total estimated cancer risk associated with indoor air is attributable to the two agencies recognizing different CSFs for TCE. This difference is apparent in Tables 7 and 8, which show the cancer risk associated specifically with TCE for the residential scenario using U.S. EPA and Cal/EPA criteria, respectively. The estimated hazard index under this scenario was quantified at 0.0035 (Table 6). Table 9 presents the hazard quotients associated with the Site 16 COPCs.

6.2 Site 16 – Industrial Worker Scenario

The estimated cancer risk for a hypothetical industrial worker exposed to indoor-air COPCs at Site 16 for 250 days a year over 25 years was quantified at 1.5×10^{-7} (using U.S. EPA criteria) and 2.6×10^{-9} (using Cal/EPA criteria) (Table 6). The estimated hazard index under this scenario was quantified at 0.0001. Tables 10 through 12 show the cancer risk estimates (using U.S. EPA and Cal/EPA criteria) and hazard quotients for Site 16 COPCs under an industrial scenario.

6.3 Site 24 – Residential Scenario

The estimated cancer risk for a hypothetical resident adult exposed to indoor-air COPCs at Site 24 for 350 days a year over 30 years was quantified at 7.8×10^{-6} (using U.S. EPA criteria) and 3.1×10^{-7} (using Cal/EPA criteria) (Table 6). Tables 13 and 14 show the cancer risk estimates using U.S. EPA and Cal/EPA criteria, respectively, for each Site 24 COPC under a residential scenario. The estimated hazard index under this scenario was quantified at 0.011 (Table 6). Table 15 presents the hazard quotients associated with Site 24 COPCs.

6.4 Site 24 – Industrial Worker Scenario

The estimated cancer risk for an industrial worker exposed to indoor-air COPCs for 250 days a year over 25 years was quantified at 3.3×10^{-7} (using U.S. EPA criteria) and 1.3×10^{-8} (using Cal/EPA criteria) (Table 6). The cancer risk using U.S. EPA criteria is primarily associated with TCE exposure, which accounts for 94 percent of the risk. The estimated hazard index under this scenario was quantified at 0.00031. Tables 16 through 18 show the cancer risk estimates (using U.S. EPA and Cal/EPA criteria) and hazard quotients for Site 24 COPCs under the industrial scenario.

7 RISK SUMMARY

Table 6 summarizes total lifetime cancer and noncancer risks associated with indoor-air exposure under residential and industrial worker scenarios at Sites 16 and 24. As shown, U.S. EPA cancer risks at both sites are acceptable (i.e., less than the 10^{-6} point of departure for acceptable risk specified in the National Oil and Hazardous Substances Pollution Contingency Plan [NCP]) or fall within the 10^{-6} to 10^{-4} range for risk that may be acceptable depending on site-specific and other factors considered appropriate for risk point-of-departure analysis (per NCP Preamble). Likewise, Cal/EPA cancer risks are also acceptable. The difference in the U.S. EPA and Cal/EPA estimated total cancer risks is largely attributable to differing CSFs for TCE recognized by the two agencies.

The noncancer hazard indices estimated for indoor-air exposure under residential and industrial worker scenarios at Sites 16 and 24 are less than 1. A hazard index value of less than 1 indicates little potential for adverse noncancer health effects to develop. Consequently, the modeled noncancer risks associated with the indoor air inhalation pathway at both sites are acceptable.

As described in Section 6, cancer risks for Sites 16 and 24 using U.S. EPA criteria are principally attributable to TCE exposures. However, the CSF for TCE, which was developed by U.S. EPA's National Center for Environmental Assessment (NCEA), is provisional and subject to change, as discussed in the next section. Hence, the U.S. EPA cancer risk estimates are considered to be overestimates of the risk.

8 UNCERTAINTY DISCUSSION

The risks from inhalation of indoor air at Sites 16 and 24 are estimated values and subject to factors that contribute varying degrees of uncertainty to their determination. Uncertainty may cause risk to be overestimated or underestimated, and the risk estimates should not be taken as absolute indicators of whether adverse health effects could occur. The more important uncertainties associated with the indoor air risk evaluation are discussed below.

8.1 Sampling Depth

The vertical distribution of sampling locations at Sites 16 and 24 introduces some degree of uncertainty into the estimation of EPCs in soil gas. This uncertainty originates from an assumption common to all subsurface sampling, that the sample population sufficiently represents the average concentration and distribution of contaminants. Soil gas analytical data used in the risk evaluation were obtained from SVE and vadose zone monitoring wells screened at three discrete intervals spanning 15 to 111 feet bgs at Site 24, and one interval spanning 145 to 160 feet bgs at Site 16. Thus, uncertainty due to vertical distribution of sampling locations will be greater at Site 16 than at Site 24.

8.2 Subsurface Geologic Conditions

The selection of soil properties used in the Johnson and Ettinger model introduces some inherent uncertainty into the estimation of indoor air EPCs. This is because the soil gas diffusion rate calculated in the model is a function of physical properties of the soil interval occurring between the building slab/soil interface and the sampling depth. The most significant parameters are soil water-filled porosity and soil vapor permeability (U.S. EPA 2003b). The availability of site-specific data for these and other soil parameters decreases the overall uncertainty at both sites; however, the uncertainty is still greater at Site 16, where the shallowest samples were from 145 feet bgs, relative to Site 24, where the shallowest samples were from 15 feet bgs.

Other processes occurring in the subsurface can also contribute uncertainty to the estimation of indoor air EPCs via other mechanisms (U.S. EPA 2003b). Transformation processes such as biodegradation may be important, and in some cases only a relatively thin stratum of bioactive soil can greatly reduce the emission flux toward the soil surface. In addition, subsurface-phase equilibrium is a dynamic process resulting in varying vapor-phase concentrations over time at the same sampling location and depth. These factors can result in significant differences in measured soil gas concentrations over relatively small spatial and temporal scales.

8.3 TCE Toxicity

As described in Section 6, U.S. EPA's cancer risks for Sites 16 and 24 are principally attributed to TCE exposures. However, the CSF for TCE, which has been developed by U.S. EPA's NCEA, is provisional and subject to change. This value has not been accepted into U.S. EPA's IRIS. In addition, U.S. EPA's Science Advisory Board disputes the use of the provisional CSF. In general, toxicologists have noted the following.

- Methods to reconstruct TCE exposures in the epidemiological studies used in the development of the provisional values are inappropriate.
- Comments provided by U.S. EPA's Science Advisory Board TCE Review Panel indicate numerous critical scientific issues in the draft Assessment of TCE requiring significant improvement.
- Risk-based concentrations that are based on the provisional CSF fall below typical indoor-air background levels.

9 CONCLUSIONS AND RECOMMENDATIONS

On the basis of the modeled risk evaluation results presented in this TM, Sites 16 and 24 do not pose unacceptable risks to human health via an indoor air inhalation exposure pathway, because risks are acceptable or may be acceptable depending on site-specific and other factors considered appropriate for risk point-of-departure analysis, per the NCP. Therefore, no action is required and no restrictions on reuse of these two sites are necessary relative to this potential exposure route. Factors that support this recommendation include the following.

- Subsurface soil at Sites 16 and 24 consists of complex, interbedded fine-grained silt and clay, and silty fine- to medium-grained sand. However, as noted in Table 3, the soil type used in modeling vapor migration through the vadose zone at both sites was conservatively assumed to be a single unit consisting of sandy loam at Site 16 and loamy sand at Site 24. Physical properties of these soil types that influence modeling of soil vapor migration through the vadose zone will bias calculated migration rates toward the higher end of rates that may be representative of these sites. Thus, soil vapor migration rates assumed in the modeling are likely to be overly conservative and may contribute to the overestimation of risks.
- Total cancer risks at Sites 16 and 24 estimated using both U.S. EPA and Cal/EPA toxicity criteria for residential and industrial scenarios are acceptable, or fall within the 10^{-6} to 10^{-4} risk range that may be acceptable depending on site-specific and other factors considered appropriate for risk management decisions.
- Hazard indices estimated at Sites 16 and 24 for the residential and industrial worker scenarios are less than 1, indicating little potential for adverse noncancer health effects via the indoor-air inhalation pathway, even among the most chemically sensitive receptors.

- The estimated residential cancer risk at Site 16 using U.S. EPA criteria is driven by TCE, since it is the only carcinogen reported in confirmation soil gas samples collected at the site. Site 16 analytical data for TCE are lognormally distributed, and the maximum TCE concentration was used to calculate the EPC, because the 95 percent UCL for this compound exceeded the maximum reported value. It is unlikely that the maximum TCE concentration is representative of average concentrations in Site 16 soil gas, or that a receptor would be exposed exclusively to a single maximum TCE concentration over the long-term exposure period used in this evaluation. Thus, the risk from exposure to this compound is overestimated.
- Cancer risk estimates at Sites 16 and 24 using U.S. EPA criteria are overwhelmingly dominated by TCE, which accounts for 100 percent of the risk at Site 16 and 98 percent of the risk at Site 24. As noted above, the U.S. EPA CSF for TCE was generated by NCEA and is a provisional value; it has not been accepted into U.S. EPA's IRIS database. This provisional CSF is not universally accepted within U.S. EPA, and there is some question as to the scientific basis and methodology used in its development. Thus, the U.S. EPA risk estimates associated with TCE have a significant degree of uncertainty (assumed overestimation), and they should not be taken as an absolute characterization of risk.
- Finally, as noted earlier, risk assessments by design use conservative assumptions that are selected to represent conservative RME conditions. Use of these exposure conditions deliberately overestimates risk, so that risk managers are provided a safety margin when making risk management decisions.

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U.S. EPA. *See* United States Environmental Protection Agency.

ATTACHMENT A

ANALYTICAL DATA – SITE 16

SOIL GAS ANALYTICAL DATA - SITE 16

Station ID	Sample ID	Analyte ID	Analyte Name	Result	Review Qualifier	Result Units	Collection Date	Top Depth*	Bottom Depth*	Depth Units
16MPE1	1788532	76-13-1	1,1,2-Trichloro-trifluoroethane	2.4		µg/L	01/30/98	146	191	FT
16MPE1	1788533	76-13-1	1,1,2-Trichloro-trifluoroethane	3.1		µg/L	01/30/98	146	191	FT
16MW1	1788534	76-13-1	1,1,2-Trichloro-trifluoroethane	1	U	µg/L	01/30/98	155	180	FT
16MW4	1788531	76-13-1	1,1,2-Trichloro-trifluoroethane	1	U	µg/L	01/30/98	155	190	FT
16MW5	1788530	76-13-1	1,1,2-Trichloro-trifluoroethane	140		µg/L	01/30/98	155	190	FT
16MW6	1788535	76-13-1	1,1,2-Trichloro-trifluoroethane	11		µg/L	01/30/98	145	190	FT
16MW7	1788537	76-13-1	1,1,2-Trichloro-trifluoroethane	54		µg/L	01/30/98	145	190	FT
16VM1	1788536	76-13-1	1,1,2-Trichloro-trifluoroethane	27		µg/L	01/30/98	145	155	FT
16MPE1	1788532	79-01-6	Trichloroethene	44		µg/L	01/30/98	146	191	FT
16MPE1	1788533	79-01-6	Trichloroethene	64		µg/L	01/30/98	146	191	FT
16MW1	1788534	79-01-6	Trichloroethene	1	U	µg/L	01/30/98	155	180	FT
16MW4	1788531	79-01-6	Trichloroethene	1	U	µg/L	01/30/98	155	190	FT
16MW5	1788530	79-01-6	Trichloroethene	15		µg/L	01/30/98	155	190	FT
16MW6	1788535	79-01-6	Trichloroethene	33		µg/L	01/30/98	145	190	FT
16MW7	1788537	79-01-6	Trichloroethene	9.2		µg/L	01/30/98	145	190	FT
16VM1	1788536	79-01-6	Trichloroethene	4.5		µg/L	01/30/98	145	155	FT
16MPE1	1788532	75-69-4	Trichlorofluoromethane	1	U	µg/L	01/30/98	146	191	FT
16MPE1	1788533	75-69-4	Trichlorofluoromethane	1	U	µg/L	01/30/98	146	191	FT
16MW1	1788534	75-69-4	Trichlorofluoromethane	1	U	µg/L	01/30/98	155	180	FT
16MW4	1788531	75-69-4	Trichlorofluoromethane	1	U	µg/L	01/30/98	155	190	FT
16MW5	1788530	75-69-4	Trichlorofluoromethane	2.2		µg/L	01/30/98	155	190	FT
16MW6	1788535	75-69-4	Trichlorofluoromethane	1	U	µg/L	01/30/98	145	190	FT
16MW7	1788537	75-69-4	Trichlorofluoromethane	1	U	µg/L	01/30/98	145	190	FT
16VM1	1788536	75-69-4	Trichlorofluoromethane	1	U	µg/L	01/30/98	145	155	FT

Note:

* the top and bottom depths are the screened interval of the well; at the time of sampling, the depth to water at Site 16 in the area of these wells averaged approximately 160 feet below ground surface; therefore, the actual soil gas sample depth intervals (in wells with part of their screened intervals situated below the water table) are equal to the depth to water of approximately 160 feet minus the "top depth" indicated in the data table

Acronyms/Abbreviations:

FT – feet

µg/L – micrograms per liter

Review Qualifier:

U – not reported above detection limit

ATTACHMENT B

ANALYTICAL DATA – SITE 24

SOIL GAS ANALYTICAL DATA - SITE 24

Station ID	Sample ID	Analyte ID	Analyte Name	Result	Review Qualifier	Result Units	Collection Date	Top Depth*	Bottom Depth*	Depth Units
24SVE10	LC-451	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015	U	µg/L	19-Sep-00	79	109	FT
24SVE11	LC-452	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.62		µg/L	19-Sep-00	79	109	FT
24SVE11	LC-453	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.64		µg/L	19-Sep-00	79	109	FT
24SVE116	LC-458	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.075		µg/L	19-Sep-00	75	95	FT
24SVE12	LC-446	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.62		µg/L	19-Sep-00	34	74	FT
24SVE12	LC-447	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.65		µg/L	19-Sep-00	34	74	FT
24SVE128B	LC-459	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.09		µg/L	19-Sep-00	15	40	FT
24SVE13	LC-494	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.44		µg/L	21-Sep-00	79	109	FT
24SVE138A	LC-477	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015	U	µg/L	20-Sep-00	45	70	FT
24SVE14	LC-480	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015	U	µg/L	20-Sep-00	78	108	FT
24SVE147A	LC-448	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.025		µg/L	19-Sep-00	57	77	FT
24SVE161	LC-460	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015	U	µg/L	19-Sep-00	70	95	FT
24SVE2	LC-478	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	1.5		µg/L	20-Sep-00	80	105	FT
24SVE21	LC-481	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015	U	µg/L	20-Sep-00	85	105	FT
24SVE3	LC-479	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015	U	µg/L	20-Sep-00	80	105	FT
24SVE35	LC-482	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015	U	µg/L	20-Sep-00	85	105	FT
24SVE35A	LC-483	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015	U	µg/L	20-Sep-00	50	75	FT
24SVE45	LC-484	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015	U	µg/L	20-Sep-00	80	100	FT
24SVE49	LC-485	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.14		µg/L	20-Sep-00	83	103	FT
24SVE5	LC-449	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.063		µg/L	19-Sep-00	68	88	FT
24SVE51	LC-486	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015	U	µg/L	20-Sep-00	83	103	FT
24SVE54	LC-487	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015	U	µg/L	21-Sep-00	85	105	FT
24SVE55	LC-488	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.13		µg/L	21-Sep-00	80	100	FT
24SVE67	LC-489	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015	U	µg/L	20-Sep-00	75	100	FT
24SVE77	LC-490	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015	U	µg/L	20-Sep-00	75	100	FT
24SVE78	LC-454	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015		µg/L	19-Sep-00	80	100	FT
24SVE89	LC-456	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.19		µg/L	19-Sep-00	80	105	FT
24SVE89	LC-455	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.19		µg/L	19-Sep-00	80	105	FT
24SVE9	LC-450	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	5.6		µg/L	19-Sep-00	81	111	FT
24SVE94	LC-457	76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.015	U	µg/L	19-Sep-00	75	105	FT
24SVE10	LC-451	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	19-Sep-00	79	109	FT
24SVE11	LC-453	79-00-5	1,1,2-Trichloroethane	0.033	U	µg/L	19-Sep-00	79	109	FT
24SVE11	LC-452	79-00-5	1,1,2-Trichloroethane	0.044	U	µg/L	19-Sep-00	79	109	FT

SOIL GAS ANALYTICAL DATA - SITE 24

Station ID	Sample ID	Analyte ID	Analyte Name	Result	Review Qualifier	Result Units	Collection Date	Top Depth*	Bottom Depth*	Depth Units
24SVE116	LC-458	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	19-Sep-00	75	95	FT
24SVE12	LC-446	79-00-5	1,1,2-Trichloroethane	0.1		µg/L	19-Sep-00	34	74	FT
24SVE12	LC-447	79-00-5	1,1,2-Trichloroethane	0.11		µg/L	19-Sep-00	34	74	FT
24SVE128B	LC-459	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	19-Sep-00	15	40	FT
24SVE13	LC-494	79-00-5	1,1,2-Trichloroethane	0.19	U	µg/L	21-Sep-00	79	109	FT
24SVE138A	LC-477	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	20-Sep-00	45	70	FT
24SVE14	LC-480	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	20-Sep-00	78	108	FT
24SVE147A	LC-448	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	19-Sep-00	57	77	FT
24SVE161	LC-460	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	19-Sep-00	70	95	FT
24SVE2	LC-478	79-00-5	1,1,2-Trichloroethane	0.018	U	µg/L	20-Sep-00	80	105	FT
24SVE21	LC-481	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	20-Sep-00	85	105	FT
24SVE3	LC-479	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	20-Sep-00	80	105	FT
24SVE35	LC-482	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	20-Sep-00	85	105	FT
24SVE35A	LC-483	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	20-Sep-00	50	75	FT
24SVE45	LC-484	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	20-Sep-00	80	100	FT
24SVE49	LC-485	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	20-Sep-00	83	103	FT
24SVE5	LC-449	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	19-Sep-00	68	88	FT
24SVE51	LC-486	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	20-Sep-00	83	103	FT
24SVE54	LC-487	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	21-Sep-00	85	105	FT
24SVE55	LC-488	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	21-Sep-00	80	100	FT
24SVE67	LC-489	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	20-Sep-00	75	100	FT
24SVE77	LC-490	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	20-Sep-00	75	100	FT
24SVE78	LC-454	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	19-Sep-00	80	100	FT
24SVE89	LC-456	79-00-5	1,1,2-Trichloroethane	0.028	U	µg/L	19-Sep-00	80	105	FT
24SVE89	LC-455	79-00-5	1,1,2-Trichloroethane	0.031	U	µg/L	19-Sep-00	80	105	FT
24SVE9	LC-450	79-00-5	1,1,2-Trichloroethane	0.052	U	µg/L	19-Sep-00	81	111	FT
24SVE94	LC-457	79-00-5	1,1,2-Trichloroethane	0.011	U	µg/L	19-Sep-00	75	105	FT
24SVE10	LC-451	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	19-Sep-00	79	109	FT
24SVE11	LC-453	75-35-4	1,1-Dichloroethene	0.024	U	µg/L	19-Sep-00	79	109	FT
24SVE11	LC-452	75-35-4	1,1-Dichloroethene	0.032	U	µg/L	19-Sep-00	79	109	FT
24SVE116	LC-458	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	19-Sep-00	75	95	FT
24SVE12	LC-446	75-35-4	1,1-Dichloroethene	0.18		µg/L	19-Sep-00	34	74	FT
24SVE12	LC-447	75-35-4	1,1-Dichloroethene	0.2		µg/L	19-Sep-00	34	74	FT

SOIL GAS ANALYTICAL DATA - SITE 24

Station ID	Sample ID	Analyte ID	Analyte Name	Result	Review Qualifier	Result Units	Collection Date	Top Depth*	Bottom Depth*	Depth Units
24SVE128B	LC-459	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	19-Sep-00	15	40	FT
24SVE13	LC-494	75-35-4	1,1-Dichloroethene	0.13	U	µg/L	21-Sep-00	79	109	FT
24SVE138A	LC-477	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	20-Sep-00	45	70	FT
24SVE14	LC-480	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	20-Sep-00	78	108	FT
24SVE147A	LC-448	75-35-4	1,1-Dichloroethene	0.022		µg/L	19-Sep-00	57	77	FT
24SVE161	LC-460	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	19-Sep-00	70	95	FT
24SVE2	LC-478	75-35-4	1,1-Dichloroethene	0.39		µg/L	20-Sep-00	80	105	FT
24SVE21	LC-481	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	20-Sep-00	85	105	FT
24SVE3	LC-479	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	20-Sep-00	80	105	FT
24SVE35	LC-482	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	20-Sep-00	85	105	FT
24SVE35A	LC-483	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	20-Sep-00	50	75	FT
24SVE45	LC-484	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	20-Sep-00	80	100	FT
24SVE49	LC-485	75-35-4	1,1-Dichloroethene	0.0079		µg/L	20-Sep-00	83	103	FT
24SVE5	LC-449	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	19-Sep-00	68	88	FT
24SVE51	LC-486	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	20-Sep-00	83	103	FT
24SVE54	LC-487	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	21-Sep-00	85	105	FT
24SVE55	LC-488	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	21-Sep-00	80	100	FT
24SVE67	LC-489	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	20-Sep-00	75	100	FT
24SVE77	LC-490	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	20-Sep-00	75	100	FT
24SVE78	LC-454	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	19-Sep-00	80	100	FT
24SVE89	LC-456	75-35-4	1,1-Dichloroethene	0.02	U	µg/L	19-Sep-00	80	105	FT
24SVE89	LC-455	75-35-4	1,1-Dichloroethene	0.022	U	µg/L	19-Sep-00	80	105	FT
24SVE9	LC-450	75-35-4	1,1-Dichloroethene	0.048		µg/L	19-Sep-00	81	111	FT
24SVE94	LC-457	75-35-4	1,1-Dichloroethene	0.0079	U	µg/L	19-Sep-00	75	105	FT
24SVE10	LC-451	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	19-Sep-00	79	109	FT
24SVE11	LC-453	107-06-2	1,2-Dichloroethane	0.024	U	µg/L	19-Sep-00	79	109	FT
24SVE11	LC-452	107-06-2	1,2-Dichloroethane	0.033	U	µg/L	19-Sep-00	79	109	FT
24SVE116	LC-458	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	19-Sep-00	75	95	FT
24SVE12	LC-446	107-06-2	1,2-Dichloroethane	0.063	U	µg/L	19-Sep-00	34	74	FT
24SVE12	LC-447	107-06-2	1,2-Dichloroethane	0.065	U	µg/L	19-Sep-00	34	74	FT
24SVE128B	LC-459	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	19-Sep-00	15	40	FT
24SVE13	LC-494	107-06-2	1,2-Dichloroethane	0.14	U	µg/L	21-Sep-00	79	109	FT
24SVE138A	LC-477	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	20-Sep-00	45	70	FT

SOIL GAS ANALYTICAL DATA - SITE 24

Station ID	Sample ID	Analyte ID	Analyte Name	Result	Review Qualifier	Result Units	Collection Date	Top Depth*	Bottom Depth*	Depth Units
24SVE14	LC-480	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	20-Sep-00	78	108	FT
24SVE147A	LC-448	107-06-2	1,2-Dichloroethane	0.046		µg/L	19-Sep-00	57	77	FT
24SVE161	LC-460	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	19-Sep-00	70	95	FT
24SVE2	LC-478	107-06-2	1,2-Dichloroethane	0.013	U	µg/L	20-Sep-00	80	105	FT
24SVE21	LC-481	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	20-Sep-00	85	105	FT
24SVE3	LC-479	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	20-Sep-00	80	105	FT
24SVE35	LC-482	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	20-Sep-00	85	105	FT
24SVE35A	LC-483	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	20-Sep-00	50	75	FT
24SVE45	LC-484	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	20-Sep-00	80	100	FT
24SVE49	LC-485	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	20-Sep-00	83	103	FT
24SVE5	LC-449	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	19-Sep-00	68	88	FT
24SVE51	LC-486	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	20-Sep-00	83	103	FT
24SVE54	LC-487	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	21-Sep-00	85	105	FT
24SVE55	LC-488	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	21-Sep-00	80	100	FT
24SVE67	LC-489	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	20-Sep-00	75	100	FT
24SVE77	LC-490	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	20-Sep-00	75	100	FT
24SVE78	LC-454	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	19-Sep-00	80	100	FT
24SVE89	LC-456	107-06-2	1,2-Dichloroethane	0.021	U	µg/L	19-Sep-00	80	105	FT
24SVE89	LC-455	107-06-2	1,2-Dichloroethane	0.023	U	µg/L	19-Sep-00	80	105	FT
24SVE9	LC-450	107-06-2	1,2-Dichloroethane	0.039	U	µg/L	19-Sep-00	81	111	FT
24SVE94	LC-457	107-06-2	1,2-Dichloroethane	0.0081	U	µg/L	19-Sep-00	75	105	FT
24SVE10	LC-451	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	19-Sep-00	79	109	FT
24SVE11	LC-453	56-23-5	Carbon Tetrachloride	0.039	U	µg/L	19-Sep-00	79	109	FT
24SVE11	LC-452	56-23-5	Carbon Tetrachloride	0.053	U	µg/L	19-Sep-00	79	109	FT
24SVE116	LC-458	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	19-Sep-00	75	95	FT
24SVE12	LC-446	56-23-5	Carbon Tetrachloride	0.23		µg/L	19-Sep-00	34	74	FT
24SVE12	LC-447	56-23-5	Carbon Tetrachloride	0.24		µg/L	19-Sep-00	34	74	FT
24SVE128B	LC-459	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	19-Sep-00	15	40	FT
24SVE13	LC-494	56-23-5	Carbon Tetrachloride	0.22	U	µg/L	21-Sep-00	79	109	FT
24SVE138A	LC-477	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	20-Sep-00	45	70	FT
24SVE14	LC-480	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	20-Sep-00	78	108	FT
24SVE147A	LC-448	56-23-5	Carbon Tetrachloride	0.062		µg/L	19-Sep-00	57	77	FT
24SVE161	LC-460	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	19-Sep-00	70	95	FT

SOIL GAS ANALYTICAL DATA - SITE 24

Station ID	Sample ID	Analyte ID	Analyte Name	Result	Review Qualifier	Result Units	Collection Date	Top Depth*	Bottom Depth*	Depth Units
24SVE2	LC-478	56-23-5	Carbon Tetrachloride	0.021	U	µg/L	20-Sep-00	80	105	FT
24SVE21	LC-481	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	20-Sep-00	85	105	FT
24SVE3	LC-479	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	20-Sep-00	80	105	FT
24SVE35	LC-482	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	20-Sep-00	85	105	FT
24SVE35A	LC-483	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	20-Sep-00	50	75	FT
24SVE45	LC-484	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	20-Sep-00	80	100	FT
24SVE49	LC-485	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	20-Sep-00	83	103	FT
24SVE5	LC-449	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	19-Sep-00	68	88	FT
24SVE51	LC-486	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	20-Sep-00	83	103	FT
24SVE54	LC-487	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	21-Sep-00	85	105	FT
24SVE55	LC-488	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	21-Sep-00	80	100	FT
24SVE67	LC-489	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	20-Sep-00	75	100	FT
24SVE77	LC-490	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	20-Sep-00	75	100	FT
24SVE78	LC-454	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	19-Sep-00	80	100	FT
24SVE89	LC-456	56-23-5	Carbon Tetrachloride	0.033	U	µg/L	19-Sep-00	80	105	FT
24SVE89	LC-455	56-23-5	Carbon Tetrachloride	0.037	U	µg/L	19-Sep-00	80	105	FT
24SVE9	LC-450	56-23-5	Carbon Tetrachloride	0.062	U	µg/L	19-Sep-00	81	111	FT
24SVE94	LC-457	56-23-5	Carbon Tetrachloride	0.013	U	µg/L	19-Sep-00	75	105	FT
24SVE10	LC-451	67-66-3	Chloroform	0.0097	U	µg/L	19-Sep-00	79	109	FT
24SVE11	LC-453	67-66-3	Chloroform	0.029	U	µg/L	19-Sep-00	79	109	FT
24SVE11	LC-452	67-66-3	Chloroform	0.039	U	µg/L	19-Sep-00	79	109	FT
24SVE116	LC-458	67-66-3	Chloroform	0.0097	U	µg/L	19-Sep-00	75	95	FT
24SVE12	LC-446	67-66-3	Chloroform	0.23		µg/L	19-Sep-00	34	74	FT
24SVE12	LC-447	67-66-3	Chloroform	0.24		µg/L	19-Sep-00	34	74	FT
24SVE128B	LC-459	67-66-3	Chloroform	0.0097	U	µg/L	19-Sep-00	15	40	FT
24SVE13	LC-494	67-66-3	Chloroform	0.16	U	µg/L	21-Sep-00	79	109	FT
24SVE138A	LC-477	67-66-3	Chloroform	0.0097	U	µg/L	20-Sep-00	45	70	FT
24SVE14	LC-480	67-66-3	Chloroform	0.0097	U	µg/L	20-Sep-00	78	108	FT
24SVE147A	LC-448	67-66-3	Chloroform	0.83		µg/L	19-Sep-00	57	77	FT
24SVE161	LC-460	67-66-3	Chloroform	0.0097	U	µg/L	19-Sep-00	70	95	FT
24SVE2	LC-478	67-66-3	Chloroform	0.016	U	µg/L	20-Sep-00	80	105	FT
24SVE21	LC-481	67-66-3	Chloroform	0.0097	U	µg/L	20-Sep-00	85	105	FT
24SVE3	LC-479	67-66-3	Chloroform	0.0097	U	µg/L	20-Sep-00	80	105	FT

SOIL GAS ANALYTICAL DATA - SITE 24

Station ID	Sample ID	Analyte ID	Analyte Name	Result	Review Qualifier	Result Units	Collection Date	Top Depth*	Bottom Depth*	Depth Units
24SVE35	LC-482	67-66-3	Chloroform	0.0097	U	µg/L	20-Sep-00	85	105	FT
24SVE35A	LC-483	67-66-3	Chloroform	0.0097	U	µg/L	20-Sep-00	50	75	FT
24SVE45	LC-484	67-66-3	Chloroform	0.0097	U	µg/L	20-Sep-00	80	100	FT
24SVE49	LC-485	67-66-3	Chloroform	0.0097	U	µg/L	20-Sep-00	83	103	FT
24SVE5	LC-449	67-66-3	Chloroform	0.0097	U	µg/L	19-Sep-00	68	88	FT
24SVE51	LC-486	67-66-3	Chloroform	0.0097	U	µg/L	20-Sep-00	83	103	FT
24SVE54	LC-487	67-66-3	Chloroform	0.0097	U	µg/L	21-Sep-00	85	105	FT
24SVE55	LC-488	67-66-3	Chloroform	0.0097	U	µg/L	21-Sep-00	80	100	FT
24SVE67	LC-489	67-66-3	Chloroform	0.0097	U	µg/L	20-Sep-00	75	100	FT
24SVE77	LC-490	67-66-3	Chloroform	0.0097	U	µg/L	20-Sep-00	75	100	FT
24SVE78	LC-454	67-66-3	Chloroform	0.0097	U	µg/L	19-Sep-00	80	100	FT
24SVE89	LC-456	67-66-3	Chloroform	0.025	U	µg/L	19-Sep-00	80	105	FT
24SVE89	LC-455	67-66-3	Chloroform	0.027	U	µg/L	19-Sep-00	80	105	FT
24SVE9	LC-450	67-66-3	Chloroform	0.046	U	µg/L	19-Sep-00	81	111	FT
24SVE94	LC-457	67-66-3	Chloroform	0.0097	U	µg/L	19-Sep-00	75	105	FT
24SVE10	LC-451	127-18-4	Tetrachloroethene	0.014	U	µg/L	19-Sep-00	79	109	FT
24SVE11	LC-453	127-18-4	Tetrachloroethene	0.042	U	µg/L	19-Sep-00	79	109	FT
24SVE11	LC-452	127-18-4	Tetrachloroethene	0.057	U	µg/L	19-Sep-00	79	109	FT
24SVE116	LC-458	127-18-4	Tetrachloroethene	0.014	U	µg/L	19-Sep-00	75	95	FT
24SVE12	LC-446	127-18-4	Tetrachloroethene	0.23		µg/L	19-Sep-00	34	74	FT
24SVE12	LC-447	127-18-4	Tetrachloroethene	0.24		µg/L	19-Sep-00	34	74	FT
24SVE128B	LC-459	127-18-4	Tetrachloroethene	0.014	U	µg/L	19-Sep-00	15	40	FT
24SVE13	LC-494	127-18-4	Tetrachloroethene	30		µg/L	21-Sep-00	79	109	FT
24SVE138A	LC-477	127-18-4	Tetrachloroethene	0.014	U	µg/L	20-Sep-00	45	70	FT
24SVE14	LC-480	127-18-4	Tetrachloroethene	0.014	U	µg/L	20-Sep-00	78	108	FT
24SVE147A	LC-448	127-18-4	Tetrachloroethene	0.099		µg/L	19-Sep-00	57	77	FT
24SVE161	LC-460	127-18-4	Tetrachloroethene	0.014	U	µg/L	19-Sep-00	70	95	FT
24SVE2	LC-478	127-18-4	Tetrachloroethene	0.097		µg/L	20-Sep-00	80	105	FT
24SVE21	LC-481	127-18-4	Tetrachloroethene	0.014	U	µg/L	20-Sep-00	85	105	FT
24SVE3	LC-479	127-18-4	Tetrachloroethene	0.014	U	µg/L	20-Sep-00	80	105	FT
24SVE35	LC-482	127-18-4	Tetrachloroethene	0.014	U	µg/L	20-Sep-00	85	105	FT
24SVE35A	LC-483	127-18-4	Tetrachloroethene	0.014	U	µg/L	20-Sep-00	50	75	FT
24SVE45	LC-484	127-18-4	Tetrachloroethene	0.014	U	µg/L	20-Sep-00	80	100	FT

SOIL GAS ANALYTICAL DATA - SITE 24

Station ID	Sample ID	Analyte ID	Analyte Name	Result	Review Qualifier	Result Units	Collection Date	Top Depth*	Bottom Depth*	Depth Units
24SVE49	LC-485	127-18-4	Tetrachloroethene	0.014	U	µg/L	20-Sep-00	83	103	FT
24SVE5	LC-449	127-18-4	Tetrachloroethene	0.034		µg/L	19-Sep-00	68	88	FT
24SVE51	LC-486	127-18-4	Tetrachloroethene	0.014	U	µg/L	20-Sep-00	83	103	FT
24SVE54	LC-487	127-18-4	Tetrachloroethene	0.014	U	µg/L	21-Sep-00	85	105	FT
24SVE55	LC-488	127-18-4	Tetrachloroethene	0.016		µg/L	21-Sep-00	80	100	FT
24SVE67	LC-489	127-18-4	Tetrachloroethene	0.014	U	µg/L	20-Sep-00	75	100	FT
24SVE77	LC-490	127-18-4	Tetrachloroethene	0.014	U	µg/L	20-Sep-00	75	100	FT
24SVE78	LC-454	127-18-4	Tetrachloroethene	0.014	U	µg/L	19-Sep-00	80	100	FT
24SVE89	LC-456	127-18-4	Tetrachloroethene	0.035	U	µg/L	19-Sep-00	80	105	FT
24SVE89	LC-455	127-18-4	Tetrachloroethene	0.039	U	µg/L	19-Sep-00	80	105	FT
24SVE9	LC-450	127-18-4	Tetrachloroethene	0.067	U	µg/L	19-Sep-00	81	111	FT
24SVE94	LC-457	127-18-4	Tetrachloroethene	0.014	U	µg/L	19-Sep-00	75	105	FT
24SVE10	LC-451	79-01-6	Trichloroethene	0.011	U	µg/L	19-Sep-00	79	109	FT
24SVE11	LC-453	79-01-6	Trichloroethene	5.3		µg/L	19-Sep-00	79	109	FT
24SVE11	LC-452	79-01-6	Trichloroethene	5.4		µg/L	19-Sep-00	79	109	FT
24SVE116	LC-458	79-01-6	Trichloroethene	0.023		µg/L	19-Sep-00	75	95	FT
24SVE12	LC-446	79-01-6	Trichloroethene	13		µg/L	19-Sep-00	34	74	FT
24SVE12	LC-447	79-01-6	Trichloroethene	13		µg/L	19-Sep-00	34	74	FT
24SVE128B	LC-459	79-01-6	Trichloroethene	0.16		µg/L	19-Sep-00	15	40	FT
24SVE13	LC-494	79-01-6	Trichloroethene	1.5		µg/L	21-Sep-00	79	109	FT
24SVE138A	LC-477	79-01-6	Trichloroethene	0.011	U	µg/L	20-Sep-00	45	70	FT
24SVE14	LC-480	79-01-6	Trichloroethene	0.011	U	µg/L	20-Sep-00	78	108	FT
24SVE147A	LC-448	79-01-6	Trichloroethene	2.1		µg/L	19-Sep-00	57	77	FT
24SVE161	LC-460	79-01-6	Trichloroethene	0.011	U	µg/L	19-Sep-00	70	95	FT
24SVE2	LC-478	79-01-6	Trichloroethene	2		µg/L	20-Sep-00	80	105	FT
24SVE21	LC-481	79-01-6	Trichloroethene	0.011	U	µg/L	20-Sep-00	85	105	FT
24SVE3	LC-479	79-01-6	Trichloroethene	0.12		µg/L	20-Sep-00	80	105	FT
24SVE35	LC-482	79-01-6	Trichloroethene	0.011	U	µg/L	20-Sep-00	85	105	FT
24SVE35A	LC-483	79-01-6	Trichloroethene	0.011	U	µg/L	20-Sep-00	50	75	FT
24SVE45	LC-484	79-01-6	Trichloroethene	0.011	U	µg/L	20-Sep-00	80	100	FT
24SVE49	LC-485	79-01-6	Trichloroethene	0.36		µg/L	20-Sep-00	83	103	FT
24SVE5	LC-449	79-01-6	Trichloroethene	0.2		µg/L	19-Sep-00	68	88	FT
24SVE51	LC-486	79-01-6	Trichloroethene	0.011	U	µg/L	20-Sep-00	83	103	FT

SOIL GAS ANALYTICAL DATA - SITE 24

Station ID	Sample ID	Analyte ID	Analyte Name	Result	Review Qualifier	Result Units	Collection Date	Top Depth*	Bottom Depth*	Depth Units
24SVE54	LC-487	79-01-6	Trichloroethene	0.011	U	µg/L	21-Sep-00	85	105	FT
24SVE55	LC-488	79-01-6	Trichloroethene	0.89		µg/L	21-Sep-00	80	100	FT
24SVE67	LC-489	79-01-6	Trichloroethene	0.011	U	µg/L	20-Sep-00	75	100	FT
24SVE77	LC-490	79-01-6	Trichloroethene	0.12		µg/L	20-Sep-00	75	100	FT
24SVE78	LC-454	79-01-6	Trichloroethene	0.22		µg/L	19-Sep-00	80	100	FT
24SVE89	LC-456	79-01-6	Trichloroethene	4		µg/L	19-Sep-00	80	105	FT
24SVE89	LC-455	79-01-6	Trichloroethene	4		µg/L	19-Sep-00	80	105	FT
24SVE9	LC-450	79-01-6	Trichloroethene	8.5		µg/L	19-Sep-00	81	111	FT
24SVE94	LC-457	79-01-6	Trichloroethene	0.011	U	µg/L	19-Sep-00	75	105	FT

Note:
* the top and bottom depths are the screened interval of the well

Acronyms/Abbreviations:
FT – feet
µg/L – micrograms per liter

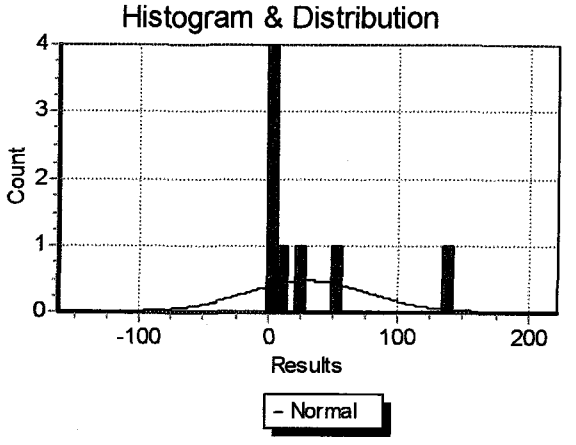
Review Qualifier:
U – not reported above detection limit

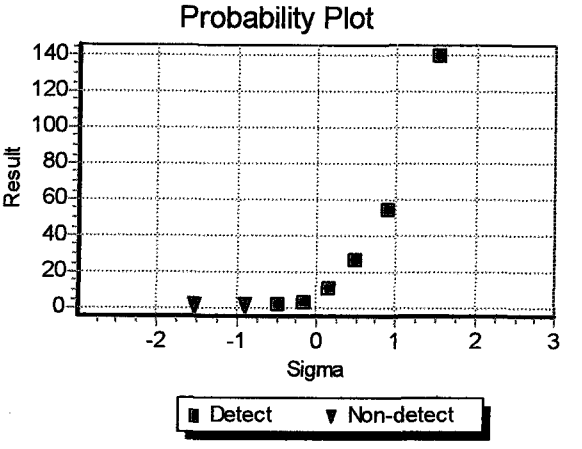
ATTACHMENT C

PROBABILITY PLOTS – SITE 16

Former MCAS El Toro, IRP Site 16

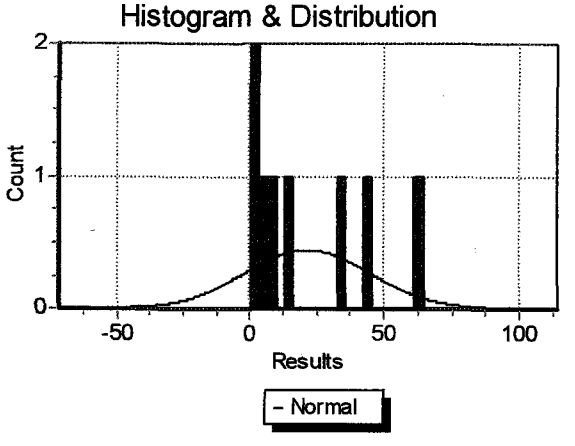
Trichlorotrifluoroethane – 76-13-1

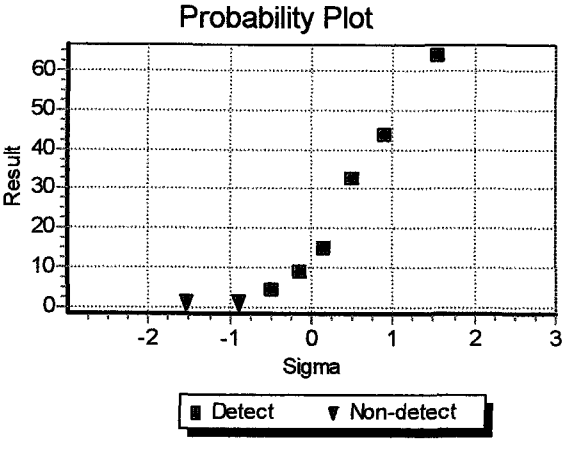




No. Samples:	8	EPC:	140 µg/L
No. Rejected Samples:	0	Min Detect:	2.4 µg/L
No. Results:	8	Max Detect:	140 µg/L
No. Detects:	6	Mean:	29.8 µg/L
Non-detects:	2 (25%)	Std Dev:	48.2 µg/L
Distribution:	Lognormal	Geo Mean:	6.72 µg/L

Trichloroethene – 79-01-6

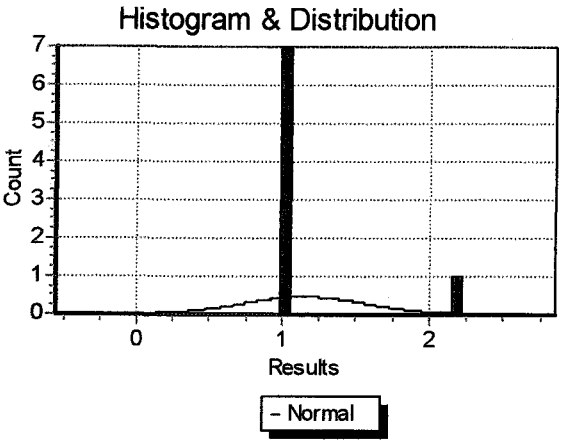


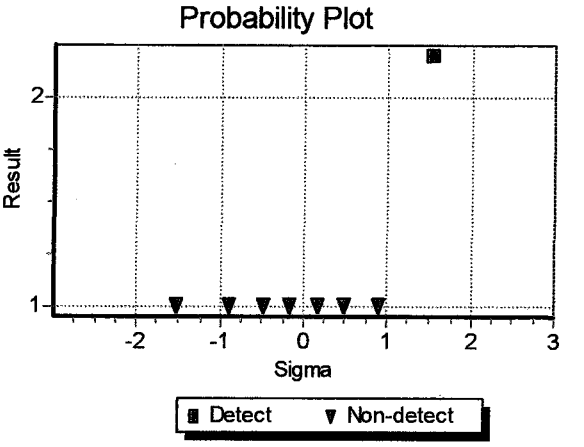


No. Samples:	8	EPC:	64 µg/L
No. Rejected Samples:	0	Min Detect:	4.5 µg/L
No. Results:	8	Max Detect:	64 µg/L
No. Detects:	6	Mean:	21.3 µg/L
Non-detects:	2 (25%)	Std Dev:	23.3 µg/L
Distribution:	Lognormal	Geo Mean:	7.85 µg/L

Former MCAS El Toro, IRP Site 16

Trichlorofluoromethane – 75-69-4





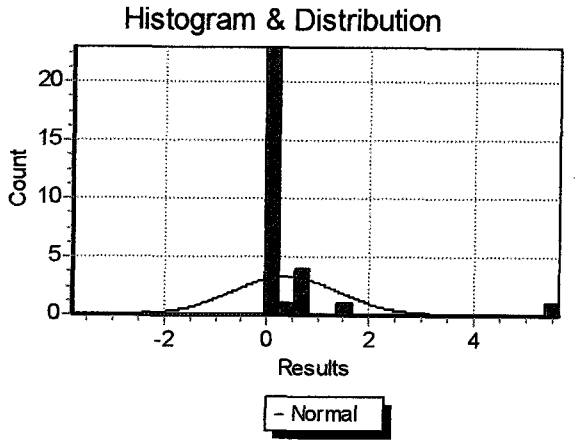
No. Samples:	8	EPC:	1.04 µg/L
No. Rejected Samples:	0	Min Detect:	2.2 µg/L
No. Results:	8	Max Detect:	2.2 µg/L
No. Detects:	1	Mean:	0.713 µg/L
Non-detects:	7 (87.5%)	Std Dev:	0.601 µg/L
Distribution:	Nonparametric		

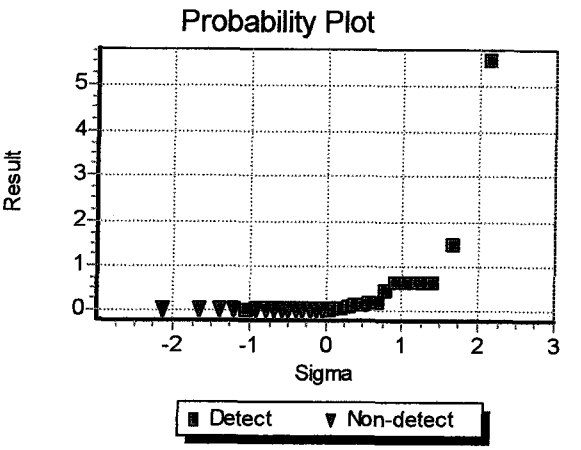
ATTACHMENT D

PROBABILITY PLOTS – SITE 24

Former MCAS El Toro, IRP Site 24

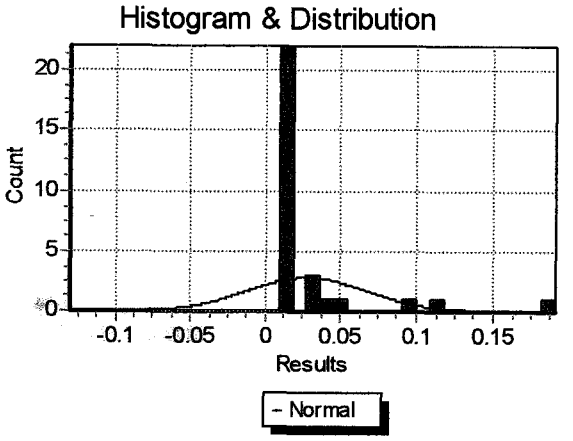
Trichlorotrifluoroethane – 76-13-1

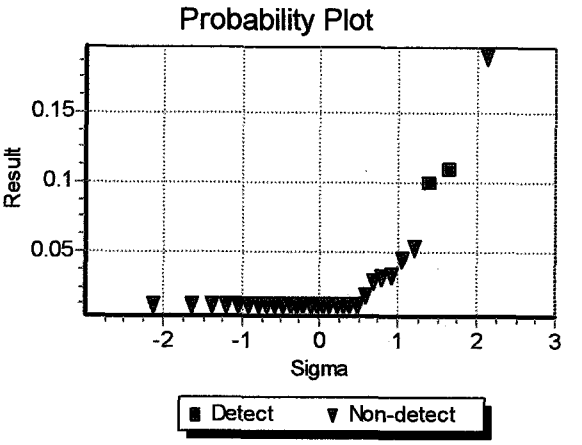




No. Samples:	30	EPC:	0.67 µg/L
No. Rejected Samples:	0	Min Detect:	0.015 µg/L
No. Results:	30	Max Detect:	5.6 µg/L
No. Detects:	16	Mean:	0.37 µg/L
Non-detects:	14 (46.7%)	Std Dev:	1.04 µg/L
Distribution:	Nonparametric	Median:	0.02 µg/L

1,1,2-Trichloroethane – 79-00-5

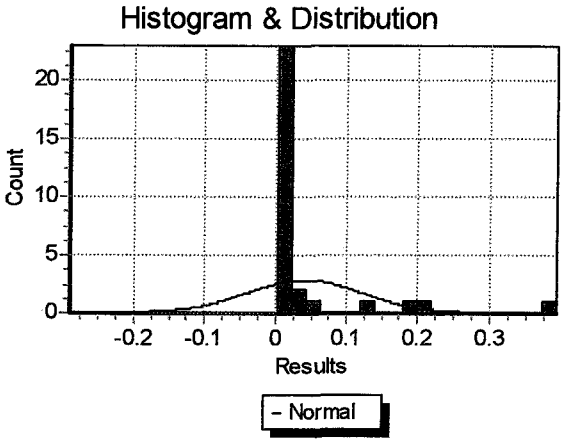


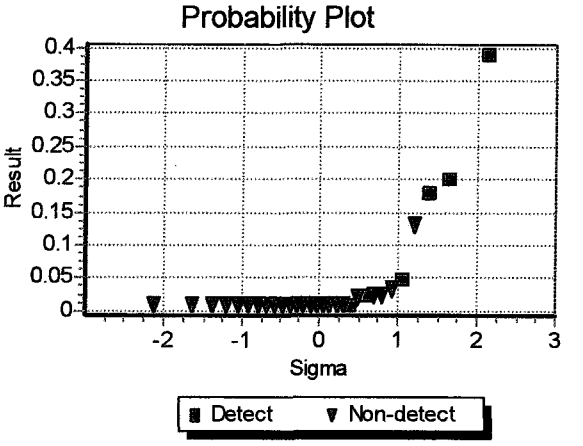


No. Samples:	30	EPC:	0.0225 µg/L
No. Rejected Samples:	1	Min Detect:	0.1 µg/L
No. Results:	29	Max Detect:	0.11 µg/L
No. Detects:	2	Mean:	0.0148 µg/L
Non-detects:	27 (93.1%)	Std Dev:	0.0256 µg/L
Distribution:	Nonparametric		

Former MCAS El Toro, IRP Site 24

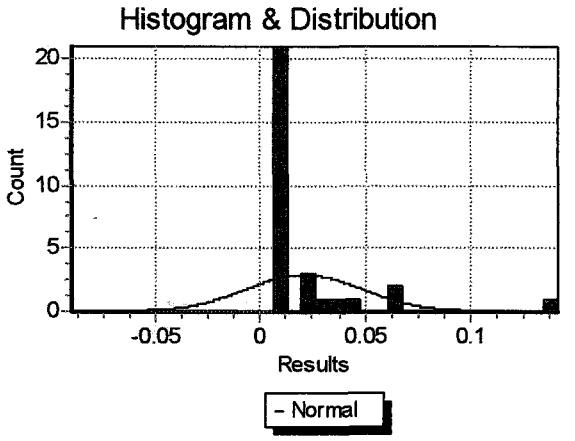
1,1-Dichloroethene – 75-35-4

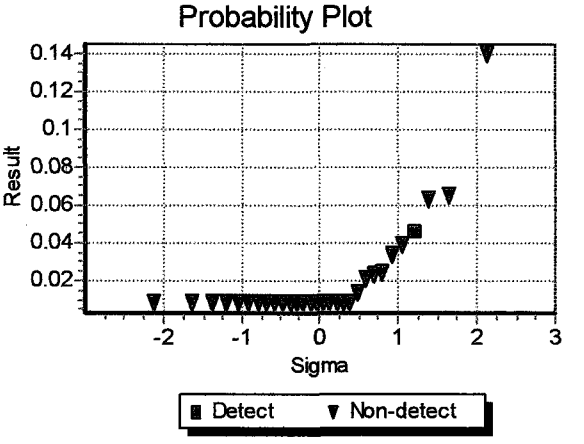




No. Samples:	30	EPC:	0.0582 µg/L
No. Rejected Samples:	0	Min Detect:	0.0079 µg/L
No. Results:	30	Max Detect:	0.39 µg/L
No. Detects:	6	Mean:	0.0346 µg/L
Non-detects:	24 (80%)	Std Dev:	0.0823 µg/L
Distribution:	Nonparametric	Median:	0.00395 µg/L

1,2-Dichloroethane – 107-06-2

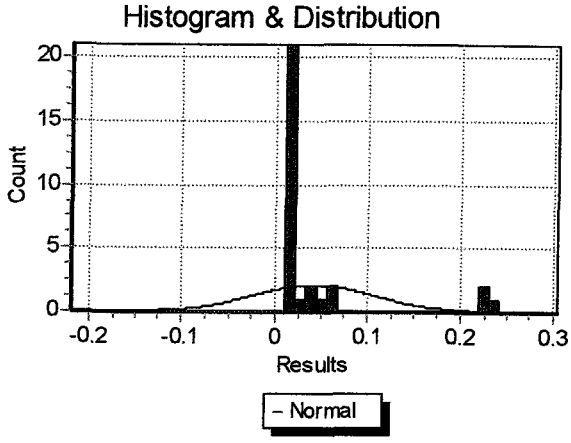


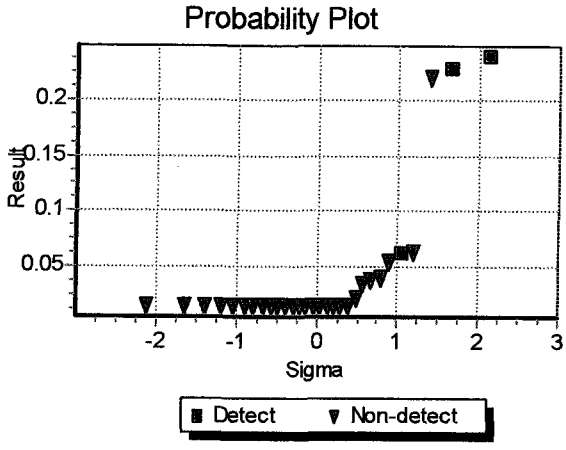


No. Samples:	30	EPC:	0.0103 µg/L
No. Rejected Samples:	3	Min Detect:	0.046 µg/L
No. Results:	27	Max Detect:	0.046 µg/L
No. Detects:	1	Mean:	0.00754 µg/L
Non-detects:	26 (96.3%)	Std Dev:	0.00875 µg/L
Distribution:	Nonparametric		

Former MCAS El Toro, IRP Site 24

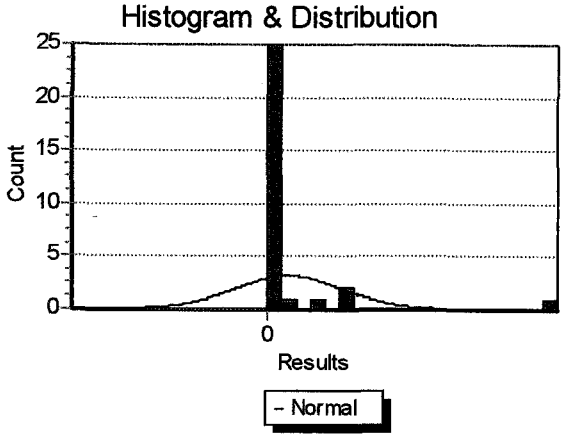
Carbon Tetrachloride – 56-23-5

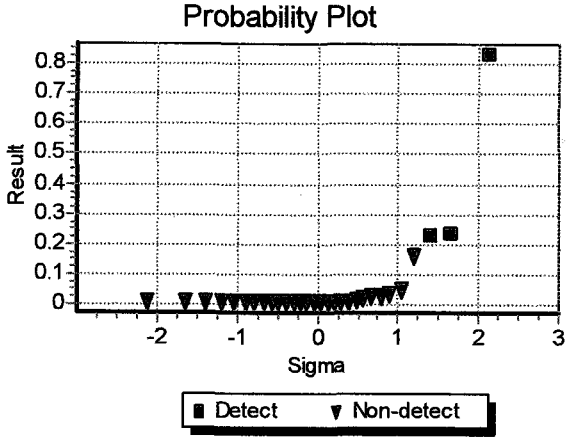




No. Samples:	30	EPC:	0.0478 µg/L
No. Rejected Samples:	0	Min Detect:	0.062 µg/L
No. Results:	30	Max Detect:	0.24 µg/L
No. Detects:	3	Mean:	0.0298 µg/L
Non-detects:	27 (90%)	Std Dev:	0.0597 µg/L
Distribution:	Nonparametric		

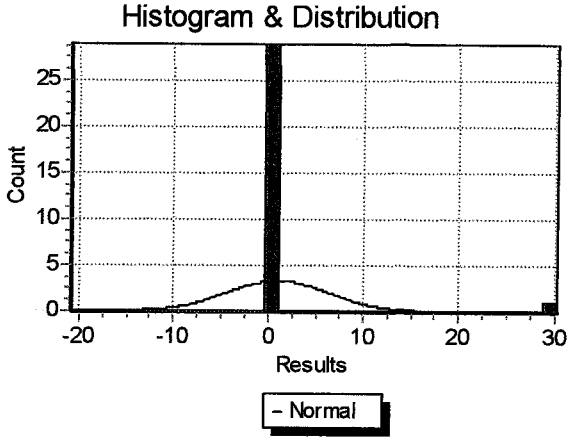
Chloroform – 67-66-3

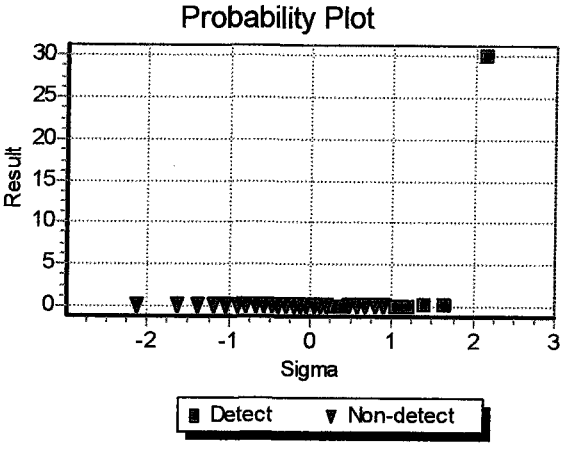




No. Samples:	30	EPC:	0.0986 µg/L
No. Rejected Samples:	0	Min Detect:	0.23 µg/L
No. Results:	30	Max Detect:	0.83 µg/L
No. Detects:	3	Mean:	0.0523 µg/L
Non-detects:	27 (90%)	Std Dev:	0.158 µg/L
Distribution:	Nonparametric		

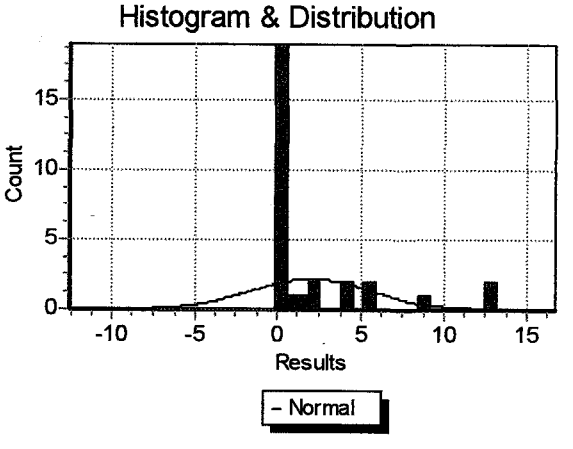
Tetrachloroethene – 127-18-4

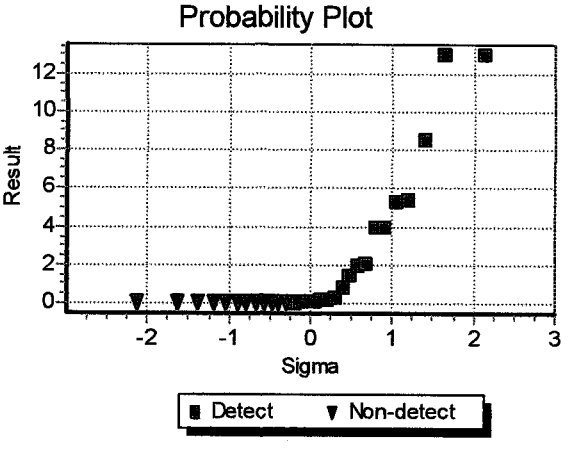




No. Samples:	30	EPC:	2.65 µg/L
No. Rejected Samples:	0	Min Detect:	0.016 µg/L
No. Results:	30	Max Detect:	30 µg/L
No. Detects:	7	Mean:	1.03 µg/L
Non-detects:	23 (76.7%)	Std Dev:	5.47 µg/L
Distribution:	Nonparametric	Median:	0.007 µg/L

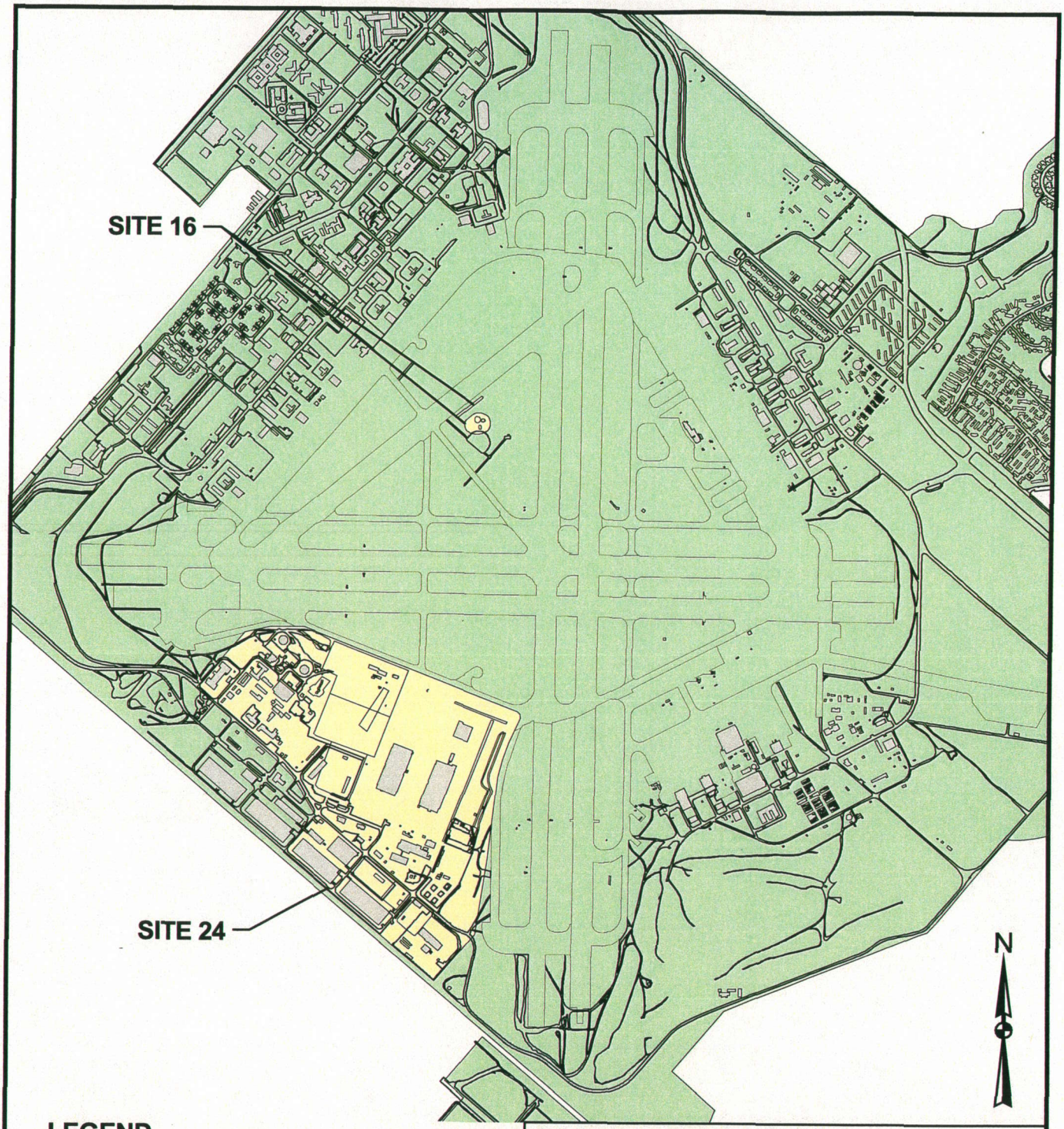
Trichloroethene – 79-01-6





No. Samples:	30	EPC:	3.11 µg/L
No. Rejected Samples:	0	Min Detect:	0.023 µg/L
No. Results:	30	Max Detect:	13 µg/L
No. Detects:	18	Mean:	2.03 µg/L
Non-detects:	12 (40%)	Std Dev:	3.65 µg/L
Distribution:	Nonparametric	Median:	0.14 µg/L

FIGURES



LEGEND

- FORMER MCAS EL TORO BOUNDARY
- SITE BOUNDARY
- ROAD
- RUNWAY

2000 0 2000 Feet

Sites 16 and 24 Indoor Air Risk Evaluation

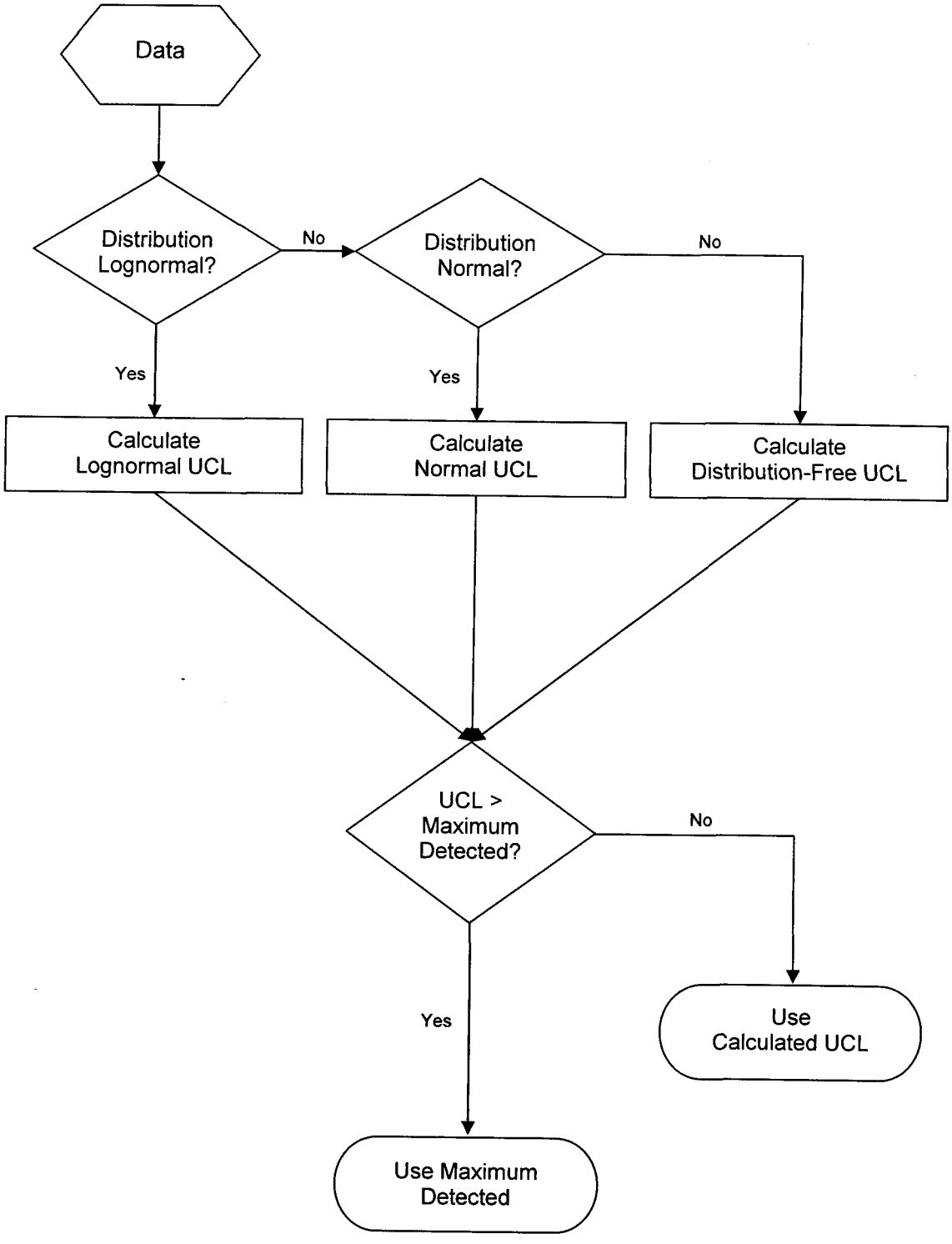
Figure 1

Locations of Sites 16 and 24

Former MCAS El Toro, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 6/4/04
File No.: 045L12347
Job No.: 23818-045
Rev No.: B



Acronym/Abbreviation:
UCL – upper confidence limit

Figure 2
Exposure Point Concentrations Flowchart

TABLES

Table 1
Soil Gas EPCs and Resultant Indoor Air Concentrations

CAS No.	Chemical	Residential Air EPC (mg/m^3)	Industrial Air EPC (mg/m^3)	Soil Gas EPC (µg/L)	Soil Gas EPC = Max	Soil Gas EPC Distribution
IRP Site 16						
76-13-1	trichlorotrifluoroethane	1.16E-04	3.38E-05	140	X	Lognormal
79-01-6	trichloroethene	5.43E-05	1.58E-05	64	X	Lognormal
75-69-4	trichlorofluoromethane	9.03E-07	2.62E-07	1.04		Nonparametric
IRP Site 24						
76-13-1	trichlorotrifluoroethane	2.76E-05	7.57E-06	0.67		Nonparametric
79-00-5	1,1,2-trichloroethane	4.19E-07	1.19E-07	0.0225		Nonparametric
75-35-4	1,1-dichloroethene	1.24E-06	3.49E-07	0.0582		Nonparametric
107-06-2	1,2-dichloroethane	1.52E-07	4.34E-08	0.0103		Nonparametric
56-23-5	carbon tetrachloride	8.84E-07	2.50E-07	0.0478		Nonparametric
67-66-3	chloroform	2.41E-06	6.77E-07	0.0986		Nonparametric
127-18-4	tetrachloroethene	4.54E-05	1.29E-05	2.65		Nonparametric
79-01-6	trichloroethene	1.30E-04	3.56E-05	3.11		Nonparametric

Acronyms/Abbreviations:
- CAS – Chemical Abstracts Service
- EPC – exposure point concentration
- IRP – Installation Restoration Program
- µg/L – micrograms per liter
- mg/m^3 – milligrams per cubic meter

Table 2
Values[a] Assigned to the Parameters in the Inhalation Dose Equation

Equation Parameter	Units	Resident Child[b]	Resident Adult[c]	Industrial Worker
Soil Gas				
Inhalation of volatiles[c]				
Intake rate	m^3/hour	0.42	0.83	0.83
Exposure time	Hours/day	24	24	8
Exposure frequency	Days/year	350	350	250
Exposure duration (cancer)	Years	6	24	25
Exposure duration (noncancer)	Years	6	24	25
Body weight	Kilograms	15	70	70
Averaging time (cancer)	Days	25,550	25,550	25,550
Averaging time (noncancer)	Days	2,190[d]	10,950[d]	9,125[d]

Notes:
[a] unless otherwise noted, values are based on factors published by U.S. EPA in Region 9 table of preliminary remediation goals (U.S. EPA 2002)
[b] resident child age is 0 to 6 years
[c] vapor-phase concentration estimated by use of the Johnson and Ettinger air model for resident and industrial receptors
[d] exposure duration x 365

Acronyms/Abbreviations:
m^3/hour – cubic meters per hour
U.S. EPA – United States Environmental Protection Agency

Table 3
Air Modeling Input Parameters

Parameters[a]	Residential Input Variables	Industrial Input Variables
Chemical-Specific Parameters		
Soil gas concentrations ($\mu g/m^3$)	Chemical-specific (see Table 1)	Chemical-specific (see Table 1)
Organic carbon partition coefficient (cm^3/g)	Provided in Johnson and Ettinger VLOOKUP tables	Provided in Johnson and Ettinger VLOOKUP tables
Henry's law constant (unitless)		
Water diffusion coefficient (cm^2/s)		
Air diffusion coefficient (cm^2/s)		
Other chemical parameters: Enthalpy of vaporization Water solubility Boiling point Critical temperature		
Soil Parameters		
Average soil temperature (°C)	20 (DTSC 2003)	20 (DTSC 2003)
Depth below grade to bottom of floor (cm)	15 (best professional judgment)	15 (best professional judgment)
Depth below grade to top of contamination (cm)	Depth to COPC's most shallow detection	Depth to COPC's most shallow detection
SCS soil type[b]	Site 16: sandy loam (SL) Site 24: loamy sand (LS)	Site 16: sandy loam (SL) Site 24: loamy sand (LS)
Dry bulk density (g/cm^3)	Site 16: 1.79 (BNI 1997) Site 24: 1.77 (BNI 1998)	Site 16: 1.79 (BNI 1997) Site 24: 1.77 (BNI 1998)
Total porosity (cm^3/cm^3)	Site 16: 0.326 (BNI 1998) Site 24: 0.326 (BNI 1998)	Site 16: 0.326 (BNI 1998) Site 24: 0.326 (BNI 1998)
Soil water-filled porosity (cm^3/cm^3)	Site 16: 0.2355 (BNI 1997) Site 24: 0.1767 (BNI 1998)	Site 16: 0.2355 (BNI 1997) Site 24: 0.1767 (BNI 1998)
Building Parameters[c]		
Height of structure (cm)	366 (default value, U.S. EPA 2003b)	1,000 (best professional judgment)
Length of structure (cm)	1,000 (default value, U.S. EPA 2003b)	6,038 (best professional judgment)

(table continues)

Table 3 (continued)

Parameters[a]	Residential Input Variables	Industrial Input Variables
Building Parameters[c] (continued)		
Width of structure (cm)	1,000 (default value, U.S. EPA 2003b)	2,898 (best professional judgment)
Floor thickness (cm)	15 (best professional judgment)	30 (best professional judgment)
Floor-wall seam crack width (cm)	0.1(default value, U.S. EPA 2003b)	0.1 (default value, U.S. EPA 2003b)
Soil pressure differential (g/cm^2-sec)	20 (U.S. EPA 2003b)	40 (default value, U.S. EPA 2003b)
Indoor air exchange rate (1/h)	0.66[d] (U.S. EPA 1997a)	0.83[d] (ASTM 2002)
Soil vapor permeability (cm^2)	Site 16: 5.14E-08 (BNI 2002a) Site 24: 8.84E-08 (BNI 1998)	Site 16: 5.14E-08 (BNI 2002a) Site 24: 8.84E-08 (BNI 1998)

References:
ASTM 2002
BNI 1997, 1998, 2002a
DTSC 2003
U.S. EPA 1997a, 2003b

Notes:
[a] parameters listed are chemical-specific, site-specific, or based on published default values; values calculated by the model are not listed
[b] assumed to be a single unit
[c] the residential exposure scenario assumes a structure with U.S. EPA default dimensions (U.S. EPA 2003b) and a 6-inch slab, typical of residential structures in California; since U.S. EPA does not specify building dimensions under an industrial exposure scenario, the risk assessment assumes that the industrial worker occupies a two-story, 200-foot-long by 100-foot-wide (20,000 square feet) building with a 1-foot-thick, half-buried slab
[d] 0.66 corresponds to the average residential air exchange rate for southern California published in the U.S. EPA Exposure Factors Handbook (U.S. EPA 1997a); 0.83 corresponds to an industrial building (ASTM 2002)

Acronyms/Abbreviations:
1/h – one exchange per hour
°C – degrees Celsius
cm – centimeter
cm^2 – square centimeter
cm^2/s – square centimeters per second
cm^3/cm^3 – cubic centimeters per cubic centimeter
cm^3/g – cubic centimeters per gram
COPC – chemical of potential concern
g/cm^3 – grams per cubic centimeter
g/cm^2-sec – grams per square centimeter per second
$\mu g/m^3$ – micrograms per cubic meter
SCS – Soil Conservation Service
U.S. EPA – United States Environmental Protection Agency

Table 4
U.S. EPA Toxicity Values

Chemical Name	CAS No.	Carcinogen	Federal Cancer Class Inhalation	U.S. EPA INHALATION			
				CSF $(mg/kg\text{-}d)^{-1}$	Ref	RfD (mg/kg-d)	Ref
carbon tetrachloride	56-23-5	C	B2	5.25E-02	I	7.00E-04	R
chloroform	67-66-3	C	B2	8.05E-02	I	8.60E-04	N
1,2-dichloroethane	107-06-2	C	B2	9.10E-02	I	1.40E-03	N
1,1-dichloroethene	75-35-4	NC	NE	NA		5.71E-02	I
tetrachloroethene (PCE)	127-18-4	C	B2	1.00E-02	N	1.70E-01	N
trichlorotrifluoroethane	76-13-1	NC	NE	NA		8.57E+00	H
1,1,2-trichloroethane	79-00-5	C	C	5.60E-02	I	4.00E-03	R
trichloroethene (TCE)	79-01-6	C	B2	4.00E-01	N	1.00E-02	N
trichlorofluoromethane	75-69-4	NC	NE	NA		2.00E-01	H

Acronyms/Abbreviations:
- C – carcinogenic
- CAS – Chemical Abstracts Service
- CSF – cancer slope factor
- mg/kg-d – milligrams per kilogram per day
- $(mg/kg\text{-}d)^{-1}$ – inverse of milligrams per kilograms per day
- NA – not available
- NC – noncarcinogenic
- Ref – reference
- RfD – reference dose
- U.S. EPA – United States Environmental Protection Agency

References:
- H – Health Effects Assessment Summary Table (HEAST) (U.S. EPA 1997b)
- I – Integrated Risk Information System (IRIS) (U.S. EPA 2004)
- N – National Center for Environmental Assessment (NCEA)
- R – route-to-route extrapolation

Cancer Classes:
- B2 – probable human carcinogen with sufficient evidence in animals and inadequate or no evidence in humans
- C – possible human carcinogen
- NE – not established

Table 5
Cal/EPA Toxicity Values

Chemical Name	CAS No.	Carcinogen	CAL/EPA INHALATION CSF $(mg/kg\text{-}d)^{-1}$	Ref
carbon tetrachloride	56-23-5	C	1.50E-01	O
chloroform	67-66-3	C	1.90E-02	O
1,2-dichloroethane	107-06-2	C	7.20E-02	O
1,1-dichloroethene	75-35-4	NC	NA	
tetrachloroethene (PCE)	127-18-4	C	2.10E-02	O
trichlorotrifluoroethane	76-13-1	NC	NA	
1,1,2-trichloroethane	79-00-5	C	5.70E-02	O
trichloroethene (TCE)	79-01-6	C	7.00E-03	O
trichlorofluoromethane	75-69-4	NC	NA	

Acronyms/Abbreviations:
- C – carcinogenic
- Cal/EPA – California Environmental Protection Agency
- CAS – Chemical Abstracts Service
- CSF – cancer slope factor
- $(mg/kg\text{-}d)^{-1}$ – inverse of milligrams per kilograms per day
- NA – not available
- NC – noncarcinogenic
- O – Office of Environmental Health Hazard Assessment (OEHHA)
- Ref – reference

Table 6
Summary of Total Lifetime Cancer Risk and Hazard Index

Exposure Route	Cancer Risk (U.S. EPA)[a,b]	Cancer Risk (State)[a,c]	Hazard Index[d]
IRP Site 16			
Resident			
Inhalation of VOCs in indoor air[e]	3.2E-06	5.7E-08	3.5E-03
Industrial Worker			
Inhalation of VOCs in indoor air[e]	1.5E-07	2.6E-09	1.0E-04
IRP Site 24			
Resident			
Inhalation of VOCs in indoor air[e]	7.8E-06	3.1E-07	1.1E-02
Industrial Worker			
Inhalation of VOCs in indoor air[e]	3.3E-07	1.3E-08	3.1E-04

Notes:
[a] the risk is higher for the resident adult; therefore, only the resident adult risk results are shown
[b] risk was calculated using U.S. EPA toxicity values
[c] risk was calculated using Cal/EPA toxicity values
[d] the hazard index is higher for the resident child; therefore, only the resident child index is shown
[e] risk was calculated using soil gas data

Acronyms/Abbreviations:
Cal/EPA – California Environmental Protection Agency
IRP – Installation Restoration Program
VOC – volatile organic compound
U.S. EPA – United States Environmental Protection Agency

Table 7
IRP Site 16
Summary of U.S. EPA Excess Lifetime Cancer Risk for the Adult Resident

	CAS No.	Chemical Name	Chemical Type	Federal Cancer Class Oral	Inh	Der	Sample Concentration		Sample Set	Chronic Daily Intake (mg/kg-d)	Excess Lifetime Cancer Risk
1	79-01-6	trichloroethene (TCE)	V	B2	B2	B2	5.4E-05	mg/m^3	Air volatiles	8.1E-06	3.2E-06
									Total of Top 20 Contributors:		**3.2E-06**
									Grand Total for Adult Resident:		**3.2E-06**

Acronyms/Abbreviations:
- B2 – probable human carcinogen with sufficient evidence in animals and inadequate or no evidence in humans
- CAS – Chemical Abstracts Service
- Der – dermal
- Inh – inhalation
- IRP – Installation Restoration Program
- mg/kg-d – milligrams per kilogram per day
- mg/m^3 – milligrams per cubic meter
- U.S. EPA – United States Environmental Protection Agency
- V – volatile organic compound

Table 8
IRP Site 16
Summary of Cal/EPA Excess Lifetime Cancer Risks for the Adult Resident

	CAS No.	Chemical Name	Chemical Type	Sample Concentration	Sample Set	Chronic Daily Intake (mg/kg-d)	Excess Lifetime Cancer Risk
1	79-01-6	trichloroethene (TCE)	V	5.4E-05 mg/m^3	Air volatiles	8.1E-06	5.7E-08
						Total of Top 20 Contributors:	**5.7E-08**
						Grand Total for Adult Resident:	**5.7E-08**

Acronyms/Abbreviations:
- Cal/EPA – California Environmental Protection Agency
- CAS – Chemical Abstracts Service
- IRP – Installation Restoration Program
- mg/kg-d – milligrams per kilogram per day
- mg/m^3 – milligrams per cubic meter
- V – volatile organic compound

Table 9
IRP Site 16
Summary of Chronic Hazard Index for the Child Resident

	CAS No.	Chemical Name	Chemical Type	Sample Concentration		Sample Set	Chronic Daily Intake (mg/kg-d)	Hazard Quotient
1	79-01-6	trichloroethene (TCE)	V	5.4E-05	mg/m^3	Air volatiles	3.5E-05	3.5E-03
2	76-13-1	trichloro-1,2,2-trifluoroethane	V	1.2E-04	mg/m^3	Air volatiles	7.5E-05	8.8E-06
3	75-69-4	trichlorofluoromethane	V	9.0E-07	mg/m^3	Air volatiles	5.8E-07	2.9E-06
							Total of Top 20 Contributors:	**3.5E-03**
							Grand Total for Child Resident:	**3.5E-03**

Acronyms/Abbreviations:
- CAS – Chemical Abstracts Service
- IRP – Installation Restoration Program
- mg/kg-d – milligrams per kilogram per day
- mg/m^3 – milligrams per cubic meter
- V – volatile organic compound

Table 10
IRP Site 16
Summary of U.S. EPA Excess Lifetime Cancer Risks for the Industrial Worker

	CAS No.	Chemical Name	Chemical Type	Federal Cancer Class Oral	Inh	Der	Sample Concentration		Sample Set	Chronic Daily Intake (mg/kg-d)	Excess Lifetime Cancer Risk
1	79-01-6	trichloroethene (TCE)	V	B2	B2	B2	1.6E-05	mg/m^3	Air volatiles	3.7E-07	1.5E-07
										Total of Top 20 Contributors:	**1.5E-07**
										Grand Total for Industrial Worker:	**1.5E-07**

Acronyms/Abbreviations:
- B2 – probable human carcinogen with sufficient evidence in animals and inadequate or no evidence in humans
- CAS – Chemical Abstracts Service
- Der – dermal
- Inh – inhalation
- IRP – Installation Restoration Program
- mg/kg-d – milligrams per kilogram per day
- mg/m^3 – milligrams per cubic meter
- U.S. EPA – United States Environmental Protection Agency
- V – volatile organic compound

Table 11
IRP Site 16
Summary of Cal/EPA Excess Lifetime Cancer Risks for the Industrial Worker

	CAS No.	Chemical Name	Chemical Type	Sample Concentration	Sample Set	Chronic Daily Intake (mg/kg-d)	Excess Lifetime Cancer Risk
1	79-01-6	trichloroethene (TCE)	V	1.6E-05 mg/m^3	Air volatiles	3.7E-07	2.6E-09
						Total of Top 20 Contributors:	**2.6E-09**
						Grand Total for Industrial Worker:	**2.6E-09**

Acronyms/Abbreviations:
- Cal/EPA – California Environmental Protection Agency
- CAS – Chemical Abstracts Service
- IRP – Installation Restoration Program
- mg/kg-d – milligrams per kilogram per day
- mg/m^3 – milligrams per cubic meter
- V – volatile organic compound

Table 12
IRP Site 16
Summary of Chronic Hazard Index for the Industrial Worker

	CAS No.	Chemical Name	Chemical Type	Sample Concentration		Sample Set	Chronic Daily Intake (mg/kg-d)	Hazard Quotient
1	79-01-6	trichloroethene (TCE)	V	1.6E-05	mg/m^3	Air volatiles	1.0E-06	1.0E-04
2	76-13-1	trichloro-1,2,2-trifluoroethane	V	3.4E-05	mg/m^3	Air volatiles	2.2E-06	2.6E-07
3	75-69-4	trichlorofluoromethane	V	2.6E-07	mg/m^3	Air volatiles	1.7E-08	8.5E-08
							Total of Top 20 Contributors:	**1.0E-04**
							Grand Total for Industrial Worker:	**1.0E-04**

Acronyms/Abbreviations:
- CAS – Chemical Abstracts Service
- IRP – Installation Restoration Program
- mg/kg-d – milligrams per kilogram per day
- mg/m^3 – milligrams per cubic meter
- V – volatile organic compound

Table 13
IRP Site 24
Summary of U.S. EPA Excess Lifetime Cancer Risk for the Adult Resident

	CAS No.	Chemical Name	Chemical Type	Federal Cancer Class Oral	Inh	Der	Sample Concentration		Sample Set	Chronic Daily Intake (mg/kg-d)	Excess Lifetime Cancer Risk
1	79-01-6	trichloroethene (TCE)	V	B2	B2	B2	1.3E-04	mg/m^3	Air volatiles	1.9E-05	7.7E-06
2	127-18-4	tetrachloroethene (PCE)	V	B2	B2	B2	4.5E-05	mg/m^3	Air volatiles	6.7E-06	6.7E-08
3	67-66-3	chloroform	V	B2	B2	B2	2.4E-06	mg/m^3	Air volatiles	3.6E-07	2.9E-08
4	56-23-5	carbon tetrachloride	V	B2	B2	B2	8.8E-07	mg/m^3	Air volatiles	1.3E-07	6.9E-09
5	79-00-5	1,1,2-trichloroethane	V	C	C	C	4.2E-07	mg/m^3	Air volatiles	6.2E-08	3.5E-09
6	107-06-2	1,2-dichloroethane (EDC)	V	B2	B2	B2	1.5E-07	mg/m^3	Air volatiles	2.3E-08	2.1E-09
										Total of Top 20 Contributors:	**7.8E-06**
										Grand Total for Adult Resident:	**7.8E-06**

Acronyms/Abbreviations:
- B2 – probable human carcinogen with sufficient evidence in animals and inadequate or no evidence in humans
- C – possible human carcinogen
- CAS – Chemical Abstracts Service
- Der – dermal
- Inh – inhalation
- IRP – Installation Restoration Program
- mg/kg-d – milligrams per kilogram per day
- mg/m^3 – milligrams per cubic meter
- U.S. EPA – United States Environmental Protection Agency
- V – volatile organic compound

Table 14
IRP Site 24
Summary of Cal/EPA Excess Lifetime Cancer Risks for the Adult Resident

	CAS No.	Chemical Name	Chemical Type	Sample Concentration		Sample Set	Chronic Daily Intake (mg/kg-d)	Excess Lifetime Cancer Risk
1	127-18-4	tetrachloroethene (PCE)	V	4.5E-05	mg/m^3	Air volatiles	6.7E-06	1.4E-07
2	79-01-6	trichloroethene (TCE)	V	1.3E-04	mg/m^3	Air volatiles	1.9E-05	1.4E-07
3	56-23-5	carbon tetrachloride	V	8.8E-07	mg/m^3	Air volatiles	1.3E-07	2.0E-08
4	67-66-3	chloroform	V	2.4E-06	mg/m^3	Air volatiles	3.6E-07	6.8E-09
5	79-00-5	1,1,2-trichloroethane	V	4.2E-07	mg/m^3	Air volatiles	6.2E-08	3.6E-09
6	107-06-2	1,2-dichloroethane (EDC)	V	1.5E-07	mg/m^3	Air volatiles	2.3E-08	1.6E-09
							Total of Top 20 Contributors:	**3.1E-07**
							Grand Total for Adult Resident:	**3.1E-07**

Acronyms/Abbreviations:
- Cal/EPA – California Environmental Protection Agency
- CAS – Chemical Abstracts Service
- IRP – Installation Restoration Program
- mg/kg-d – milligrams per kilogram per day
- mg/m^3 – milligrams per cubic meter
- V – volatile organic compound

Table 15
IRP Site 24
Summary of Chronic Hazard Index for the Child Resident

	CAS No.	Chemical Name	Chemical Type	Sample Concentration		Sample Set	Chronic Daily Intake (mg/kg-d)	Hazard Quotient
1	79-01-6	trichloroethene (TCE)	V	1.3E-04	mg/m^3	Air volatiles	8.4E-05	8.4E-03
2	67-66-3	chloroform	V	2.4E-06	mg/m^3	Air volatiles	1.6E-06	1.8E-03
3	56-23-5	carbon tetrachloride	V	8.8E-07	mg/m^3	Air volatiles	5.7E-07	8.1E-04
4	127-18-4	tetrachloroethene (PCE)	V	4.5E-05	mg/m^3	Air volatiles	2.9E-05	1.7E-04
5	107-06-2	1,2-dichloroethane (EDC)	V	1.5E-07	mg/m^3	Air volatiles	9.8E-08	7.0E-05
6	79-00-5	1,1,2-trichloroethane	V	4.2E-07	mg/m^3	Air volatiles	2.7E-07	6.7E-05
7	75-35-4	1,1-dichloroethylene	V	1.2E-06	mg/m^3	Air volatiles	8.0E-07	1.4E-05
8	76-13-1	trichloro-1,2,2-trifluoroethane	V	2.8E-05	mg/m^3	Air volatiles	1.8E-05	2.1E-06
							Total of Top 20 Contributors:	**1.1E-02**
							Grand Total for Child Resident:	**1.1E-02**

Acronyms/Abbreviations:
- CAS – Chemical Abstracts Service
- IRP – Installation Restoration Program
- mg/kg-d – milligrams per kilogram per day
- mg/m^3 – milligrams per cubic meter
- V – volatile organic compound

Table 16
IRP Site 24
Summary of U.S. EPA Excess Lifetime Cancer Risks for the Industrial Worker

	CAS No.	Chemical Name	Chemical Type	Federal Cancer Class Oral	Inh	Der	Sample Concentration		Sample Set	Chronic Daily Intake (mg/kg-d)	Excess Lifetime Cancer Risk
1	79-01-6	trichloroethene (TCE)	V	B2	B2	B2	3.6E-05	mg/m^3	Air volatiles	8.3E-07	3.3E-07
2	127-18-4	tetrachloroethene (PCE)	V	B2	B2	B2	1.3E-05	mg/m^3	Air volatiles	3.0E-07	3.0E-09
3	67-66-3	chloroform	V	B2	B2	B2	6.8E-07	mg/m^3	Air volatiles	1.6E-08	1.3E-09
4	56-23-5	carbon tetrachloride	V	B2	B2	B2	2.5E-07	mg/m^3	Air volatiles	5.8E-09	3.1E-10
5	79-00-5	1,1,2-trichloroethane	V	C	C	C	1.2E-07	mg/m^3	Air volatiles	2.8E-09	1.5E-10
6	107-06-2	1,2-dichloroethane (EDC)	V	B2	B2	B2	4.3E-08	mg/m^3	Air volatiles	1.0E-09	9.2E-11
										Total of Top 20 Contributors:	**3.3E-07**
										Grand Total for Industrial Worker:	**3.3E-07**

Acronyms/Abbreviations:
- B2 – probable human carcinogen with sufficient evidence in animals and inadequate or no evidence in humans
- C – possible human carcinogen
- CAS – Chemical Abstracts Service
- Der – dermal
- Inh – inhalation
- IRP – Installation Restoration Program
- mg/kg-d – milligrams per kilogram per day
- mg/m^3 – *milligrams per cubic meter*
- U.S. EPA – United States Environmental Protection Agency
- V – volatile organic compound

Table 17
IRP Site 24
Summary of Cal/EPA Excess Lifetime Cancer Risks for the Industrial Worker

	CAS No.	Chemical Name	Chemical Type	Sample Concentration	Sample Set	Chronic Daily Intake (mg/kg-d)	Excess Lifetime Cancer Risk
1	127-18-4	tetrachloroethene (PCE)	V	1.3E-05 mg/m^3	Air volatiles	3.0E-07	6.3E-09
2	79-01-6	trichloroethene (TCE)	V	3.6E-05 mg/m^3	Air volatiles	8.3E-07	5.8E-09
3	56-23-5	carbon tetrachloride	V	2.5E-07 mg/m^3	Air volatiles	5.8E-09	8.7E-10
4	67-66-3	chloroform	V	6.8E-07 mg/m^3	Air volatiles	1.6E-08	3.0E-10
5	79-00-5	1,1,2-trichloroethane	V	1.2E-07 mg/m^3	Air volatiles	2.8E-09	1.6E-10
6	107-06-2	1,2-dichloroethane (EDC)	V	4.3E-08 mg/m^3	Air volatiles	1.0E-09	7.2E-11
						Total of Top 20 Contributors:	**1.3E-08**
						Grand Total for Industrial Worker:	**1.3E-08**

Acronyms/Abbreviations:
- Cal/EPA – California Environmental Protection Agency
- CAS – Chemical Abstracts Service
- IRP – Installation Restoration Program
- mg/kg-d – milligrams per kilogram per day
- mg/m^3 – milligrams per cubic meter
- V – volatile organic compound

Table 18
IRP Site 24
Summary of Chronic Hazard Index for the Industrial Worker

	CAS No.	Chemical Name	Chemical Type	Sample Concentration		Sample Set	Chronic Daily Intake (mg/kg-d)	Hazard Quotient
1	79-01-6	trichloroethene (TCE)	V	3.6E-05	mg/m^3	Air volatiles	2.3E-06	2.3E-04
2	67-66-3	chloroform	V	6.8E-07	mg/m^3	Air volatiles	4.4E-08	5.1E-05
3	56-23-5	carbon tetrachloride	V	2.5E-07	mg/m^3	Air volatiles	1.6E-08	2.3E-05
4	127-18-4	tetrachloroethene (PCE)	V	1.3E-05	mg/m^3	Air volatiles	8.4E-07	4.9E-06
5	107-06-2	1,2-dichloroethane (EDC)	V	4.3E-08	mg/m^3	Air volatiles	2.8E-09	2.0E-06
6	79-00-5	1,1,2-trichloroethane	V	1.2E-07	mg/m^3	Air volatiles	7.7E-09	1.9E-06
7	75-35-4	1,1-dichloroethylene	V	3.5E-07	mg/m^3	Air volatiles	2.3E-08	4.0E-07
8	76-13-1	trichloro-1,2,2-trifluoroethane	V	7.6E-06	mg/m^3	Air volatiles	4.9E-07	5.7E-08
							Total of Top 20 Contributors:	**3.1E-04**
							Grand Total for Industrial Worker:	**3.1E-04**

Acronyms/Abbreviations:
- CAS – Chemical Abstracts Service
- IRP – Installation Restoration Program
- mg/kg-d – milligrams per kilogram per day
- mg/m^3 – milligrams per cubic meter
- V – volatile organic compound