18600748.09050

FINAL

DEFENSE LOGISTICS AGENCY
DISTRIBUTION SAN JOAQUIN, CALIFORNIA - SHARPE SITE

AMENDMENT TO THE RECORD OF DECISION
BASEWIDE REMEDY FOR DEFENSE DISTRIBUTION DEPOT SAN JOAQUIN - SHARPE SITE (OPERABLE UNIT 2 − SOILS)

Prepared by:

URS Group, Inc.
2870 Gateway Oaks Drive, Suite 150
Sacramento, California 95833

Prepared for:

HQ AFCEE/EXA
2261 Hughes Avenue, Suite 155
Lackland Air Force Base, Texas 78236-9853

Contract No. F41624-03-D-8609
Task Order No. 0388

June 2011

DECLARATION FOR THE AMENDMENT TO THE RECORD OF DECISION

SITE NAME AND LOCATION

Site Name: Operable Unit 2 (OU 2) at the Defense Distribution Depot San Joaquin - Sharpe Site (Sharpe Site); referred to in the National Superfund Database as Sharpe Army Depot.

Site Location: Lathrop, California.

National Superfund Database Identification Number: CA8210020832.

STATEMENT OF BASIS AND PURPOSE

This decision document amends the *Record of Decision, Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) (Environmental Science and Engineering, Inc. [ESE], 1996) to satisfy the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended. The selected actions identified in this ROD amendment are also in compliance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Part 300) and Chapter 6.8 of the California Health and Safety Code (§25300 et seq.). This ROD amendment is based on information contained in the Administrative Record for OU 2.

The Defense Logistics Agency (DLA) and the United States Environmental Protection Agency (EPA) Region 9 select this amendment in concurrence with the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) and Regional Water Quality Control Board–Central Valley Region (RWQCB).

This ROD amendment was prepared to enhance the OU 2 ROD remedies by documenting land use controls (LUCs) for the protection of human health at trichloroethene (TCE) sites P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A and metals sites S-3, S-26, S-30, S-33/29, and S-36 and documenting annual monitoring for protection of ecological receptors, specifically burrowing owls, at metals sites S-3 and S-26 as components of their selected remedies. The OU 2 ROD established current and potential future use of the site as industrial land use, which does not allow for unlimited use and unrestricted exposure (e.g., residential use). However, the OU 2 ROD did not document the administrative measures by which DLA will ensure that the remedy for these sites, including industrial land use restriction, remains protective. Therefore, this ROD amendment describes the administrative implementation of the LUC component associated with protection of human health at these eight TCE and five metals sites. This ROD amendment also describes implementation of monitoring associated with protection of burrowing owls at Sites S-3 and S-26. At Site P-5A, the need for LUCs will be re-evaluated following completion of the SVE remedial action that commenced at that site in April 2010.

In addition, this ROD amendment documents no further action decisions at eight other TCE sites (P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A) identified in the OU 2 ROD.

ASSESSMENT OF OPERABLE UNIT 2, TCE AND METALS SITES

The response action selected in this ROD amendment is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

DESCRIPTION OF THE REMEDY

The remedy identified in the OU 2 ROD for TCE sites is in situ volatilization for sites with TCE concentrations in soil vapor greater than the cleanup standard that pose a threat to groundwater quality. This ROD amendment adds LUCs, which will be implemented and enforced by DLA Installation Support at San Joaquin, to eight of the 16 TCE sites (P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A). This ROD amendment also documents no further action decisions for the other eight TCE sites (P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A).

The remedy identified in the OU 2 ROD for metals sites is excavation of soils with concentrations of total lead and/or chromium greater than the cleanup standards, followed by off-site disposal. This ROD amendment adds LUCs for the five metals sites (S-3, S-26, S-30, S-33/29, and S-36) to protect human health and annual monitoring at two of the metals sites (S-3 and S-26) to protect burrowing owls. The LUCs and monitoring will be implemented and enforced by DLA Installation Support at San Joaquin.

STATUTORY DETERMINATIONS

Considering existing and ongoing operations at the Sharpe Site, new information obtained since the signing of the OU 2 ROD, the addition of LUCs to the remedial action for eight of the TCE sites and the five metals sites, and the addition of monitoring for burrowing owls to the remedial action for two of the metals sites, the identified remedy enhancements are protective of human health and the environment, comply with federal and state requirements including CERCLA §121, and are cost effective. Five-year reviews will be conducted in accordance with CERCLA §121(c) for these sites. Five-year reviews are required whenever a remedial action results in hazardous substances, pollutants, or contaminants remaining on site above concentrations that allow for unlimited use and unrestricted exposure. The five-year reviews are required to determine whether the remedy continues to be protective of human health and the environment.

Previous response actions have eliminated the need to conduct further remedial action at the eight TCE sites recommended for no further action in this ROD amendment. Therefore, five-year reviews are not required because unlimited use and unrestricted exposure are allowed at those sites.

J.B

AUTHORIZING SIGNATURES

L R Tatman 6/23/11

Lawrence R. Tatman Date
Site Director
DLA Installation Support at San Joaquin
Defense Logistics Agency

Phillip R. Dawson June 30, 11

Phillip R. Dawson Date
Staff Director
DLA Installation Support Environmental Management
Defense Logistics Agency

Sept 27, 2011

Michael Montgomery Date
Assistant Director
Federal Facilities and Site Cleanup Branch
Region 9
U.S. Environmental Protection Agency

Oct. 19, 2011

Allen Wolfenden Date
Performance Manager
Brownsfield and Environmental Restoration
Sacramento Cleanup Branch
Department of Toxic Substances Control
California Environmental Protection Agency

for Frederick L. Moss October 11, 2011

Pamela Creedon Date
Executive Officer
Central Valley Region
Regional Water Quality Control Board
California Environmental Protection Agency

RECEIVED
SACRAMENTO
CVRWQCB
11 OCT -5 AM 10: 12

TABLE OF CONTENTS

Page

DECLARATION

1.0 INTRODUCTION 1-1

2.0 TCE SITES 2-1
2.1 Site Risks, ROD Remedy, and Site Histories 2-2
2.1.1 Site Risks 2-2
2.1.2 ROD Remedy 2-7
2.1.3 Site Histories 2-8
2.2 Basis for Amendment 2-8
2.2.1 No Further Action 2-9
2.2.2 Land Use Controls 2-9
2.3 Evaluation of Remedial Alternatives 2-16
2.3.1 Overall Protection of Human Health and the Environment 2-16
2.3.2 Compliance with Applicable or Relevant and Appropriate Requirements 2-16
2.3.3 Long-Term Effectiveness 2-17
2.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment 2-17
2.3.5 Short-Term Effectiveness 2-17
2.3.6 Implementability 2-17
2.3.7 Cost 2-18
2.3.8 State and Community Acceptance 2-18
2.4 Selected Remedy 2-18
2.5 Statutory Determination 2-18

3.0 METALS SITES 3-1
3.1 Site Risks, ROD Remedy, and Site Histories 3-1
3.1.1 Site Risks 3-1
3.1.2 ROD Remedy 3-3
3.1.3 Site Histories 3-4
3.2 Basis for Amendment 3-7
3.2.1 Land Use Controls for Protection of Human Health 3-7
3.2.2 Monitoring for Protection of Burrowing Owls 3-9
3.3 Evaluation of Remedial Alternatives 3-11
3.3.1 Overall Protection of Human Health and the Environment 3-11
3.3.2 Compliance with Applicable or Relevant and Appropriate Requirements 3-11
3.3.3 Long-Term Effectiveness 3-12
3.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment 3-13
3.3.5 Short-Term Effectiveness 3-13
3.3.6 Implementability 3-13
3.3.7 Cost 3-13
3.3.8 State and Community Acceptance 3-13
3.4 Selected Remedy 3-13
3.5 Statutory Determination 3-13

4.0 REGULATORY AGENCY COMMENTS 4-1

5.0 PUBLIC PARTICIPATION COMPLIANCE 5-1

6.0 REFERENCES 6-1

TABLE OF CONTENTS (Continued)

APPENDIX A – Site Summaries
APPENDIX B – Risk and Hazard Estimates for the Vapor Intrusion Pathway at the TCE Sites
APPENDIX C – Addendum to the Installation Master Plan
APPENDIX D – Responses to Comments
APPENDIX E – Proposed Plan

LIST OF TABLES

Page

2-1 Status of TCE Sites, Sharpe Site 2-10
2-2 Applicable or Relevant and Appropriate Requirements for TCE Sites 2-17
2-3 Compliance Factors for the Selected Remedy for TCE Sites 2-18

3-1 Applicable or Relevant and Appropriate Requirements for Metals Sites 3-12
3-2 Compliance Factors for the Selected Remedy for Metals Sites 3-14

LIST OF FIGURES

Page

1-1 Status of Soil Sites, Sharpe Site 1-3

This page intentionally left blank

LIST OF ACRONYMS AND ABBREVIATIONS

AAFES	Army and Air Force Exchange Service
ACL	aquifer cleanup level
ALM	Adult Lead Model
ARAR	applicable or relevant and appropriate requirement
atm	atmosphere
bgs	below ground surface
BRA	baseline risk assessment
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CKY	CKY Incorporated Environmental Services
DI-WET	deionized water waste extraction test
DLA	Defense Logistics Agency
DoD	United States Department of Defense
DTSC	California Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
ESE	Environmental Science and Engineering, Inc.
FFA	Federal Facility Agreement
FOST	finding of suitability to transfer
FS	feasibility study
ISV	in situ volatilization
J&E	Johnson and Ettinger
kg	kilogram
LUC	land use control
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan)
OU	operable unit
ppbv	parts per billion by volume

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

RAO	remedial action objective
REC	record of environmental consideration
RI	remedial investigation
ROD	record of decision
RPM	remedial project manager
RWQCB	California Regional Water Quality Control Board–Central Valley Region
SVE	soil vapor extraction
TCE	trichloroethene
URS	URS Group, Inc.
VOC	volatile organic compound
µg/L	micrograms per liter
$\mu g/m^3$	microgram per cubic meter

1.0 INTRODUCTION

Two operable units (OUs) have been established to facilitate environmental cleanup at the Defense Distribution Depot San Joaquin - Sharpe Site (Sharpe Site), in Lathrop, California. OU 1 encompasses groundwater contaminated primarily with volatile organic compounds (VOCs), and OU 2 consists of contaminated soil and soil vapor above the water table. This decision document amends the *Record of Decision, Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD), signed in February 1996, for soil sites at the Sharpe Site (Environmental Science and Engineering, Inc. [ESE], 1996); it does not amend the *Remedial Investigation/Feasibility Study at DDRW-Sharpe Site, Record of Decision, Operable Unit 1* (OU 1 ROD), signed in January 1993, for contaminated groundwater beneath and emanating from the Sharpe Site (ESE, 1993). A separate amendment to the OU 1 ROD is in preparation.

The OU 2 ROD identified two types of sites requiring action: trichloroethene (TCE) sites and metals sites. This ROD amendment adds land use controls (LUCs) to eight TCE sites and five metals sites, monitoring for burrowing owls at two metals sites, and documents no further action decisions at eight other TCE sites[1]. LUCs may also be established for OU 1 in the forthcoming amendment to the OU 1 ROD. Consequently, LUCs may be a component of the overall remedial strategies for both OU 1 and OU 2 to ensure protection of human health and the environment.

The OU 2 ROD identified 14 TCE sites that required further investigation and/or remediation using in situ volatilization (ISV) (now more commonly referred to as soil vapor extraction [SVE]). After the OU 2 ROD was signed, two additional TCE sites (P-2B and P-4C) were identified as requiring further investigation. All but one (Site P-5A) of the 16 TCE sites has been investigated and/or remediated in accordance with the OU 2 ROD remedy. The results of recent investigations indicated that a residual TCE source area exists at Site P-5A (URS Group, Inc. [URS], 2007a; 2007b; and 2009a); therefore, as of April 2010, Site P-5A is being remediated using SVE in accordance with OU 2 ROD requirements.

The purpose of including the TCE sites in this ROD amendment is to formalize no further action decisions at Sites P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A and to establish LUCs at Sites P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A (Figure 1-1). LUCs are necessary at these eight TCE sites to protect a hypothetical residential receptor potentially exposed to residual VOC concentrations via the vapor intrusion pathway. No threats to the environment were identified at the TCE sites. At Site P-5A, the need for LUCs will be re-evaluated following completion of the SVE remedial action. In addition, because of the potential for vapor intrusion from volatilization from shallow (A Zone) groundwater plumes, LUCs may be established for groundwater in the forthcoming amendment to the OU 1 ROD.

The OU 2 ROD also identified 14 areas with total lead and/or chromium concentrations that required further investigation and/or remediation using excavation with off-site disposal. These 14 metals areas were consolidated into five metals sites (S-3, S-26, S-30, S-33/29, and S-36) (Figure 1-1). Three of the five metals sites were investigated and did not require remediation because the concentrations of total lead and chromium reported at those sites did not exceed the OU 2 ROD cleanup standards (Radian International, 2000a). At the two remaining sites, soil was excavated until total lead and chromium confirmation sample results were less than cleanup standards (Radian International, 2000b; URS, 2008). However, LUCs are necessary at the five metals sites to protect human health, because the total lead and chromium cleanup standards at the Sharpe Site are based on current and potential future industrial land

[1] The OU 2 ROD designated 111 solid waste management units as requiring no further action. In addition, soils at the pesticide mix area in the North Balloon above risk-based cleanup levels were excavated and disposed of off site prior to the completion of the OU 2 ROD (CKY, 1995; 1996; and ESE, 1996); therefore, this site also required no further action in the OU 2 ROD.

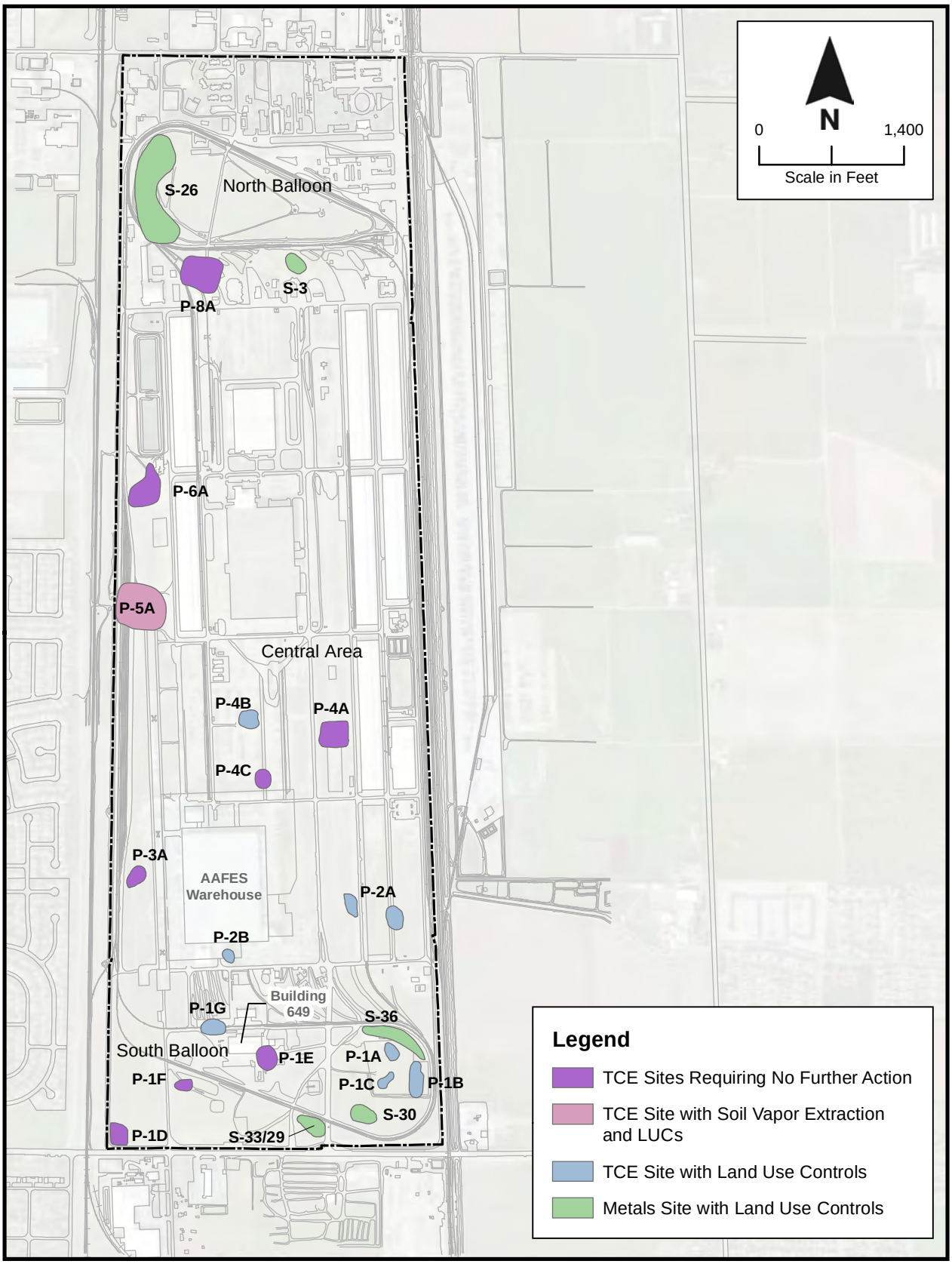
use; the site is not approved for unlimited use and unrestricted exposure (e.g., residential use). In addition, an ecological risk evaluation of burrowing owls concluded that concentrations of total lead at a few individual sample locations at Sites S-3 and S-26 exceed effect-based soil screening levels (URS, 2011); therefore, annual monitoring at these two sites is necessary to protect burrowing owls.

The OU 2 ROD did not document the administrative measures used to ensure that use of the TCE and metals sites remains protective; therefore, this ROD amendment describes the administrative implementation of the LUC remedial component associated with protecting human health at eight of the TCE sites and the five metals sites. LUCs are measures that help minimize the potential for human and ecological receptor exposure to contamination by restricting activity, use, and/or access to property with residual contamination. This ROD amendment thereby enhances the remedy identified in the OU 2 ROD by formally adding LUCs and the associated mechanisms that will prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing at eight of the TCE sites and the five metals sites. In addition, annual monitoring at two of the metals sites is added in this ROD amendment to ensure burrowing owls do not inhabit Site S-3 or Site S-26.

The Defense Logistics Agency (DLA), the lead agency, and the United States Environmental Protection Agency (EPA) Region 9 select this ROD amendment in concurrence with the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) and Regional Water Quality Control Board–Central Valley Region (RWQCB). This ROD amendment was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §117, as amended. This ROD amendment is also in compliance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), §300.435(c)(2)(ii), and Chapter 6.8 of the California Health and Safety Code, §25300, et seq. Furthermore, this action is being taken in accordance with the California Water Code (§13300, et seq.).

This ROD amendment was developed using EPA guidance entitled *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (EPA, 1999) and Sample Federal Facility Land Use Control ROD Checklist with Suggested Language (EPA, 2006).

This ROD amendment will become part of the Administrative Record file as mandated by NCP §300.825 (a)(9)(2). The Administrative Record file and other documents related to the Installation Restoration Program for the Sharpe Site are available to the public at Building 1, Tracy Site, located at 25600 South Chrisman Road in Tracy, California. The Administrative Record is available between the hours of 7 a.m. and 3 p.m., Monday through Friday. To arrange to view the Administrative Record, a visitor should call (209) 839-4065 or (209) 839-4426.



L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\sharpe_ROD_2009_SWMU_locs_letter.mxd AVS 5/31/2011 SAC

Figure 1-1. Status of Soil Sites, Sharpe Site

This page intentionally left blank

2.0 TCE SITES

VOC (primarily TCE) contamination was caused by previous use and disposal of VOCs at the Sharpe Site. The disposal of VOCs occurred in designated disposal areas within the South Balloon and the North Balloon. Disposal also occurred at undesignated, isolated locations in other parts of the installation, such as the Central Area. TCE-contaminated sites are designated with a "P" (e.g., Site P-1A). This designation was introduced for these sites in the *Operable Unit 2 Remedial Design Work Plan* (Radian Corporation, 1996). The "P"-designated names were necessary in the work plan to isolate smaller areas for remediation and characterization, from the larger areas that were identified in the OU 2 ROD on the basis of groundwater plumes (e.g., Plume 1, Plume 2, etc.).

Based on the results of the 1994 remedial investigation/feasibility study (RI/FS), the OU 2 ROD identified seven sites that had been sufficiently characterized and found to be degrading groundwater. Using the "P" designations, these sites were:

- P-1A
- P-1B
- P-1C
- P-1D
- P-5A
- P-6A
- P-8A

Seven other sites were identified in the OU 2 ROD as requiring further characterization to determine whether they were causing groundwater degradation. These sites would be subject to remediation based on the results of the characterization. Using the "P" designations, these sites were:

- P-1E
- P-1F
- P-1G
- P-2A
- P-3A
- P-4A
- P-4B

During preparation of the *Operable Unit 2 Remedial Design Work Plan*, Sites P-2B and P-4C were added to the characterization effort because a review of RI data indicated that these two sites may also be degrading groundwater (Radian Corporation, 1996). With these two additional sites, the total number of "TCE-contaminated" sites increased to 16. The locations of the 16 sites are shown on Figure 1-1.

Post-ROD (pre-design) investigations at the 16 TCE sites were completed in 1996, 1997, and 1999 to further define the extent of TCE contamination in the vadose zone and determine whether each site was causing groundwater degradation, hence requiring remediation. The results of the 1996 and 1997 investigations are presented in the *Operable Unit 2 Pre-Design Technical Summary* (Radian International, 1997a) and *Addendum to the Operable Unit 2 Pre-Design Technical Summary* (Radian International, 1997b). The results of the 1999 investigation are presented in the *Operable Unit 2, No Further Action, Remedial Action Report* (Radian International, 2000a). Following completion of the post-ROD investigations, five TCE sites (P-1A, P-1B, P-1C, P-1E, and P-6A) were determined to require a remedial action to protect groundwater quality (Radian International, 1997a), and 11 TCE sites (P-1D, P-1F, P-1G, P-2A, P-2B, P-3A, P-4A, P-4B, P-4C, P-5A, and P-8A) were determined to require no further action (Radian International, 2000a). However, the results of recent investigations indicated that a residual TCE source area exists at Site P-5A (URS, 2007a; 2007b; and 2009a); therefore, as of April 2010, Site P-5A is being remediated using SVE in accordance with OU 2 ROD requirements.

Section 2.1 provides a summary of the site risks and the remedy selected in the OU 2 ROD for the TCE sites. The investigation histories, remedial actions (where applicable), and current status for the 16 TCE sites are summarized briefly in Section 2.1, with more detail provided in Appendix A. Sections 2.2 through 2.5 provide the basis for this ROD amendment (i.e., no further action decisions at 8 of the 16 TCE sites and establishment of LUCs at the other 8 TCE sites), a more thorough description of the LUC remedy, and the necessary statutory evaluations and determinations.

2.1 Site Risks, ROD Remedy, and Site Histories

2.1.1 Site Risks

Human Health Risk. The baseline risk assessment (BRA) for soil in OU 2, as presented in the 1994 RI/FS report, was an initial evaluation of chemical contamination to indicate whether untreated conditions posed a threat to human health (ESE, 1994a). The BRA evaluated the potential exposure of on-depot workers, child and adult residents, and a child recreational (outdoor play) user to chemicals in soil through breathing of dusts and vapors, through skin contact, and through inadvertent eating or swallowing of soil particles. The residential exposure scenario was hypothetical because there were no long-term, on-depot residents, but the scenario was used as the indicator of whether “unrestricted land use” could occur at a site. Exposure assumptions for the worker exposure scenario assumed a 70-kilogram (kg) adult working 250 days per year for 25 years; the resident child exposure scenario assumed a 15-kg child residing on site 350 days per year for 3 years (the then-average turnover rate for personnel stationed at the Sharpe Site); the resident adult exposure scenario assumed a 70-kg adult residing 350 days per year for 3 years; and the recreational child exposure scenario assumed a 15-kg child played on site 50 days per year for 6 years (as a high-end estimate for off-post civilians working at the installation). In addition, there were receptor-specific values for inhalation rates (for dust exposures of on-site workers) and for skin surface area and skin adherence rates (for dermal exposures of on-site workers, residents, and child recreational users).

As estimated using standard exposure calculation equations and agency-approved toxicity factors, the concentrations of VOC contaminants in solid-phase soil were not predicted to pose a threat to human health (ESE, 1994a). However, VOCs were considered to be a threat to groundwater if leaching and/or percolation were to occur. A cleanup standard for TCE in soil vapor was developed to be protective of groundwater quality. The cleanup standard for TCE in soil vapor established in the OU 2 ROD is 350 parts per billion by volume (ppbv), which is based on maintaining TCE concentrations in ground-water less than the aquifer cleanup level (ACL) (5.0 micrograms per liter [μg/L]) if TCE in soil vapor were to migrate to groundwater and attain a state of equilibrium. This value was first proposed in *Remedial Investigation/Feasibility Study at DDRW-Sharpe Site: Soils Feasibility Study Report* (ESE,

1994b). The cleanup standard was derived using Henry's Law and represents the equilibrium relationship for a chemical that can partition between liquid and gas phases:

$$C_{sg} = C_w \times H' \times \frac{R \times T}{P} \times \frac{1}{MW} \times CF \qquad \text{(Equation 2-1)}$$

Where:

C_{sg}	=	concentration of TCE in soil gas (350 ppbv = 0.35 µL TCE/L_{air});
C_w	=	concentration of TCE in groundwater (ACL = 5 µg TCE/L_{water});
H'	=	Henry's Law constant (0.372 $L_{water}/L_{soil\ gas}$);
R	=	universal gas constant (8.21×10^{-5} [atmosphere (atm)•m^3]/[mole•°Kelvin]);
T	=	standard temperature (298° Kelvin = 25° Celsius);
P	=	standard atmospheric pressure (1 atm);
CF	=	conversion factor (1×10^3 [g•L•µL]/[µg•m^3•L]); and
MW	=	gram molecular weight (131 g TCE/mole TCE).

There have been no changes to the ACL for TCE, so the cleanup standard of 350 ppbv continues to be protective of groundwater.

The OU 2 ROD concluded that TCE-contaminated soils did not pose a risk to human health (ESE, 1996); however, intrusion of vapors originating from volatile chemicals in subsurface media (soil or groundwater) into building interiors potentially utilized by workers or residents is an exposure pathway that was not addressed in the 1994 RI/FS risk assessment. Evolving awareness of the potential for health risks from inhalation of VOCs have raised concerns about risks to occupants of buildings constructed atop contaminated soil and groundwater. Therefore, a risk assessment of the vapor intrusion pathway has been completed for each of the TCE sites.

The vapor intrusion pathway is a potential route through which people can be exposed to VOCs that have migrated from the subsurface (soil or groundwater) into the indoor air of enclosed spaces. Vapors entering the air outside of buildings generally do not present a risk because they are rapidly diluted by air movement. However, because air circulation and exchange in buildings is much less than outdoors, air vapors entering buildings through the floor can rise to levels posing a potential health threat. The vapor intrusion pathway has a variety of components, but a primary requirement is that VOCs are present in vadose zone soil vapor underlying buildings that are used or occupied by people; VOCs can be present in soil vapor either from historical releases directly into soil or volatilization of contaminated groundwater (Note: vapor intrusion from volatilization of contaminated groundwater is not addressed in this ROD amendment for OU 2 soil sites). Then, the potential threat to the health of "receptors" (exposed people) can be estimated based on chemical characteristics (e.g., degree of volatility, toxicity), soil characteristics (e.g., sand or clay, moist or dry), building characteristics (e.g., extent of foundation cracks, ventilation rates), and receptor characteristics (e.g., building occupancy durations). The estimated health risks can then be used in making environmental management decisions, such as no further action, further investigation, or remediation or mitigation.

Recently developed guidance for assessment of the vapor intrusion pathway is available from EPA (2002) and DTSC (2005). The guidance documents differ in some of the specifics but are generally similar in overall approach:

- Identify if a problem could exist;
- Evaluate the potential magnitude; and

- Develop increasingly site-specific assessments, or
- Develop remedial and/or mitigative strategies, if warranted.

The potential for VOCs to migrate from vadose zone soil to indoor air was evaluated in accordance with EPA (2002 and 2004) and DTSC (2005) using three evaluation methods: EPA screening, DTSC screening, and site-specific. A common but influential factor throughout each of these methods is the attenuation factor ("alpha" or α), which is the ratio of the concentration of a VOC in indoor air to the concentration of the VOC in soil vapor. Conceptually simple, this ratio expresses a highly complex integration of chemical, soil, and building characteristics, which can be used to predict indoor air concentrations based on those characteristics. The EPA screening method uses conservative "generic" attenuation factors that reflect generally reasonable worst-case conditions for a first-pass screening of groundwater and soil vapor data (EPA, 2002). The DTSC screening method uses default attenuation factors that reflect reasonable worst-case conditions for California for the contamination of indoor air due to intrusion of vapors migrating from subsurface contamination (DTSC, 2005). The site-specific method uses attenuation factors (based on a generally conservative [health-protective] use of EPA's Johnson and Ettinger [1991] computational simulation model [J&E model] for vapor intrusion) derived using factors for site-specific conditions such as depth of contamination and soil type, and as adapted by the DTSC for use in California (DTSC, 2009). The specific details of the risk assessment methods, calculations, and risk and hazard estimates are presented in Appendix B.

Vapor intrusion risk assessments were conducted for each of the 16 TCE sites using the results from the most recent soil vapor sampling (which is either post-ROD confirmation sampling or sampling conducted *after* SVE system shutdown [if SVE remediation occurred at a site]), although many of these data are more than 10 years old. Estimates of the cancer risks or noncancer health hazards were derived for all detected VOCs, using each of the three aforementioned methods for an assumed "unrestricted" (e.g., residential) land use. Evaluating an unrestricted use scenario is necessary because it is the point-of-departure for agency decision-making: if a site allows for unlimited use and unrestricted exposure, then measures such as LUCs or additional remediation are not necessary. The unrestricted land use scenario assumes that occupied *residences* overlie the sites, which is neither a current nor a reasonably anticipated future land use for the depot. The Sharpe Site is an actively operating facility, and there are no buildings (residences or otherwise) that currently overlie any of the TCE sites, except for the southeast corner of Building 649, which overlies a small portion of Site P-1E, and a small area at the southern end of the Army and Air Force Exchange Service (AAFES) warehouse, which overlies the northern one-quarter of Site P-2B (Figures 3-1 and 7-1 in Appendix A).

Building 649 is the only building at the Sharpe Site that overlies a shallow (A Zone) groundwater plume (Figure A-1 in Appendix A). Soil vapor samples were collected beneath Building 649 from two borings at two depths each in October 2009 to address a concern expressed by DTSC regarding the presence of a vadose zone source for groundwater contamination beneath the building (see Appendix D). TCE was detected in one sample at a concentration of 38 ppbv at 11.5 feet below ground surface (bgs), which is less than the OU 2 ROD cleanup standard. TCE was not detected in the other three samples (see the Site P-1E summary in Appendix A for sample locations and results). Soil vapor sample results indicate that there is no VOC source in the vadose zone beneath the building where the samples were collected. The detection of TCE in the soil vapor sample from beneath the northeastern portion of Building 649 suggests that volatilization from the shallow (A Zone) groundwater plume may be occurring. However, the concentration is less than the 113 ppbv generic industrial screening level (at a risk level of 1E-06) for

soil gas greater than five feet bgs[2]. Consequently, there is no unacceptable risk to current industrial receptors at Building 649, which is only occupied for approximately one hour per day.

Most of Site P-2B is open space; however, the northern one-quarter of the site is covered by the AAFES warehouse that was constructed after post-ROD characterization sampling. Because VOCs were detected in one soil gas sample beneath the footprint of the AAFES warehouse and at three sample locations along the perimeter of the building, there is the potential for risk through the vapor intrusion pathway to employees who work in enclosed spaces within the southern portion of the warehouse. However, it should be noted that the floor of the warehouse consists of sealed concrete. DLA Installation Support at San Joaquin collected an air sample in the warehouse to assure that employees are not being exposed to VOCs from soil vapor beneath the building. VOCs were not detected. A photoionization detector was also used to collect field measurements in the area of sample collection, as well as along the floor at the southern wall of the building. VOCs were not detected. Assuming the results of this sampling represent typical air quality in the building, there is no unacceptable risk to current industrial receptors at the AAFES warehouse. See the Site P-2B summary in Appendix A for a more detailed description of the collection of the air sample and sample location.

There is no unacceptable risk to current industrial receptors at Building 649, AAFES warehouse, or the Sharpe Site, in general. There are no other buildings currently overlying any other TCE site or a shallow groundwater plume, and none are planned for construction within the foreseeable future.

Cumulative cancer risk estimates and noncancer hazard estimates for each site vary depending on the risk assessment method. These risk and hazard estimates calculated for potential future unrestricted land use were used as lines of evidence to assist in determining whether a TCE site requires no further action or whether a TCE site requires LUCs to protect human health. As described above, there is no unacceptable risk to human health for the current industrial land use. The risk and hazard estimates for each site, along with the other lines of evidence evaluated, are presented in the TCE site summaries in Appendix A.

Limitations. As discussed previously, the quantitative risk estimates are based on EPA screening, DTSC screening, and site-specific evaluations. No one method is completely and specifically applicable to the TCE sites at the Sharpe Site, and consequently, these multiple methods provide a range of risk estimates, each with associated uncertainty:

- The attenuation factor in the EPA screening method is considered by EPA to be a reasonable upper bound value to reflect generally reasonable worst-case conditions for a first-pass screening of soil vapor data (EPA, 2002). EPA derived the value based on co-located (paired) data from sites where indoor air, soil vapor, and groundwater samples were available, and from theoretical considerations. The specific site conditions that gave rise to the generic attenuation factor may or may not be representative of the TCE sites at the Sharpe Site, but as an upper-bound value, the factor is intended to be conservative (health-protective) and more likely to over-indicate risk (to ensure that risks are not overlooked).

- The attenuation factor in the DTSC screening method is based on the most protective value for slab-on-grade or crawlspace structures, which are the most likely and common types of construction in the region (as opposed to structures with basements). In addition, the factor is based on current *residences*

[2] The EPA Regional Screening Level for the concentration of TCE in ambient air in a commercial/industrial setting is 6.1 micrograms per cubic meter (µg/m^3). Based on EPA's generic screening attenuation factor for soil greater than 5 feet bgs (a dimensionless value of 0.01; EPA, 2002), the equivalent soil vapor concentration at those depths would be 610 µg/m^3. Then, converting the measurement units (assuming standard temperature [25° Celsius] and pressure [1 atm]): 610 µg/m^3 = 113.5 ppbv (EPA, 2009).

(although none are present at any site); the attenuation factor for future residences is slightly less than half the value used for the TCE sites at the Sharpe Site, and the commercial factors are approximately half the residential value under current and future conditions. In consideration of the California-specific factors and health-protective assumptions, the DTSC screening method uses default attenuation factors that reflect reasonable worst-case conditions for California for the contamination of indoor air due to intrusion of vapors migrating from subsurface contamination (DTSC, 2005). Consequently, the factor is intended to be conservative (health-protective) and more likely to over-indicate risk (to ensure that risks are not overlooked).

- The site-specific method relied on limited site-specific input data to the J&E model (chemical-specific concentrations at specific subsurface depths and site-specific soil types). Although these inputs are more site-specific than the conditions embedded within the EPA and DTSC attenuation factors, the specific applicability of the J&E model itself is likely to be more uncertain than the empirical data of EPA and DTSC. The empirical data represent actual vapor-intrusion processes at real locations, whereas the J&E model simulates conditions at a hypothetical location based on assumed values for multiple computational variables. However, as developed by EPA (2004), the screening-level input parameters to the J&E model are considered default parameters for a first tier assessment, which should in most cases provide a reasonably (but not overly) conservative estimate of the vapor intrusion attenuation factor for a site. Consequently, using this model with site-specific data is also likely to be conservative with, perhaps, a closer approximation of potential on-site conditions.

Collectively, the various approaches provide three risk estimates for one line of evidence in determining whether a TCE site requires no further action or whether a TCE site requires LUCs to protect human health (see Appendix A). All three are mathematical predictions for hypothetical conditions, as there are (with two partial exceptions) no structures for human use that overlie the TCE sites at the Sharpe Site.

Ecological Risk. The OU 2 ROD concluded that TCE-contaminated soils did not pose a risk to the environment (ESE, 1996); however, the BRA did not evaluate the potential effects of residual TCE concentrations at the TCE sites on burrowing owls (although environmental inhalation of volatile compounds was not thought to be important, even for human health, when the BRA was developed). Several areas of the Sharpe Site (including land at [e.g., Site P-3A], and adjacent to, the TCE sites) provide habitat for and are occupied by burrowing owls (*Athene cunicularia*), a California species of special concern. Burrowing owls occupy burrows excavated by California ground squirrels (*Spermophilus beecheyi*) (common at the Sharpe Site) or other animals and, consequently, are subjected to subsurface environmental conditions for portions of their lifecycle. Burrowing owls are a mobile species and may occupy one area during one year and occupy a different area in a subsequent year. Conceivably, if burrowing owls were to occupy burrows in areas of residual TCE contamination of soil gas, the animals could be exposed via inhalation of burrow air.

Risk to burrowing owls, which have been observed to inhabit Site P-3A, was recently evaluated by DTSC and the California Department of Fish and Game (CDFG). Inhalation toxicity in birds exposed to TCE has not been studied. Therefore, these agencies estimated risk from inhalation for an alternative burrowing animal, the California ground squirrel. They used the lower (i.e., more-protective) of two published no-effect toxicity values (Gallegos et al., 2007; MWH, 2010) for burrowing mammals. The agencies compared the maximum residual TCE concentration at Site P-3A to the toxicity value, and the ratio of exposure concentration to toxicity concentration was less than 1. A ratio less than one indicates that exposure is less than the no-effect toxicity value, and indicates no ecological hazard. In addition, DTSC and CDFG reviewed burrowing owl population data from 1997 to 2009 summarized in the *Annual Burrowing Owl Breeding Season Census at Sharpe Depot* (Albion Environmental, Inc., 2009). DTSC and CDFG concluded that burrowing owls are present at the Sharpe Site, that burrowing owls are successfully

reproducing at Site P-3A, and there is de minimis (inconsequential) inhalation risk to a surrogate burrow-occupying receptor—the California ground squirrel—based on the exposure:toxicity ratio method of indicating ecological hazard (DTSC and CDFG, 2010). Based on this information, there are no mitigative measures necessary to protect burrowing owls at the TCE sites.

2.1.2 ROD Remedy

SVE (termed ISV in the OU 2 ROD) is the remedy selected in the OU 2 ROD for soil with TCE concentrations in soil vapor that pose a threat to groundwater quality. The remedial action objective (RAO) is to prevent further degradation of groundwater and minimize aquifer cleanup time by reducing the mass of TCE that reaches groundwater (ESE, 1996). The remedy requires treatment of TCE-contaminated soil with soil vapor concentrations greater than the OU 2 ROD cleanup standard (350 ppbv). This remedy is required by the OU 2 ROD "as a source control effort to prevent further degradation of the groundwater and minimize the aquifer cleanup time." The following requirements are specified:

- Delineate areas suspected of being sources of groundwater contamination using soil vapor data.
- Install vapor extraction wells, a positive displacement blower, a condensate separator, and aboveground piping to extract air flow from subsurface soils.
- Transmit SVE off gas from the vapor extraction wells to a vapor-phase carbon system for treatment of soil vapor prior to discharge to the atmosphere.
- Construct separate SVE systems that can operate independently to remediate separate areas of contamination.
- Install soil vapor monitoring wells to monitor the progress of remediation.

The selected remedy documented in the OU 2 ROD includes an operational period of 24 months. The ROD specifies performance monitoring with optimization efforts, including:

- Collecting soil vapor monitoring data and tracking the cumulative mass of VOCs removed.
- Alternating extraction operations with rebound periods; during extraction periods, operating until asymptotic conditions have been reached.
- Discontinuing the operation of extraction wells in areas where the cleanup standard has been attained.
- Modeling to assess the affects of the remaining VOCs on groundwater.

The OU 2 ROD requires that the SVE system be designed, constructed, operated, and, if necessary, modified to achieve the 350 ppbv cleanup standard.

Technical and Economic Feasibility. Even if the cleanup standard is met, the OU 2 ROD requires that VOCs in the vadose zone be remediated to the extent technically and economically feasible. The feasibility analysis will include but not be limited to consideration of the following factors:

- Technical effectiveness of the system, including whether the asymptote has been reached.

- A groundwater transport model may be used to predict the time the pump-and-treat remedy would need to be operated, with no additional vadose zone remediation, to achieve aquifer cleanup levels.
- The additional cost for continuing to operate the SVE system to/at asymptotic mass levels.
- The total cost for enhancing the SVE technology (e.g., additional vapor extraction wells, air injection) beyond system optimization, which should occur throughout operation of the remedial action, to remove additional VOCs.
- The cost of vadose zone remediation compared to the cost of groundwater remediation when comparing cost on the basis of a common unit (i.e., cost per pound of TCE removed) prior to the time that groundwater reaches aquifer cleanup levels.

Further Characterization. The OU 2 ROD required further characterization at seven sites to determine whether they were causing groundwater degradation. The data from the additional characterization efforts was to be used to determine whether those sites required remediation.

2.1.3 Site Histories

Appendix A includes the conceptual site model, the site history, and a recommendation for no further action or addition of LUCs for each of the 16 TCE sites[3]. The site summaries highlight data from the 1987 RI that led to each site's subsequent inclusion and classification (i.e., remediation or characterization site) in the OU 2 ROD. The summaries provide the relevant results from the 1996, 1997, and 1999 post-ROD (pre-design) investigations that resulted in either implementation of the OU 2 ROD remedy (i.e., SVE) or a determination that no action was required based on concentration data (i.e., all results less than 350 ppbv) and/or modeling predictions (i.e., residual mass does not pose an unacceptable threat to groundwater). For sites that required SVE, the final closure/confirmation data are presented with the site summary to support achievement of the OU 2 ROD requirements. For each site, post-ROD investigation data (no action sites) or post-remediation data (SVE sites) are presented in a table and accompanying figure. These data combined with operational history, land use, groundwater data, mass estimates (in place and removed, where applicable), vadose zone and groundwater modeling, and risk and hazard estimates from the vapor intrusion pathway assuming potential future unrestricted land use support no further action decisions at eight of the 16 TCE sites (P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A). At the other eight TCE sites (P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A), LUCs are necessary to protect human health from the potential risk associated with inhalation of VOCs via the vapor intrusion pathway. A brief summary of each of the 16 TCE sites is presented in Table 2-1.

2.2 Basis for Amendment

The OU 2 ROD identified 14 TCE sites that required further investigation and/or remediation. After the OU 2 ROD was signed, two additional TCE sites (P-2B and P-4C) were identified as requiring further investigation. All but one (Site P-5A) of the TCE sites have been investigated and/or remediated in accordance with the OU 2 ROD remedy and have achieved the RAO of preventing further degradation of groundwater and minimizing aquifer cleanup time by reducing the mass of TCE that reaches groundwater. At Site P-5A, the RAO is expected to be achieved upon completion of SVE operations, which commenced in April 2010. The purpose of including the TCE sites in this ROD amendment is to formalize no further action decisions at Sites P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A; and to establish LUCs at Sites P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A. LUCs are necessary at

[3] Because of their proximity to each other and similar remediation history, Sites P-1A, P-1B, and P-1C are combined into one site summary in Appendix A.

these eight sites to protect a hypothetical residential receptor potentially exposed to residual VOC concentrations via the vapor intrusion pathway. At Site P-5A, the need for LUCs will be re-evaluated following completion of the SVE remedial action.

Because the OU 2 ROD RAO has already been met at each of the TCE sites (with the exception of Site P-5A) and no threats to the environment were identified, the decision to establish LUCs at a TCE site or designate a TCE site for no further action is based on the potential threat to human health related to the vapor intrusion pathway. To ensure protection of human health, estimated health risks in combination with several other factors should be evaluated to support environmental management decisions. These factors may include: (1) operational history; (2) remedial action (SVE) implementation, including mass removed; (3) extent of any remaining contamination, including density of sampling, sample concentration and depth, residual mass, and potential for migration to groundwater; (4) presence of a current structure, condition of the slab (e.g., presence of cracks), use of the building, and type of occupancy; and (5) presence of VOCs in any breathing space, in the sub-slab, and in deeper soil vapor. These factors should be evaluated for current and potential future land use scenarios. As described in Section 2.1.1, residual VOC soil vapor concentrations at the TCE sites at the Sharpe Site, which are not overlain by any buildings (except a small portion of Sites P-1E and P-2B), do not pose an unacceptable risk to human health in the current industrial exposure setting. Therefore, the focus of the evaluations for each TCE site is on potential future unlimited use and unrestricted exposure. As presented in Appendix A, these factors or lines of evidence are evaluated to determine whether a TCE site requires no further action or whether a TCE site requires LUCs to protect human health.

2.2.1 No Further Action

Eight TCE sites are recommended for no further action because there is no current or potential threat to human health, the environment, or groundwater quality. Table 2-1 and the site summaries in Appendix A provide the rationale supporting no further action decisions for soil at Sites P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A.

2.2.2 Land Use Controls

Intrusion of vapors originating from VOCs in subsurface media (soil or groundwater) into building interiors potentially utilized by workers or residents is an exposure pathway that was not addressed in the BRA. Evolving awareness of the potential for health risks from inhalation of VOCs and changes in inhalation slope factors have raised concerns about risks to occupants of buildings constructed atop contaminated soil and groundwater. Given that the current and anticipated future land use at the Sharpe Site is industrial, residual VOC soil vapor concentrations at the TCE sites, which are not overlain by any buildings (except a small portion of Sites P-1E and P-2B), do not pose an unacceptable risk to human health (see Section 2.1.1). However, when the selected remedy allows contaminants to be left in place at levels that do not allow for unlimited use and unrestricted exposure (e.g., residential use), LUCs are applied to ensure the selected remedies are protective of human health and the environment. The residual VOC soil vapor concentrations at eight TCE sites do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary to protect human health from the potential risk associated with inhalation of VOCs via the vapor intrusion pathway. This amendment to the OU 2 ROD adds LUCs to the remedy for eight TCE sites. Table 2-1 and the site summaries in Appendix A provide the rationale supporting the addition of LUCs for soil at Sites P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A.

Table 2-1. Status of TCE Sites, Sharpe Site

Site	Status	References
P-1A, P-1B, P-1C	SVE system operated in phases between September 1998 and December 2001 at Sites P-1A, P-1B, and P-1C. The total TCE mass removed by the SVE system was approximately 23 pounds from Site P-1A, 2.19 pounds from Site P-1B, and 15.55 pounds from Site P-1C. Vadose zone modeling of post-SVE TCE concentrations predicted that the residual mass will not pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause exceedance of the ACL), and an economic evaluation concluded that additional SVE operational costs will greatly exceed groundwater remediation costs. Therefore, no further remedial action was required at Sites P-1A, P-1B, or P-1C.	URS, 2002. *Operable Unit 2 Soil Vapor Extraction Remedial Action Report, DDJC-Sharpe*. Final. May.
	The area of the three sites is open space. Hence, there is no unacceptable risk to current industrial receptors. Estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1E-04 to 1E-06.	Appendices A and B of this ROD amendment.
	Seven post-SVE soil vapor samples had TCE concentrations greater than 350 ppbv. Residual VOC soil vapor concentrations at Sites P-1A, P-1B, and P-1C do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary at these sites to protect human health from the potential risk associated with inhalation of VOCs via the vapor intrusion pathway.	
P-1E	SVE system operated in phases between August 1998 and June 1999. The total TCE mass removed by the SVE system was 0.16 pound. Vadose zone modeling of post-SVE TCE concentrations predicted that the residual mass will not pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause exceedance of the ACL), and an economic evaluation concluded that additional SVE operational costs will greatly exceed groundwater remediation costs. Therefore, no further remedial action was required at Site P-1E.	URS, 2002. *Operable Unit 2 Soil Vapor Extraction Remedial Action Report, DDJC-Sharpe*. Final. May.
	Most of the site is open space; Building 649, a portion of which is within the site, is occupied less than one hour per day, and concentrations in soil vapor beneath the building are less than the generic industrial screening level. Hence, there is no unacceptable risk to current industrial receptors.	Appendices A and B of this ROD amendment.
	The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1E-04 to 1E-06. Any remaining TCE mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors; therefore, no further action is necessary at Site P-1E.	

Table 2-1. (Continued)

Site	Status	References
P-6A	SVE system operated in phases between July 1998 and December 2001. The total TCE mass removed by the SVE system was less than 2 pounds. Vadose zone modeling of post-SVE TCE concentrations predicted that the residual mass will not pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause exceedance of the ACL), and an economic evaluation concluded that additional SVE operational costs will greatly exceed groundwater remediation costs. Therefore, no further remedial action was required at Site P-6A.	URS, 2002. *Operable Unit 2 Soil Vapor Extraction Remedial Action Report, DDJC-Sharpe*. Final. May.
	The site is open space. Hence, there is no unacceptable risk to current industrial receptors. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1E-04 to 1E-06. Any remaining TCE mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors; therefore, no further action is necessary at Site P-6A.	Appendices A and B of this ROD amendment.
P-8A	A pilot-scale SVE system operated in 1993 and 1995. TCE concentrations in post-SVE soil vapor samples were greater than 350 ppbv, but minimal TCE mass (0.003 pound) was estimated. Vadose zone modeling predicted that the residual mass will not pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause exceedance of the ACL), and a TEFA concluded that operation of an SVE system will not provide an economically feasible alternative to ongoing groundwater extraction and treatment. Therefore, no further remedial action was required at Site P-8A.	Radian International, 2000a. *Operable Unit 2, No Further Action, Remedial Action Report*. Final. December.
	The site is open space. Hence, there is no unacceptable risk to current industrial receptors. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1E-04 to 1E-06. Any remaining VOC mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors; therefore, no further action is necessary at Site P-8A.	Appendices A and B of this ROD amendment.
P-1D, P-1F, P-4A, P-4C	TCE concentrations in post-ROD soil vapor samples were less than 350 ppbv. Therefore, there was no threat to groundwater quality, and no remedial action was required at Sites P-1D, P-1F, P-4A, or P-4C.	Radian International, 2000a. *Operable Unit 2, No Further Action, Remedial Action Report*. Final. December.
	The sites are open space. Hence, there is no unacceptable risk to current industrial receptors. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within or below the risk management range of 1E-04 to 1E-06. Any remaining VOC mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors; therefore, no further action is necessary at Sites P-1D, P-1F, P-4A, or P-4C.	Appendices A and B of this ROD amendment.

Table 2-1. (Continued)

Site	Status	References
P-3A	TCE concentrations in post-ROD soil vapor samples were greater than 350 ppbv, but minimal TCE mass (0.15 pound) was estimated. Vadose zone modeling predicted this site will not pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause exceedance of the ACL), and a TEFA concluded that operation of an SVE system will not provide an economically feasible alternative to ongoing groundwater extraction and treatment. Therefore, no remedial action was required at Site P-3A.	Radian International, 2000a. *Operable Unit 2, No Further Action, Remedial Action Report*. Final. December.
	In addition, available data do not indicate an ecological hazard to burrowing owls at Site P-3A from residual TCE concentrations in soil.	DTSC and CDFG, 2010. *Ecological Risk Evaluation for Burrowing Owls at Site P-3A*. September.
	The site is open space. Hence, there is no unacceptable risk to current industrial receptors. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1E-04 to 1E-06. Any remaining VOC mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors; therefore, no further action is necessary at Site P-3A.	Appendices A and B of this ROD amendment.
P-1G, P-2B, P-4B	TCE concentrations in post-ROD soil vapor samples were greater than 350 ppbv, but minimal TCE mass (less than 0.5 pound) was estimated for each site. Vadose zone modeling predicted these sites will not pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause exceedance of the ACL), and a TEFA concluded that operation of an SVE system will not provide an economically feasible alternative to ongoing groundwater extraction and treatment. Therefore, no remedial action was required at Sites P-1G, P-2B, and P-4B.	Radian International, 2000a. *Operable Unit 2, No Further Action, Remedial Action Report*. Final. December.
	The area of the sites is open space, except for the northern one-quarter of Site P-2B, which is covered by the AAFES warehouse. DLA Installation Support at San Joaquin collected an indoor air sample in the warehouse to ensure that employees are not being exposed to VOCs from soil vapor beneath the building; VOCs were not detected. Hence, there is no unacceptable risk to current industrial receptors at Sites P-1G, P-2B, or P-4B.	Appendices A and B of this ROD amendment.
	Estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within to greater than the risk management range of 1E-04 to 1E-06. Therefore, residual VOC soil vapor concentrations at Sites P-1G, P-2B, and P-4B do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary at these sites to protect human health from the potential risk associated with inhalation of VOCs via the vapor intrusion pathway.	

Table 2-1. (Continued)

Site	Status	References
P-2A	TCE concentrations in post-ROD soil vapor samples collected in the eastern portion of Site P-2A were greater than 350 ppbv, but minimal TCE mass (0.18 pound) was estimated. Vadose zone modeling predicted the site will not pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause exceedance of the ACL), and a TEFA concluded that operation of an SVE system will not provide an economically feasible alternative to ongoing groundwater extraction and treatment. TCE concentrations in post-ROD soil vapor samples collected in the western portion of Site P-2A were less than 350 ppbv. Therefore, no remedial action was required at Site P-2A.	Radian International, 2000a. *Operable Unit 2, No Further Action, Remedial Action Report*. Final. December. URS, 2007b. *DDJC-Sharpe Comprehensive Cone Penetrometer Investigation – Sites P-2A and P-5A Soil Vapor Sampling Results*. December. URS, 2009a. *DDJC-Sharpe Comprehensive Cone Penetrometer Testing Investigation Results Report.* October.
	The site is open space. Hence, there is no unacceptable risk to current industrial receptors. Estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1E-04 to 1E-06. However, residual VOC soil vapor concentrations at Site P-2A do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary at this site to protect human health from the potential risk associated with inhalation of VOCs via the vapor intrusion pathway.	Appendices A and B of this ROD amendment.
P-5A	Concentrations of TCE in soil vapor samples collected during investigations in 2006 and 2007 indicated a residual TCE source area is present. As of April 2010, Site P-5A is being remediated using SVE in accordance with OU 2 ROD requirements.	URS, 2007a. *DDJC-Sharpe Site P-5A Investigation Results Technical Memorandum*. February. URS, 2007b. *DDJC-Sharpe Comprehensive Cone Penetrometer Investigation – Sites P-2A and P-5A Soil Vapor Sampling Results*. December. URS, 2009a. *DDJC-Sharpe Comprehensive Cone Penetrometer Testing Investigation Results Report.* October.
	The site is open space. Hence, there is no unacceptable risk to current industrial receptors. Estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within to greater than the risk management range of 1E-04 to 1E-06. Therefore, TCE soil vapor concentrations at Site P-5A do not allow for unlimited use and unrestricted exposure; thus, LUCs are necessary at this site to protect human health from the potential risk associated with inhalation of VOCs via the vapor intrusion pathway. The need for LUCs will be re-evaluated following completion of the SVE remedial action.	Appendices A and B of this ROD amendment.

Note: The cleanup standard for TCE in soil vapor is 350 ppbv.

AAFES = Army and Air Force Exchange Service
ACL = aquifer cleanup level
CDFG = California Department of Fish and Game
DTSC = Department of Toxic Substances Control
LUC = land use control
OU = operable unit
ppbv = parts per billion by volume
ROD = record of decision
SVE = soil vapor extraction
TCE = trichloroethene
TEFA = technical and economic feasibility analysis
URS = URS Group, Inc.
VOC = volatile organic compound

The objective of the LUCs at Sites P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A is to protect human health in accordance with CERCLA by limiting human exposure to VOCs through the vapor intrusion pathway.

The LUC objective for these sites will be achieved by:

- Modifying the *Defense Distribution Depot San Joaquin Real Property Master Plan Digest* (formerly Installation Master Plan) to prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing.

- Posting appropriate signage at the eight TCE sites indicating areas of restricted land use.

- Reviewing proposed construction projects to ensure that they are consistent with the LUC objective, applicable or relevant and appropriate requirements (ARARs), and the Sharpe/Tracy Site Waste Management Plan.

- Establishing environmental restrictions at the time of real property transfer in order to publicly record LUCs.

DLA will implement, monitor, maintain, and enforce the LUCs as follows:

- The *Defense Distribution Depot San Joaquin Real Property Master Plan Digest* will be modified to include maps showing the locations of the eight TCE sites with LUCs (Figures 2 through 6 and 11 in Appendix C). The Addendum to the Real Property Master Plan Digest (Appendix C of this ROD amendment) describes the procedures that will be used to ensure that the eight TCE sites with LUCs are prohibited from development for uses such as schools, child care facilities, playgrounds, and residential housing and that signs indicating areas of restricted land use are maintained. The Addendum also refers to the DLA Installation Support at San Joaquin Environmental Office Program Manager if more information is needed. The Addendum will be incorporated into the Real Property Master Plan Digest within 90 days of the final signature on this ROD amendment. DLA will notify EPA, DTSC, and RWQCB in advance of any changes to internal procedures that affect the LUCs.

- A DLA Installation Support at San Joaquin Environmental Office Program Manager will review all proposed construction projects at the Sharpe Site and issue a record of environmental consideration (REC). If any component of a proposed project is inconsistent with the LUC objectives, the requester will be required to modify the project plans to be consistent with the LUCs. In addition, excavation and disposal of any soil associated with the eight TCE sites will comply with all ARARs, including waste characterization and disposal of the soil in accordance with the Sharpe/Tracy Site Waste Management Plan.

- DLA will address any activity that is inconsistent with the LUC objective or use restriction, or any other action that may interfere with the effectiveness of the LUCs, as soon as practicable. In no case will the process be initiated later than 10 days after the date DLA becomes aware of the inconsistency.

- DLA will notify EPA, DTSC, and RWQCB as soon as practicable, but no later than 10 days after discovery of any activity that is inconsistent with the LUC objective or use restriction, or any other action that may interfere with the effectiveness of the LUCs. Within 10 days of sending the initial notification related to the inconsistency, DLA will provide notification explaining how the inconsistency was or will be addressed.

- DLA will notify EPA, DTSC, and RWQCB at least 45 days in advance of any proposed land use change that is inconsistent with the LUC objective, any anticipated action that may disrupt or interfere with the effectiveness of the LUCs, any action that might alter or negate the need for the LUCs, or any anticipated transfer of the property subject to the LUCs.

- DLA will maintain administrative controls (e.g., review of proposed construction projects) while the LUCs are in place. The LUCs will be maintained at the eight TCE sites until concentrations of hazardous substances in the soil are at such levels that allow for unlimited use and unrestricted exposure. For example, if VOC soil vapor concentrations reported from a future investigation allow for unlimited use and unrestricted exposure (i.e., concentrations do not pose an unacceptable risk to human health associated with inhalation of VOCs through the vapor intrusion pathway), the LUCs will no longer be needed, and a memorandum to the site file will be prepared to terminate the LUCs. DLA will not modify or terminate the LUCs, implement actions, or modify land use without approval from EPA, DTSC, and RWQCB. DLA will seek prior concurrence before any anticipated action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for the LUCs.

- Monitoring of the environmental use restrictions and controls will be conducted annually by DLA. The monitoring results will be included in the Federal Facility Agreement (FFA) Annual Progress Report and provided to EPA, DTSC, and RWQCB. The Annual Progress Reports will be used in preparation of the five-year reviews to evaluate the effectiveness of the remedy. The Annual Progress Report, submitted to the regulatory agencies by DLA, will evaluate the status of the LUCs and how any LUC deficiencies or inconsistent uses have been addressed. The annual evaluation will address whether the use restrictions and controls referenced above were communicated in the deed(s) if a parcel including one of the TCE sites was sold or transferred, whether the owners and state and local agencies were notified of the use restrictions and controls affecting the property, and whether use of the property has conformed to such restrictions and controls.

- DLA will notify EPA, DTSC, and RWQCB at least six months prior to any transfer or sale of any property subject to the LUCs so that the agencies can be involved in discussions to ensure that appropriate provisions are included in the transfer terms or conveyance documents to maintain effective LUCs. If it is not possible for the facility to notify the agencies at least six months prior to any transfer or sale, then DLA will notify the agencies as soon as possible but no later than 60 days prior to transfer or sale of any property subject to LUCs. In addition to these land transfer notice and discussion provisions, DLA further agrees to provide the agencies with similar notice, within the same timeframes, for federal-to-federal transfers of property. DLA will provide a copy of the executed deed or transfer assembly to the agencies.

DLA is responsible for implementing, monitoring, maintaining, reporting on, and enforcing the identified LUCs. Although DLA may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, DLA will retain ultimate responsibility for remedy integrity. If DLA determines that it cannot meet specific LUC requirements, it is understood that the remedy may be reconsidered and that additional measures may be required to ensure the protection of human health.

Any future land use changes for property associated with the eight TCE sites requires site characterization (prior data may be used) and, at a minimum, an environmental assessment of the property in accordance with the applicable United States Department of Defense (DoD) and EPA regulations in place at the time of the change. Many decisions documented in the OU 2 ROD were based on current land use (industrial). In general, a change in land use must be evaluated to ensure that contamination left in place will not pose an unacceptable risk to human health under the new exposure scenario.

Nonclosure transfers of DoD property are guided by community input on land use, as provided for by the local government land use planning agency. In the event that no community land use plan is available at the time of property transfer, DoD will consider a range of reasonably anticipated future land uses in the transfer process. These assumptions allow the DoD (in conjunction with regulatory agencies) to determine the need for the LUCs. Environmental process requirements and restrictions (including LUCs) at installations subject to transfer are described in Title 42 United States Code §9620(h) [CERCLA §120.9(h)]. This statute establishes hazardous substance notification and deed content requirements. Title 40 Code of Federal Regulations (CFR) §373 et seq. establishes the regulatory notification and reporting requirements. DoD policy, as set forth in the Base Redevelopment and Realignment Manual (DoD, 2006), currently requires documenting the environmental condition of the property and a finding of suitability to transfer (FOST) prior to the transfer of properties subject to the NCP. In accordance with Title 22 California Code of Regulations (CCR) §67391.1(e)(1), DTSC cannot consider property owned by the federal government to be suitable for transfer to nonfederal entities where hazardous wastes/constituents/substances remain at levels that are not suitable for unrestricted land use unless appropriate land use covenants have been executed and recorded with the county of record.

If the depot is closed, DLA will implement the appropriate regulatory process and actions (e.g., legally enforceable restrictions) to ensure continued protection of human health. In addition, notification of appropriate regulatory agencies will occur at the initiation of the process.

2.3 Evaluation of Remedial Alternatives

Implementation of LUCs to protect human health constitutes a remedy. A potential remedy and a no-action alternative must undergo a comparative analysis in the context of the nine criteria specified in the NCP. The no-action alternative is evaluated to establish a baseline for the remedial alternative evaluation. The analysis is provided in the following sections.

2.3.1 Overall Protection of Human Health and the Environment

Soil vapor at the eight TCE sites contains VOCs at concentrations that pose a risk to human health if the sites were to be used for purposes such as schools, child care facilities, playgrounds, and residential housing. No threats to the environment were identified. The LUC alternative will maintain industrial use at the eight TCE sites to ensure these types of uses are not allowed in these areas and will provide a formal review process if a change in land use is proposed. The no-action alternative does not ensure a continuation of the industrial land use, nor does it provide a mechanism for regulatory review of proposed changes in land use. Both the LUC and no-action alternatives are protective of groundwater quality because residual soil vapor concentrations are not predicted to cause exceedance of the ACL. The LUC alternative ensures the overall protection of human health.

2.3.2 Compliance with Applicable or Relevant and Appropriate Requirements

The LUC alternative complies with ARARs and ensures that contaminants remaining at the eight TCE sites do not pose an unacceptable risk to human health. The no-action alternative does not ensure protection of human health and, therefore, does not comply with ARARs.

In 2003, the State of California promulgated land use covenant regulations to be executed and recorded when hazardous substances remain at a site at concentrations that are not suitable for unrestricted use of the land (22 CCR §67390.2 - 67391.1). The State of California land use covenant regulations were established after the original OU 2 ROD was executed. With the exception of the action-specific land use covenant ARAR (see Table 2-2), no new ARARs are added by this ROD amendment for the eight TCE sites.

Table 2-2. Applicable or Relevant and Appropriate Requirements for TCE Sites

Regulation	Citation	Requirement
Requirements for Land Use Covenants	California Civil Code §1471(a&e); 22 CCR §67390.2 - 67391.1	Where hazardous substances remain on site at concentrations that do not allow for unlimited use and unrestricted exposure: • California cannot concur with any decision document (e.g., ROD, RD, closure plan) that does not have LUCs or ICs for these types of properties. • For federal to nonfederal entity transfers, California will not find the site suitable for transfer unless a land use covenant is executed with the County recorder. • For federal-to-federal entity transfers, a land use covenant is not feasible. In these situations, California and the federal agency will use other methods to ensure future land use compatibility (e.g., facility master plan, MOU, MOA).

CCR = California Code of Regulations
IC = institutional control
LUC = land use control
MOA = memorandum of agreement
MOU = memorandum of understanding
RD = remedial design
ROD = record of decision
TCE = trichloroethene

2.3.3 Long-Term Effectiveness

The LUC alternative provides for the long-term effectiveness of the selected remedy as the LUCs will be maintained until the concentration of contaminants in soil vapor are at such levels that allow for unlimited use and unrestricted exposure (e.g., if VOC soil vapor concentrations reported from a future investigation allow for unlimited use and unrestricted exposure, the LUCs will no longer be needed). In the event the depot is closed and the eight TCE sites transferred, the LUCs will accompany the transfer in the form of a deed restriction or similar document. The no-action alternative does not ensure the long-term protection of human health in the absence of the LUCs.

2.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Neither the LUC alternative nor the no-action alternative includes treatment because the remaining soil vapor concentrations are protective of human health for the current industrial use scenario. Both the LUC and no-action alternatives are protective of groundwater quality because residual soil vapor concentrations are not predicted to cause exceedance of the ACL. No threats to the environment were identified.

2.3.5 Short-Term Effectiveness

Neither the LUC alternative nor the no-action alternative are expected to differ with respect to short-term effectiveness. Land use at the Sharpe Site is unlikely to change in the short term (on the order of years).

2.3.6 Implementability

Because the intention of DLA is to maintain the industrial land use at the eight TCE sites, the LUC alternative is readily implementable. The no-action alternative is also readily implementable.

2.3.7 Cost

The LUC alternative is not anticipated to incur capital costs for site management. Implementation costs associated with inspections, monitoring, and reporting are anticipated to be minor. The no-action alternative inherently does not incur cost.

2.3.8 State and Community Acceptance

The State of California accepts the LUC alternative. As the no-action alternative does not ensure the protection of human health, it is unlikely to be acceptable to the state or the community. No comments were received during the public comment period.

2.4 Selected Remedy

The LUC alternative is the selected remedy modification for eight TCE sites. This alternative will ensure the long-term protection of human health and comply with appropriate regulations.

2.5 Statutory Determination

The LUC remedy for the eight TCE sites meets the statutory requirements of CERCLA §121 (42 CFR, Chapter 103). Compliance with statutory requirements is documented in Table 2-3.

Table 2-3. Compliance Factors for the Selected Remedy for TCE Sites

Statutory Requirement	Remedy Compliance
Protection of human health and the environment	Risk associated with current land use is below carcinogenic and noncarcinogenic risk thresholds. The LUCs provide enhanced protection of human health. No threats to the environment were identified.
Compliance with ARARs	The selected remedy complies with all federal and state ARARs.
Cost effectiveness	The selected remedy is cost effective.
Use of permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable	The selected remedy uses permanent solutions to enhance the previously implemented remedial actions to the maximum extent practicable, where applicable.
Preference for treatment to reduce toxicity, mobility, or volume as a principal element	Treatment is not warranted because human exposure to the toxicity of VOCs is limited under industrial land uses, and residual soil vapor concentrations are not predicted to cause exceedance of the ACL in groundwater.
Five-year review requirements	Because the selected remedy results in hazardous substances remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to evaluate whether the remedy is protective of human health and the environment.

ACL = aquifer cleanup level
ARAR = applicable or relevant and appropriate requirement
LUC = land use control
TCE = trichloroethene
VOC = volatile organic compound

3.0 METALS SITES

Remedial investigations identified 14 areas at the Sharpe Site that had or were suspected of having total lead and/or chromium concentrations greater than the ROD cleanup standards established for these metals. The 14 areas were subsequently condensed into five sites: S-3, S-26, S-30, S-33/29, and S-36 (Figure 1-1). After the OU 2 ROD was signed, soil was sampled at the metals sites in 1996, 1998, and 1999 to determine whether contamination greater than the cleanup standards was present and, where necessary, to define the volume of soil requiring remedial action.

The sampling results and completed remedial actions, where required, are reported in the *Operable Unit 2 Pre-Design Technical Summary* (Radian International, 1997a), *Addendum to the Operable Unit 2 Pre-Design Technical Summary* (Radian International, 1997b), *Engineering Technical Memorandum Site S-33/29 Metals Investigation* (Radian International, 1999), *Operable Unit 2, No Further Action, Remedial Action Report* (Radian International, 2000a), *Operable Unit 2, Metals Remedial Action Report, Sites S-3 and S-26* (Radian International, 2000b), and *Operable Unit 2, Metals Remedial Action Report, Site S-26, Area 6* (URS, 2008).

Section 3.1 provides a summary of the site risks and the remedy selected in the OU 2 ROD for the metals sites. The investigation histories, remedial actions (where applicable), and current status for the five metals sites are summarized briefly in Section 3.1 and in more detail in Appendix A. Sections 3.2 through 3.5 provide the basis for this ROD amendment, a more thorough description of the LUC remedy, and the necessary statutory evaluations and determinations.

3.1 Site Risks, ROD Remedy, and Site Histories

3.1.1 Site Risks

Human Health Risk. The BRA for soil in OU 2, as presented in the 1994 RI/FS, was an initial evaluation of chemical contamination to indicate whether untreated conditions posed a threat to human health (ESE, 1994a). The BRA evaluated the potential exposure of on-depot workers, child and adult residents, and a child recreational (outdoor play) user to chemicals in soil through breathing of dusts and vapors, through skin contact, and through inadvertent eating or swallowing of soil particles. The residential exposure scenario was hypothetical because there were no long-term, on-depot residents, but it was used as the indicator of whether “unrestricted land use” could occur at a site. Exposure assumptions for the worker exposure scenario assumed a 70-kg adult working 250 days per year for 25 years; the resident child exposure scenario assumed a 15-kg child residing on site 350 days per year for 3 years (the then-average turnover rate for personnel stationed at the Sharpe Site); the resident adult exposure scenario assumed a 70-kg adult residing 350 days per year for 3 years; and the recreational child exposure scenario assumed a 15-kg child played on site 50 days per year for 6 years (as a high-end estimate for off-post civilians working at the installation). In addition, there were receptor-specific values for inhalation rates (for dust exposures of on-site workers) and for skin surface area and skin adherence (for dermal exposures of on-site workers, residents, and child recreational users).

As estimated using standard exposure-calculation equations and agency-approved toxicity factors, the concentrations of contaminants in soil exceeded acceptable risk levels (a cancer risk greater than one-in-one-million or 1E-06) and acceptable noncancer hazard quotient (greater than 1.0). Cumulative cancer risk estimates were as high as 1E-03 for exposure to soil-borne pesticides (on-site worker at the Zone 2a hotspot in the North Balloon) and as high as 1.4E-04 for exposure to soil-borne metals, VOCs, and polycyclic aromatic hydrocarbons (on-site worker at the South Balloon area); cumulative risk estimates at all of the soil-exposure areas were greater than 1E-06 for on-site workers. Noncancer hazard indices were as high as 43 for exposure to soil-borne pesticides (child recreational user at the Zone 2a hotspot in the

North Balloon). With the exception of the Zone 2a hotspot, most cumulative noncancer hazard indices were near or below 1 for exposures to soils (i.e., close to an acceptable noncancer hazard), except that total lead concentrations (evaluated for its effect on blood-lead levels) exceeded health-based values at all locations.

Contaminant concentrations in soil, therefore, were too high in specific areas for those areas to be considered for unrestricted land use but, if remediated, were safe for worker exposure scenarios. Based on the results of the BRA, total lead and chromium were the only contaminants present in soil at the Sharpe Site at concentrations that necessitated remedial action to protect human health and the environment[4] (ESE, 1994a). Consequently, the OU 2 ROD establishes cleanup standards for total lead (1,000 milligrams per kilogram [mg/kg]) and total chromium (300 mg/kg) to ensure that the soil at the Sharpe Site is protective of the health of on-site workers.

At the time of the BRA, the cleanup standard for total lead was confirmed as protective of an industrial adult worker based on results from the DTSC's Lead Spreadsheet Model default exposure scenarios (ESE, 1994a). This cleanup standard was also inclusive of the range of 500 mg/kg to 1,000 mg/kg, which EPA recommended as an interim cleanup standard (ESE, 1994a). The concentration of total lead that is considered health protective under commercial or industrial land use has since been revised to 800 mg/kg based on EPA's Adult Lead Model (ALM). The ALM estimates the fetal blood-lead concentration associated with occupational exposure of a mother to lead-contaminated soil. For EPA, an "acceptable level" is a soil concentration that results in a predicted 95th-percentile blood-lead concentration that does not exceed 10 micrograms of total lead per deciliter of blood. The ALM documentation provides several estimates of acceptable concentrations of total lead in soil, depending on ethnicity or national region, which range from approximately 800 mg/kg to approximately 1,370 mg/kg. The overall average acceptable concentration of total lead in soil (all ethnic groups, all regions) is predicted by the ALM to be approximately 1,200 mg/kg. The 1,000 mg/kg cleanup standard for total lead in soil at the Sharpe Site as established in the OU 2 ROD is below the average acceptable concentration and in the approximately 25th percentile of the range of results (as determined by the ALM) and is, therefore, health protective of a generally diverse population.

For total chromium, an interim cleanup standard had not been recommended by EPA at the time of the BRA. The most sensitive health-based toxicity endpoint identified in the literature for chromium was contact dermatitis. The dermatitis toxicity value for trivalent chromium was calculated to be 500 mg/kg. This value accounted for both sensitization and elicitation of the dermatitis reaction and was protective of greater than 90 percent of the population. It was not protective of the 10 percent of the population considered hypersensitive. At the request of the RWQCB, the cleanup standard for total chromium was established as 300 mg/kg, which they considered more protective of groundwater than 500 mg/kg.

The OU 2 ROD also specifies that all soils remaining in place must not have soluble lead concentrations greater than 150 µg/L or soluble chromium concentrations greater than 50 µg/L. These concentrations were determined to be protective of groundwater quality (ESE, 1996).

The Sharpe Site installation was, and continues to be, an active facility for DoD "commercial/ industrial" activities and, consequently, the OU 2 ROD cleanup standards were, and continue to be, protective of the health of on-site workers. However, the soil cleanup standards for total lead and chromium are based on industrial exposure scenarios and do not allow for unlimited use and unrestricted exposure (e.g., residential uses).

[4] The area of elevated concentrations of pesticides in the North Balloon (Zone 2a hotspot) was identified and targeted for focused removal prior to signature of the OU 2 ROD in 1996.

Ecological Risk. Similar to the TCE sites, the BRA did not evaluate the potential effects of residual concentrations of total lead and chromium at the five metals sites on burrowing owl receptors. Methods for ecological risk assessment were only just beginning to be developed at that time, and the BRA was able to assemble only a limited set of comparisons of ecological exposure and ecological toxicity data (primarily for mammals). As described in Section 2.1.1, burrowing owls occupy burrows excavated by California ground squirrels or other animals and, as a result, are subjected to subsurface environmental conditions for portions of their life cycle. As of the 2010 annual burrowing owl census, burrowing owls do not reside at any of the metals sites (Albion Environmental, Inc., 2010). However, because burrowing owls are a mobile species, EPA expressed concern that burrowing owls could occupy metals site(s) and be exposed to residual concentrations of total lead and chromium. Burrowing owls could be exposed to total lead or chromium via incidental ingestion of soil (e.g., adhering to prey or during dust baths) and via consumption of prey captured from within the metals sites.

Soil screening levels were developed based on four exposure scenarios: screening level (100 percent site use), food ingestion only (100 percent prey obtained from metals sites), 20 percent site use (20 percent prey and 100 percent soil exposure obtained from metals sites), and incidental soil ingestion-only (100 percent soil exposure from metals sites) (URS, 2011). These scenarios employed protective (i.e., conservative) assumptions to ensure potential ecological hazards are not overlooked. Residual concentrations of total lead and chromium at the metals sites represent the exposure concentrations for burrowing owls, and the soil screening levels represent the toxicity concentrations. Comparison of the site concentrations to the soil screening levels indicates whether ecological hazards might occur.

Based on these exposure scenarios that incorporated a variety of ecologically protective assumptions (e.g., overstated likelihood of site use, overstated likelihood of prey being obtained from metal-contaminated areas, use of no-effect toxicological thresholds), site concentrations of total chromium (at each of the metals sites) do not pose an ecological hazard to burrowing owls (URS, 2011).

For total lead, there are a few individual sample results at Sites S-3 and S-26 that exceed effect-based soil screening levels for three of the exposure scenarios (prey-ingestion only, 20 percent site use, or soil-ingestion only) (URS, 2011). However, most of these scenarios require assumptions that a burrowing owl would reside or forage solely within those specific sample locations, which is not a likely behavior for a burrowing owl, nor is the habitat productivity of prey items at those specific sample locations likely to be sufficient to fuel the nutritive needs of a burrowing owl. A few isolated locations of elevated concentrations of total lead in soil do not represent a reasonable exposure area for a mobile individual, nor for a population. The exposure to toxicity ratio comparisons were used as a line of evidence to determine whether a metals site requires no further action or whether a metals site requires LUCs to protect burrowing owls.

3.1.2 ROD Remedy

The remedial action selected in the OU 2 ROD for soil sites with concentrations of total lead or chromium greater than the cleanup standards is excavation and off-site disposal. The RAO for metals-contaminated soil sites is to remove soil with concentrations of total lead and chromium that could pose a threat to on-site adult workers (ESE, 1996). As specified in Section 9.1.3 of the OU 2 ROD, the maximum depth of the excavation would be 2 feet, which represents a depth by which humans could be expected to come into contact with soils. The OU 2 ROD remedy for total lead- or chromium-contaminated soils specifies the following activities:

- Collect additional samples to delineate soils contaminated with total lead or chromium at concentrations exceeding the following cleanup standards:

  - Total lead greater than 1,000 mg/kg (800 mg/kg for Area 6, Site S-26 [URS, 2005]) and
  - Total chromium greater than 300 mg/kg.
- Remove existing pavement, concrete, and light brush at locations with soils contaminated with total lead and chromium at concentrations exceeding cleanup standards.
- Excavate soils within 2 feet of the existing ground surface that exceed cleanup standards.
- Analyze excavated soils to determine if any soils are hazardous by toxicity characteristic.
  - If any portion of soils is determined to be hazardous by toxicity characteristic, transport the soils to an appropriately permitted Class I landfill.
  - Soils that are not found to be hazardous will be disposed of as construction debris in an appropriately permitted Class II landfill.
- Complete confirmation sampling to ensure that soils with total lead and chromium concentrations exceeding cleanup standards have been removed within 2 feet of the existing ground surface.
  - As a part of confirmation sampling, perform metals analyses using deionized water waste extraction test (DI-WET) to determine the concentrations of soluble metals left in place and to evaluate the impact or threat of impact to groundwater from the residual total lead and chromium in the vadose zone.
  - If the DI-WET analysis reports samples with total lead at concentrations greater than 150 µg/L and/or total chromium at concentrations greater than 50 µg/L, then DLA Installation Support at San Joaquin will perform an attenuation study.
  - If the soils attenuation study shows the residual soil concentrations threaten to impact water quality above the maximum contaminant levels (MCLs), then DLA Installation Support at San Joaquin, EPA, DTSC, and RWQCB will determine the need for any additional characterization or remedial actions and modify the OU 2 ROD, if necessary.
- Return the site to the existing grade by backfilling the excavation with clean fill.
- Complete a groundwater statistical analysis to be included as part of the annual groundwater monitoring report to determine if groundwater has been statistically impacted at levels above background or above MCLs.
  - The groundwater monitoring plan will specify the frequency, location, and duration of metals analysis.
  - If the annual groundwater statistical analysis identifies a statistically significant impact to water quality above the conditions that exist at the time of signature of this ROD, then DLA, EPA, DTSC, and RWQCB will determine the need for any additional action (may include continued monitoring, groundwater data trend analysis, soil sampling, or additional remedial actions) and modify the OU 2 ROD, if necessary.

3.1.3 Site Histories

Sites S-30, S-33/29, and S-36. Waste (sludge) from paint stripping operations historically was disposed of and mixed into surface soil in the South Balloon (Sites S-30 and S-36) (ESE, 1994b). In addition, metals contamination was suspected from wastes disposed into burial trenches and/or burn pits in the

South Balloon (Sites S-30, S-33/29, and S-36). During the RI, analysis of soil using x-ray fluorescence at Sites S-30, S-33/29, and S-36 identified concentrations of total lead and/or chromium greater than the cleanup standards. However, neither total lead nor chromium was reported at concentrations greater than the cleanup standards in post-ROD confirmation soil samples collected at these three sites in 1996, 1998 (S-33/29 only), and 1999 (S-30 and S-36 only). In addition, with two exceptions, all DI-WET extraction results indicated that soluble concentrations of lead and chromium did not exceed their 150 µg/L and 50 µg/L action levels, respectively. At Sites S-33/29 and S-36, soluble chromium concentrations were reported in one sample at each site slightly above the 50 µg/L action level (50.8 and 51 µg/L, respectively). No remedial action was required at Sites S-30, S-33/29, and S-36 (Radian International, 2000a). See Appendix A for a more detailed summary of the investigation history and total lead and chromium concentration data at each site.

Site S-3. The historical record for Site S-3 indicates that it included the operation of a spray paint booth. The use of the booth and potential improper disposal of painting materials and waste are believed to have resulted in soil contamination at this site. During the RI, this area was identified as having total lead and chromium concentrations greater than the cleanup standards. Additional sampling at Site S-3 occurred in 1996 after the OU 2 ROD was signed. The purpose of this sampling was to confirm the limits of the anticipated excavation of soil. Six locations were sampled, including one soil boring and five surface scrapes. Soil samples were collected at three different depths from the soil boring. All of the samples were analyzed for total and soluble lead and chromium. None of the samples collected from the soil boring had concentrations of lead or chromium greater than either the cleanup standards or soluble action levels. Concentrations of total chromium at one surface scrape location exceeded both the cleanup standard and soluble action level, and the concentration of total lead at one other surface scrape exceeded the cleanup standard. Based on the results of this sampling event and the prior events, the areal extent of the excavation was estimated to be approximately 9,530 square feet.

In 1998, soil from Site S-3 was excavated in accordance with the OU 2 ROD remedy. Based on their location relative to the designed extent of the excavation, “floor” and “wall” samples were collected and analyzed to ensure that all soil with concentrations of total lead and/or chromium greater than cleanup standards was excavated. All total lead and chromium concentrations in the floor and wall samples were less than cleanup standards. The extent of the excavation at Site S-3 was the same as predetermined in the final design. The results for soluble lead and chromium did not exceed the soluble action levels from analyses of DI-WET extract of samples collected from below the excavation limits. Therefore, the remedial action at Site S-3 was completed in accordance with the OU 2 ROD, and no further remedial action was required (Radian International, 2000b). See Appendix A for more information on the investigation and remedial action history and residual concentration data at Site S-3.

Site S-26. Historical dumping of sandblasting waste from nearby buildings was probably the cause of soil contamination at Site S-26. During the RI, this area was identified as having total lead and chromium concentrations in soil greater than the cleanup standards. Therefore, in accordance with the OU 2 ROD, excavation and off-site disposal of contaminated soils was required.

After the OU 2 ROD was signed in 1996, additional sampling at Site S-26 was conducted to determine the excavation boundaries. Eleven locations were sampled, including one soil boring and 10 surface scrapes. Soil samples were collected at three different depths from the soil boring. All of the samples were analyzed for total and soluble lead and chromium. None of the samples collected from the soil boring had concentrations of lead or chromium greater than either the cleanup standards or soluble action levels. Concentrations of total chromium at one of the surface scrapes exceeded the cleanup standard and soluble action level; the concentration of total chromium at a second surface scrape exceeded the soluble action level; and concentrations of total lead at three other surface scrape locations exceeded the cleanup standard. Three additional surface scrapes were collected in 1997 to meet requirements specified in the

OU 2 ROD (i.e., collect samples at three specific RI locations). None of the surface scrape samples had concentrations of lead or chromium greater than either the cleanup standards or soluble action levels.

Based on the results of the 1996 and 1997 sampling events and prior events, six distinct areas of soil contamination exceeding cleanup standards were identified, and the areal extent of the excavation was estimated at 27,429 square feet. One of the distinct areas (Area 6) was within a railroad track easement on the depot and was not planned for excavation with the other areas due to the low risk to human health and groundwater and the high cost of removing and replacing the railroad tracks.

In 1998, soil from five of the six areas within Site S-26 was excavated in accordance with the OU 2 ROD remedy. Based on their location relative to the designed extent of the excavation, “floor” and “wall” samples were collected and analyzed to ensure that all soil with concentrations of total lead and/or chromium greater than cleanup standards was excavated. Initial sample results indicated that some areas required additional excavation. Therefore, the extent of the excavation at Site S-26 was greater than the predetermined excavation limits. All total lead and chromium concentrations in the floor and wall samples were less than cleanup standards at the final excavation limits. The results for soluble lead and chromium did not exceed the soluble action levels from analyses of DI-WET extract of samples collected from below the excavation limits.

Area 6 of Site S-26 was remediated in 2006 in accordance with the OU 2 ROD remedy. The remedial project managers (RPMs) agreed to remove soil at Area 6 that contained concentrations of total lead greater than 800 mg/kg instead of the 1,000 mg/kg cleanup standard established in the OU 2 ROD (URS, 2005). Following excavation, confirmation floor and wall samples were collected and analyzed for total and soluble lead and chromium. All results were less than the cleanup standards and soluble action levels except for one sidewall sample, which had a leachable lead concentration of 613 µg/L (at 1 foot bgs). One follow-up attenuation sample was collected in January 2007 at 2 feet bgs, and the sample concentrations were less than the cleanup standards and soluble action levels (URS, 2008).

The remedial action for Site S-26 was completed in accordance with the OU 2 ROD, and no further remedial action was required (Radian International, 2000b; URS, 2008). See Appendix A for more information on the investigation and remedial action history and residual concentration data at Site S-26.

Groundwater. The OU 2 ROD required monitoring metals concentrations in groundwater relative to those that existed at the time the OU 2 ROD was signed (i.e., baseline conditions) and determining whether the changes are statistically significant (ESE, 1996). In accordance with the OU 2 ROD, baseline concentrations were established as the concentration for each well at the time the OU 2 ROD was signed in 1996 (first quarter). For wells not sampled during the first quarter of 1996, baseline concentrations were those measured in the next quarter during which a sample was collected.

As directed in the OU 2 ROD, baseline concentrations of total chromium were established in areas where groundwater could potentially be affected by chromium leaching from contaminated soil (ESE, 1996). As monitoring wells were sampled for total chromium, the concentrations were compared with these baseline concentrations to identify any statistically significant increases. Samples for total chromium analysis were collected from 1996 through 2006. No statistically significant increasing concentration trends were identified for total chromium, and there was no evidence of one or more total chromium plumes migrating from metals source areas. An ACL for total chromium was not established, and groundwater sampling for total chromium analysis was discontinued in 2007 with concurrence from the RPMs (URS, 2007c).

Groundwater beneath the Sharpe Site has not been contaminated by lead from soil. Total lead was reported in only 10 monitoring well samples collected in 1996 and 1997 and in only 2 samples collected from 1998 through 2000. There were too few detections to perform a statistical trend analysis, and an

ACL for total lead was not established. Groundwater sampling for total lead analysis was discontinued in 2001 with concurrence from the RPMs (URS, 2001). See Appendix A for more information on total lead and chromium groundwater sample results at each metals site.

3.2 Basis for Amendment

Because the total lead and chromium cleanup standards for metals sites do not allow for unlimited use and unrestricted exposure, LUCs at the five metals sites (S-3, S-26, S-30, S-33/29, and S-36) are required to protect human health, and monitoring at two of the metals sites (S-3 and S-26) is required to protect ecological receptors, specifically burrowing owls.

3.2.1 Land Use Controls for Protection of Human Health

Soluble metals testing and groundwater monitoring data indicate that the metals sites do not pose a risk to groundwater quality, and given the current and anticipated future industrial land use, the contaminants at the sites do not pose an unacceptable risk to human health. The BRA assumed continued industrial use at the depot and did not account for changes in land use (ESE, 1994a). Because the current and anticipated future use of the depot is industrial, the remedial decision for the metals sites was based on an industrial land use, not based on an unrestricted land use (e.g., residential).

Future land use assumptions are developed and considered when performing a risk assessment, developing remedial action alternatives, and selecting a remedy. When the selected remedy allows contaminants to be left in place at levels that do not allow for unlimited use and unrestricted exposure, LUCs are applied to ensure the selected remedies are protective of human health and the environment. This amendment to the OU 2 ROD adds LUCs to the remedy for the five metals sites.

The objective of the LUCs at Sites S-3, S-26, S-30, S-33/29, and S-36 is to protect human health in accordance with CERCLA by limiting human exposure to residual metals contamination in soil at concentrations that do not allow for unlimited use and unrestricted exposure.

The LUC objective for these sites will be achieved by:

- Modifying the *Defense Distribution Depot San Joaquin Real Property Master Plan Digest* (formerly Installation Master Plan) to prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing.

- Posting appropriate signage at the five metals sites indicating areas of restricted land use.

- Reviewing proposed construction projects to ensure that they are consistent with the LUC objective, ARARs, and the Sharpe/Tracy Site Waste Management Plan.

- Establishing environmental restrictions at the time of real property transfer in order to publicly record LUCs.

DLA will implement, monitor, maintain, and enforce the LUCs as follows:

- The *Defense Distribution Depot San Joaquin Real Property Master Plan Digest* will be modified to include maps showing the locations of the five metals sites with LUCs (Figures 7 through 11 in Appendix C). The Addendum to the Real Property Master Plan Digest (Appendix C of this ROD amendment) describes the procedures that will be used to ensure that the five metals sites with LUCs are prohibited from development for uses such as schools, child care facilities, playgrounds, and

residential housing and that signs indicating areas of restricted land use are maintained. The Addendum also refers to the DLA Installation Support at San Joaquin Environmental Office Program Manager if more information is needed. The Addendum will be incorporated into the Real Property Master Plan Digest within 90 days of the final signature on this ROD amendment. DLA will notify EPA, DTSC, and RWQCB in advance of any changes to internal procedures that affect the LUCs.

- A DLA Installation Support at San Joaquin Environmental Office Program Manager will review all proposed construction projects at the Sharpe Site and issue a REC. If any component of a proposed project is inconsistent with the LUC objective, the requester will be required to modify the project plans to be consistent with the LUCs. In addition, excavation and disposal of any soil associated with the metals sites will comply with all ARARs, including waste characterization and disposal of the soil in accordance with the Sharpe/Tracy Site Waste Management Plan.

- DLA will address any activity that is inconsistent with the LUC objective or use restriction, or any other action that may interfere with the effectiveness of the LUCs, as soon as practicable. In no case will the process be initiated later than 10 days after the date DLA becomes aware of the inconsistency.

- DLA will notify EPA, DTSC, and RWQCB as soon as practicable, but no later than 10 days after discovery of any activity that is inconsistent with the LUC objective or use restriction, or any other action that may interfere with the effectiveness of the LUCs. Within 10 days of sending the initial notification related to the inconsistency, DLA will provide notification explaining how the inconsistency has or will be addressed.

- DLA will notify EPA, DTSC, and RWQCB at least 45 days in advance of any proposed land use change that is inconsistent with the LUC objective, any anticipated action that may disrupt or interfere with the effectiveness of the LUCs, any action that might alter or negate the need for the LUCs, or any anticipated transfer of the property subject to the LUCs.

- DLA will maintain administrative controls (e.g., review of proposed construction projects) while the LUCs are in place. The LUCs will be maintained at the metals sites until the concentrations of hazardous substances in soil are at such levels that allow for unlimited use and unrestricted exposure. For example, if a future action results in cleanup to unlimited use and unrestricted exposure levels or if the metals concentrations reported from a future investigation allow for unlimited use and unrestricted exposure (i.e., concentrations do not pose an unacceptable risk to human health), the LUCs will no longer be needed, and a memorandum to the site file will be prepared to terminate the LUCs. DLA will not modify or terminate the LUCs, implement actions, or modify land use without approval from EPA, DTSC, and RWQCB. DLA will seek prior concurrence before any anticipated action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for the LUCs.

- Monitoring of the environmental use restrictions and controls will be conducted annually by DLA. The monitoring results will be included in the FFA Annual Progress Report and provided to EPA, DTSC, and RWQCB. The Annual Progress Reports will be used in preparation of the five-year reviews to evaluate the effectiveness of the remedy. The Annual Progress Report, submitted to the regulatory agencies by DLA, will evaluate the status of the LUCs and how any LUC deficiencies or inconsistent uses have been addressed. The annual evaluation will address whether the use restrictions and controls referenced above were communicated in the deed(s) if a parcel including one of the metals sites was sold or transferred, whether the owners and state and local agencies were notified of the use restrictions and controls affecting the property, and whether use of the property has conformed to such restrictions and controls.

- DLA will notify EPA, DTSC, and RWQCB at least six months prior to any transfer or sale of any property subject to the LUCs so that the agencies can be involved in discussions to ensure that appropriate provisions are included in the transfer terms or conveyance documents to maintain effective LUCs. If it is not possible for the facility to notify the agencies at least six months prior to any transfer or sale, then DLA will notify the agencies as soon as possible but no later than 60 days prior to transfer or sale of any property subject to LUCs. In addition to these land transfer notice and discussion provisions, DLA further agrees to provide the agencies with similar notice, within the same timeframes, for federal-to-federal transfers of property. DLA will provide a copy of the executed deed or transfer assembly to the agencies.

DLA is responsible for implementing, monitoring, maintaining, reporting on, and enforcing the identified LUCs. Although DLA may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, DLA will retain ultimate responsibility for remedy integrity. If DLA determines that it cannot meet specific LUC requirements, it is understood that the remedy may be reconsidered and that additional measures may be required to ensure the protection of human health.

Any future land use changes for property associated with the metals sites requires site characterization (prior data may be used) and, at a minimum, an environmental assessment of the property in accordance with the applicable DoD and EPA regulations in place at the time of the change. Many decisions documented in the OU 2 ROD were based on current land use (industrial). In general, a change in land use must be evaluated to ensure that contamination left in place will not pose an unacceptable risk to human health or the environment under the new exposure scenario.

Nonclosure transfers of DoD property are guided by community input on land use, as provided for by the local government land use planning agency. In the event that no community land use plan is available at the time of property transfer, DoD will consider a range of reasonably anticipated future land uses in the transfer process. These assumptions allow the DoD (in conjunction with regulatory agencies) to determine the need for the LUCs. Environmental process requirements and restrictions (including LUCs) at installations subject to transfer are described in Title 42 United States Code §9620(h) [CERCLA §120.9(h)]. This statute establishes hazardous substance notification and deed content requirements. Title 40 CFR §373 et seq. establishes the regulatory notification and reporting requirements. DoD policy, as set forth in the Base Redevelopment and Realignment Manual (DoD, 2006), currently requires documenting the environmental condition of the property and a FOST prior to the transfer of properties subject to the NCP. In accordance with Title 22 CCR §67391.1(e)(1), DTSC cannot consider property owned by the federal government to be suitable for transfer to nonfederal entities where hazardous wastes/constituents/ substances remain at levels that are not suitable for unrestricted land use unless appropriate land use covenants have been executed and recorded with the county of record.

If the depot is closed, DLA will implement the appropriate regulatory process and actions (e.g., legally enforceable restrictions) to ensure continued protection of human health and the environment. In addition, notification of appropriate regulatory agencies will occur at the initiation of the process.

3.2.2 Monitoring for Protection of Burrowing Owls

As discussed in Section 3.1.1, the BRA did not evaluate the potential effects of residual concentrations of lead and chromium at the five metals sites on burrowing owl receptors. Since the publication of the proposed plan for this ROD amendment, the risk to burrowing owls was evaluated in the *Ecological Risk Evaluation of Burrowing Owls at the Metals Sites, Defense Distribution Depot San Joaquin – Sharpe Site* (URS, 2011). The ecological risk evaluation concluded that concentrations of total lead at a few individual sample locations at Sites S-3 and S-26 exceed effect-based soil screening levels for three site-

specific scenarios. Consequently, this ROD amendment adds annual monitoring to the remedy for Sites S-3 and S-26 as a post-proposed plan minor change. Per the EPA guidance for preparation of RODs and other decision documents, minor changes are those that have little or no impact on the overall scope, performance, or cost of the alternative originally presented in the proposed plan as the preferred alternative (EPA, 1999).

The objective of the monitoring at Sites S-3 and S-26 is to protect the environment in accordance with CERCLA by limiting exposure of burrowing owls to residual metals contamination in soil at concentrations that do not allow for unlimited use and unrestricted exposure.

The monitoring objective for Sites S-3 and S-26 will be achieved by:

- Ensuring burrowing owls do not inhabit Site S-3 or Site S-26.

- Updating the *Burrowing Owl Management Plan* (Albion Environmental, Inc., 1997) to incorporate the requirements of this ROD amendment.

DLA will implement, maintain, and enforce the monitoring as follows:

- DLA will update the *Burrowing Owl Management Plan* to include maps showing the locations of Sites S-3 and S-26 and to describe the procedures that will be used to ensure burrowing owls do not inhabit these sites. The *Burrowing Owl Management Plan* will also be updated to refer to the DLA Installation Support at San Joaquin Environmental Office Program Manager if more information is needed. DLA will notify EPA, DTSC, and RWQCB in advance of any changes to internal procedures that affect the monitoring requirements.

- DLA will conduct visual inspections annually at Sites S-3 and S-26 during the non-breeding season (September through January). If burrows or burrowing owls are observed at Site S-3 or Site S-26 during the annual inspections, DLA will passively relocate the burrowing owls and collapse the burrows during the non-breeding season in accordance with the management recommendations outlined in the *Burrowing Owl Management Plan* and subsequent updates. These actions comply with CDFG codes §3503.5 and §3513 and the Migratory Bird Treaty Act.

- DLA will include the monitoring results in the FFA Annual Progress Report and provide the report to EPA, DTSC, and RWQCB. The Annual Progress Reports will be used in preparation of the five-year reviews to evaluate the effectiveness of the remedy. The Annual Progress Report, submitted to the regulatory agencies by DLA, will evaluate the status of the monitoring and how any deficiencies or inconsistencies in the monitoring or actions taken to protect burrowing owls have been addressed.

- Monitoring will be required at Sites S-3 and S-26 until the concentrations of hazardous substances in soil are at such levels that allow for unlimited use and unrestricted exposure by burrowing owls. For example, if a future action results in cleanup to unlimited use and unrestricted exposure levels or if the metals concentrations reported from a future investigation allow for unlimited use and unrestricted exposure (i.e., concentrations do not pose an unacceptable risk to burrowing owls), the monitoring will no longer be needed, and a memorandum to the site file will be prepared to terminate the monitoring. DLA will not modify or terminate the monitoring, implement actions, or modify land use without approval from EPA, DTSC, and RWQCB. DLA will seek prior concurrence before any anticipated action that may disrupt the effectiveness of the monitoring or any action that may alter or negate the need for the monitoring.

DLA is responsible for implementing, maintaining, reporting on, and enforcing the monitoring requirements at Sites S-3 and S-26, as well as the relevant notification requirements to the regulatory agencies outlined in Section 3.2.1 for reporting monitoring deficiencies or inconsistencies, land use changes, or property transfers. Although DLA may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, DLA will retain ultimate responsibility for remedy integrity. If DLA determines that it cannot meet specific monitoring requirements, it is understood that the remedy may be reconsidered and that additional measures may be required to ensure the protection of burrowing owls at Sites S-3 and S-26.

3.3 Evaluation of Remedial Alternatives

Implementation of LUCs to protect human health and monitoring to protect the environment constitutes a remedy. A potential remedy and a no-action alternative must undergo a comparative analysis in the context of the nine criteria specified in the NCP. The no-action alternative is evaluated to establish a baseline for the remedial alternative evaluation. The analysis is provided in the following sections.

3.3.1 Overall Protection of Human Health and the Environment

Soil at the metals sites contains total lead and/or chromium at concentrations that pose a risk to human health, if the sites were to be used for purposes such as schools, child care facilities, playgrounds, and residential housing, and to the environment, if Sites S-3 and S-26 were to become occupied by burrowing owls. Total lead and chromium were evaluated in a human health risk assessment, which concluded that there will not be a health risk to on-site worker receptors, if the land remains in industrial use (ESE, 1994a). Total lead and chromium were also evaluated in an ecological risk assessment, which concluded that concentrations of total lead at a few individual sample locations at Sites S-3 and S-26 exceed effect-based soil screening levels (URS, 2011). The LUC alternative will maintain industrial use of the metals sites to ensure development for uses such as schools, child care facilities, playgrounds, and residential housing are not allowed in these areas and will provide a formal review process if a change in land use is proposed. In addition, annual monitoring will ensure that burrowing owls do not inhabit Site S-3 or Site S-26. The no-action alternative does not ensure a continuation of the industrial land use, does not provide a mechanism for regulatory review of proposed changes in land use, and does not ensure that burrowing owls do not inhabit Site S-3 or Site S-26. However, both alternatives are protective of groundwater quality because the residual soil concentrations are less than the soluble action levels. The LUC and monitoring for burrowing owls alternative ensures the overall protection of human health and the environment.

3.3.2 Compliance with Applicable or Relevant and Appropriate Requirements

The LUC for the five metals sites and monitoring for burrowing owls at Sites S-3 and S-26 alternative complies with ARARs and ensures that contaminants remaining on the sites do not pose an unacceptable risk to human health and the environment. The no-action alternative does not ensure protection of human health and the environment and, therefore, does not comply with ARARs.

Action- and location-specific ARARs identified for the LUC and monitoring for burrowing owls alternative are presented in Table 3-1. In 2003, the State of California promulgated land use covenant regulations to be executed and recorded when hazardous substances remain at a site at concentrations that are not suitable for unrestricted use of the land (22 CCR §67390.2 - 67391.1). The State of California land use covenant regulations were established after the original OU 2 ROD was executed.

Burrowing owls are protected by California Fish and Game Codes §3513 and §3503.5, which make it unlawful to take or harm individual owls or their nests or eggs. The federal Migratory Bird Treaty Act of

1918, as amended, also makes the take, possession, purchase or bartering of any burrowing owl, their nests or eggs, unlawful. While these regulations provide protection to burrowing owls, their nests and eggs, their foraging habitat is not formally protected by state or federal regulations.

Table 3-1. Applicable or Relevant and Appropriate Requirements for Metals Sites

Regulation	Citation	Requirement
Action-Specific ARAR		
Requirements for Land Use Covenants	California Civil Code §1471(a&e); 22 CCR §67390.2 - 67391.1	Where hazardous substances remain on site at concentrations that do not allow for unlimited use and unrestricted exposure: • California cannot concur with any decision document (e.g., ROD, RD, closure plan) that does not have LUCs or ICs for these types of properties. • For federal to nonfederal entity transfers, California will not find the site suitable for transfer unless a land use covenant is executed with the County recorder. • For federal-to-federal entity transfers, a land use covenant is not feasible. In these situations, California and the federal agency will use other methods to ensure future land use compatibility (e.g., facility master plan, MOU, MOA).
Location-Specific ARAR		
Migratory Bird Treaty Act	16 United States Code §703	Except as permitted by regulations, it is unlawful to pursue, hunt, take, capture, possess, offer to sell, barter, purchase, or deliver any migratory bird, nest, or egg.
Migratory Nongame Birds	California Fish and Game Code §3513	Except as permitted by regulations, it is unlawful to take or possess any migratory nongame bird, or any part of such migratory nongame bird, as designated in the Migratory Bird Treaty Act.
Birds-of-Prey	California Fish and Game Code §3503.5	Except as permitted by regulations, it is unlawful to take, possess, or destroy any birds-of-prey or their nests or eggs.

ARAR = Applicable or Relevant and Appropriate Requirements
CCR = California Code of Regulations
IC = institutional control
LUC = land use control
MOA = memorandum of agreement
MOU = memorandum of understanding
RD = remedial design
ROD = record of decision

3.3.3 Long-Term Effectiveness

The LUC for the five metals sites and monitoring for burrowing owls at Sites S-3 and S-26 alternative provides for the long-term effectiveness of the selected remedy, as the LUCs and monitoring will be maintained until the concentration of contaminants in soil are at such levels that allow for unlimited use and unrestricted exposure (e.g., if a future action resulted in cleanup to unlimited use and unrestricted exposure levels or if the metals concentrations reported from a future investigation allow for unlimited use and unrestricted exposure, the LUCs and monitoring for burrowing owls will no longer be needed). In the event the depot is closed and the metals sites transferred, the LUCs and monitoring will accompany the transfer in the form of a deed restriction or similar document. The no-action alternative does not ensure the long-term protection of human health and the environment.

3.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Neither the LUC for the five metals sites and monitoring for burrowing owls at Sites S-3 and S-26 alternative nor the no-action alternative includes treatment because the remaining soil concentrations are protective of human health for the current industrial use scenario, and no burrowing owls reside at Site S-3 or Site S-26. The soluble concentrations are less than the action levels and, are therefore, protective of groundwater quality.

3.3.5 Short-Term Effectiveness

Neither the LUC for the five metals sites and monitoring for burrowing owls at Sites S-3 and S-26 alternative nor the no-action alternative are expected to differ with respect to short-term effectiveness. Land use at the Sharpe Site is unlikely to change in the short term (on the order of years).

3.3.6 Implementability

Because the intention of DLA is to maintain the industrial land use at the metals sites and no burrowing owls reside at Site S-3 or Site S-26, the LUC and monitoring alternative is readily implementable. The no-action alternative is also readily implementable.

3.3.7 Cost

The LUC for the five metals sites and monitoring for burrowing owls at Sites S-3 and S-26 alternative is not anticipated to incur capital costs for site management. Implementation costs associated with inspections, monitoring, and reporting are anticipated to be minor. The no-action alternative inherently does not incur cost.

3.3.8 State and Community Acceptance

The State of California accepts the LUC for the five metals sites and monitoring for burrowing owls at Sites S-3 and S-26 alternative. As the no-action alternative does not ensure the protection of human health and the environment, it is unlikely to be acceptable to the state or the community. No comments were received during the public comment period on the LUC alternative. Annual monitoring to ensure burrowing owls do not inhabit Sites S-3 and S-26 was added to the alternative after publication of the proposed plan and is considered a minor change per the EPA guidance for preparation of RODs and other decision documents (EPA, 1999).

3.4 Selected Remedy

The LUC for the five metals sites and monitoring for burrowing owls at Sites S-3 and S-26 alternative is the selected remedy modification for the metals sites. This alternative will ensure the long-term protection of human health and the environment and comply with appropriate regulations.

3.5 Statutory Determination

The LUC for the five metals sites and monitoring for burrowing owls at Sites S-3 and S-26 remedy meets the statutory requirements of CERCLA §121 (42 CFR, Chapter 103). Compliance with statutory requirements is documented in Table 3-2.

Table 3-2. Compliance Factors for the Selected Remedy for Metals Sites

Statutory Requirement	Remedy Compliance
Protection of human health and the environment	Risk associated with current land use is below carcinogenic and noncarcinogenic risk thresholds. At a few individual sample locations at Sites S-3 and S-26, concentrations of total lead exceed effect-based soil screening levels. The LUCs and monitoring for burrowing owls provide enhanced protection of human health and the environment.
Compliance with ARARs	The selected remedy complies with all federal and state ARARs.
Cost effectiveness	The selected remedy is cost effective.
Use of permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable	The selected remedy uses permanent solutions to enhance the previously implemented contaminant removal actions to the maximum extent practicable.
Preference for treatment to reduce toxicity, mobility, or volume as a principal element	Treatment is not warranted because human exposure to the toxicity of metals is limited under industrial land uses; no burrowing owls reside at Site S-3 or Site S-26; and the threat of metals migration to groundwater is unlikely.
Five-year review requirements	Because the selected remedy results in hazardous substances remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to evaluate whether the remedy is protective of human health and the environment.

ARAR = applicable or relevant and appropriate requirement
LUC = land use control

4.0 REGULATORY AGENCY COMMENTS

Comments received from EPA and the State of California regulatory agencies on the draft and draft final ROD amendment are addressed and incorporated, as warranted, in this final ROD amendment. Responses to comments received are included in Appendix D.

This page intentionally left blank

5.0 PUBLIC PARTICIPATION COMPLIANCE

This ROD amendment is a contributory document to the site's Administrative Record and was developed in accordance with applicable federal and state laws, regulations, and codes, including CERCLA, as amended, and, to the extent practicable, the NCP.

The preparation, publication, and presentation of a proposed plan are central components of complying with public participation requirements of CERCLA. The approved final proposed plan for this ROD amendment is included in Appendix E.

The notice of the availability of the proposed plan was published in the *Stockton Record* and *Manteca Bulletin* on 3 March and 12 March 2009, *Tracy Press* on 4 March and 11 March 2009, and *Vida en el Valle* the weeks of 2 March and 9 March 2009. The notice identified a public comment period from 4 March 2009 through 9 April 2009, and publicized the public meeting to be held on 19 March 2009 in Lathrop, California, to present a summary of the proposed plan and host a discussion on the remedial alternatives with a community audience. At the public meeting, representatives from DLA Installation Support at San Joaquin, EPA, and RWQCB were present to answer questions from the community about the proposed changes to the OU 2 ROD.

Comments were not received from the public during the public comment period; therefore, a responsiveness summary was not prepared.

This page intentionally left blank

6.0 REFERENCES

Albion Environmental, Inc., 1997. *Burrowing Owl Management Plan, Sharpe Depot*. November.

Albion Environmental, Inc., 2009. 2009 *Annual Burrowing Owl Breeding Season Census at Sharpe Depot.* August.

Albion Environmental, Inc., 2010. 2010 *Annual Burrowing Owl Breeding Season Census at Sharpe Depot.* September.

CKY Incorporated Environmental Services (CKY), 1995. *Contaminated Soil Removal at Pesticide Mix Area, Sharpe Facility, Lathrop, California.* Final. May.

CKY, 1996. *Addendum to Final Report, Contaminated Soil Removal at Pesticide Mix Area, Sharpe Facility, Lathrop, California.* October.

California Department of Toxic Substances Control (DTSC), 2005. *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*. Interim Final. Prepared by Department of Toxic Substances Control, California Environmental Protection Agency, Sacramento, CA. February. Online information: http://www.dtsc.ca.gov/AssessingRisk/upload/HERD_POL_Eval_Subsurface_Vapor_Intrusion_interim_final.pdf (last accessed February 2010).

DTSC, 2009. "HERD_Soil_Gas_Screening_Model_2009rev.xls". Prepared by DTSC's Human and Ecological Risk Division as a modification of United States Environmental Protection Agency's Johnson and Ettinger model of vapor intrusion. February. Online information: http://www.dtsc.ca.gov/AssessingRisk/upload/HERD_Soil_Gas_Screening_Model_2009rev.xls (last accessed February 2010).

DTSC and California Department of Fish and Game, 2010. *Ecological Risk Evaluation for Burrowing Owls at Site P-3A*. September.

Department of Defense, 2006. *Base Redevelopment and Realignment Manual* (DoD 4165.66-M). March.

Environmental Science and Engineering, Inc. (ESE), 1993. *Remedial Investigation/Feasibility Study at DDRW-Sharpe Site, Record of Decision, Operable Unit 1*. Final. January.

ESE, 1994a. *Remedial Investigation/Feasibility Study at Sharpe Site: Soils Risk Assessment Report*. Final. December.

ESE, 1994b. *Remedial Investigation/Feasibility Study at Sharpe Site: Soils Feasibility Study Report*. Final. December.

ESE, 1996. *Record of Decision, Basewide Remedy for DDRW-Sharpe Site*. Final. February.

Gallegos, P., J. Lutz, J. Markwiese, R. Ryti, and R. Mirenda, 2007. Wildlife ecological screening levels for inhalation of volatile organic chemicals. *Environ.Toxicol.Chem.* 26:1299–1303.

Johnson, P.C. and R.A. Ettinger, 1991. Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapors into Buildings. *Environmental Science & Technology.* 25:1445–1452.

MWH, 2010. *Inhalation Toxicity Reference Value Updates for Use in Ecological Risk Assessments at Santa Susana Field Laboratory, Ventura County, California*.

Radian Corporation, 1996. *Operable Unit 2 Remedial Design Work Plan, DDRW-Sharpe*. Final. May.

Radian International, 1997a. *Operable Unit 2 Pre-Design Technical Summary, DDRW-Sharpe*. Final. January.

Radian International, 1997b. *Addendum to the Operable Unit 2 Pre-Design Technical Summary, DDRW-Sharpe*. Final. September.

Radian International, 1999. *Engineering Technical Memorandum Site S-33/29 Metals Investigation, DDJC-Sharpe*. Final. August.

Radian International, 2000a. *Operable Unit 2, No Further Action, Remedial Action Report, DDJC-Sharpe*. Final. December.

Radian International, 2000b. *Operable Unit 2, Metals Remedial Action Report, Sites S-3 and S-26, DDJC-Sharpe*. Final. September.

United States Environmental Protection Agency (EPA), 1999. *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*. EPA 540-R-98-031. July.

EPA, 2002. *Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*. Draft. EPA 530-D-02-004. Prepared by Office of Solid Waste and Emergency Response, United States Environmental Protection Agency, Washington, D.C. November.

EPA, 2004. *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings*. Prepared by Environmental Quality Management, Inc., Durham, NC. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C. February. Online information: http://www.epa.gov/oswer/riskassessment/airmodel/johnson_ettinger.htm (last accessed February 2010).

EPA, 2006. Sample Federal Facility Land Use Control ROD Checklist with Suggested Language. October. http://www.epa.gov/fedfac/documents/icchecklist.pdf (last accessed February 2010).

EPA, 2009. *Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites. RSL Table Update December 10, 2009*. Online information: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm (last accessed February 2010).

URS Group, Inc. (URS), 2001. *DDJC-Sharpe FFA Annual Progress Report: October 1999 through September 2000*. Final. May.

URS, 2002. *Operable Unit 2 Soil Vapor Extraction Remedial Action Report, DDJC-Sharpe*. Final. May.

URS, 2005. Minutes for Remedial Project Managers Meeting, DDJC-Sharpe. November.

URS, 2007a. *Site P-5A Groundwater and Soil Vapor Investigation Results, Technical Memorandum, DDJC-Sharpe*. Final. February.

URS, 2007b. *DDJC-Sharpe Comprehensive Cone Penetrometer Investigation – Sites P-2A and P-5A Soil Vapor Sampling Results*. December.

URS, 2007c. *DDJC-Sharpe FFA Annual Progress Report: October 2005 through September 2006.* Final. May.

URS, 2008. *DDJC-Sharpe Operable Unit 2, Metals Remedial Action Report, Site S-26, Area 6.* Final. January.

URS, 2009a. *DDJC-Sharpe Comprehensive Cone Penetrometer Testing Investigation Results Report.* Final. October.

URS, 2009b. *DDJC-Sharpe/Tracy Waste Management Plan*. March.

URS, 2011. *Ecological Risk Evaluation of Burrowing Owls at the Metals Sites, Defense Distribution Depot San Joaquin – Sharpe Site*. Final. May.

APPENDIX A

Site Summaries

INTRODUCTION TO SITE SUMMARIES

This appendix includes a site summary for each of the 16 trichloroethene (TCE) sites[1] and 5 metals (lead and chromium) sites at the Defense Distribution Depot San Joaquin - Sharpe Site (Sharpe Site). Each summary provides a brief description of the conceptual site model, the site history, and recommendations for no further action, addition of land use controls (LUCs), or addition of annual monitoring for burrowing owls. The site summaries highlight data from the 1987 remedial investigation (RI) for TCE sites and the 1991 RI for metals sites that led to each site's subsequent inclusion and classification (i.e., characterization or remediation site) in the *Record of Decision, Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD). The summaries provide the relevant results from the post-ROD (pre-design) investigations that resulted in either implementation of the OU 2 ROD remedy or a determination that no action was required based on concentration data and/or modeling predictions, where applicable. For sites that required a remedial action, the final closure/confirmation data are presented with the site summary to support achievement of the OU 2 ROD requirements. For each site, post-ROD investigation data (no action sites) or post-remediation data (remedial action sites) are presented in a table and accompanying figure.

For the TCE sites, post-ROD or closure/confirmation soil gas data combined with operational history, land use, groundwater data, mass estimates (in place and removed, where applicable), vadose zone and groundwater modeling, and risk and hazard estimates from the vapor intrusion pathway were evaluated to support a recommendation of no further action for soil at eight TCE sites (Sites P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A) and a recommendation for the addition of LUCs for soil at eight TCE sites (Sites P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A). Because of the potential for vapor intrusion from volatilization from shallow (A Zone) groundwater plumes and because the remedial action objective for the TCE sites is to prevent further degradation of groundwater, Figure A-1 is presented in this appendix to show the volatile organic compound plumes in shallow groundwater relative to the TCE sites. Recent TCE results for groundwater samples are shown on the individual site summary figures.

For the metals sites, post-ROD or post-excavation soil data combined with operational history, land use, groundwater data, and residual risk were evaluated to support a recommendation for the addition of LUCs for soil at each of the five metals sites (Sites S-3, S-26, S-30, S-33/29, and S-36).

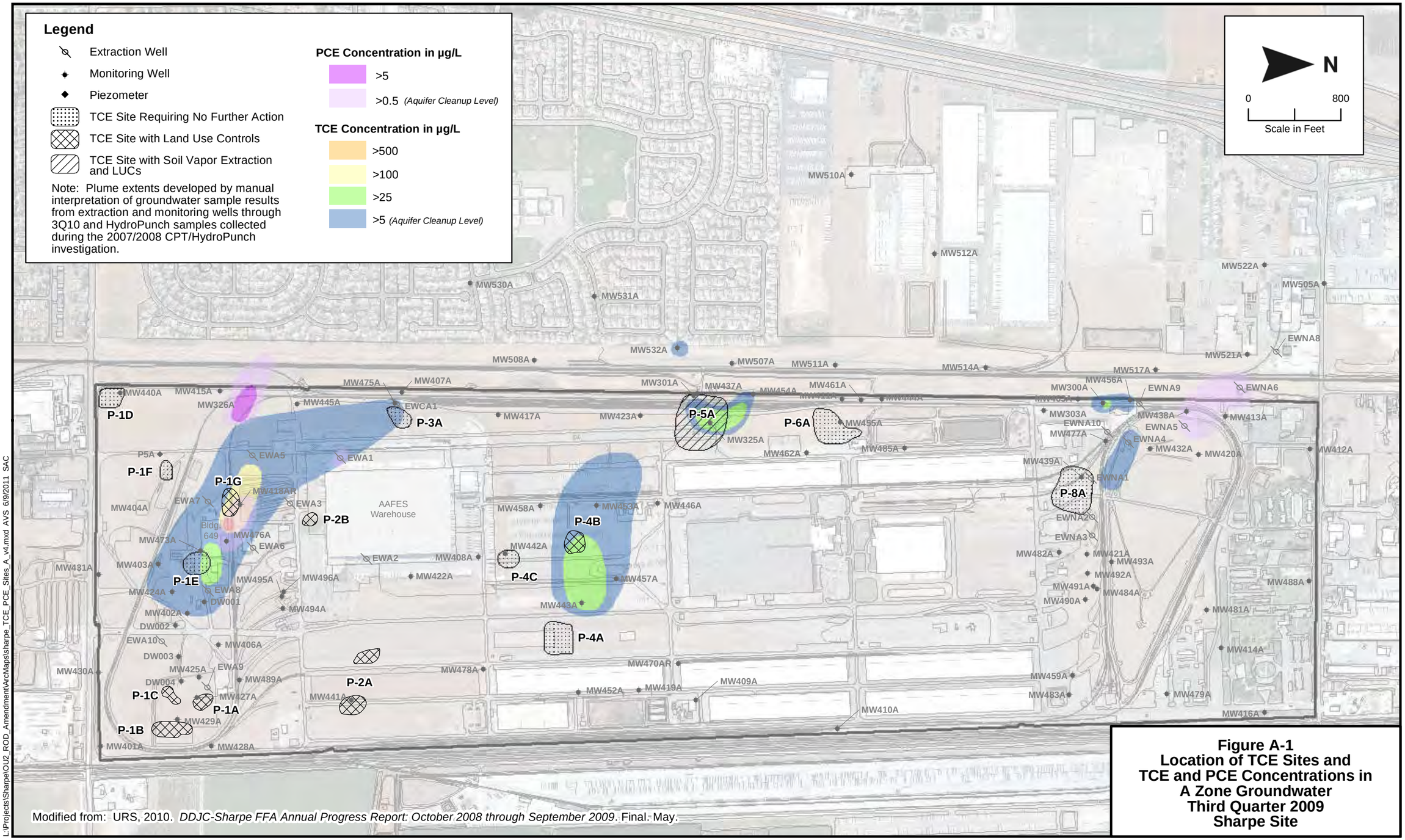
LUCs are being added to eight of the TCE sites and the five metals sites to ensure protection of human health. The risk from the TCE and metals sites to the environment was also reviewed. This information is presented here to provide a single reference since it is applicable to all of the sites. Environmental conditions in the open land at the Sharpe Site consist primarily of barren or fallow lands occupied by ruderal (weedy) plants and landscaped areas. In general, these conditions do not constitute unique or ecologically valued habitats and such conditions are generally common amongst developed/disturbed/managed lands throughout the region. However, several areas of the facility (including land at, and adjacent to, the TCE and metals sites included in this OU 2 ROD Amendment) are occupied by burrowing owls (*Athene cunicularia*), a California species of special concern. Burrowing owls occupy burrows excavated by California ground squirrels (common at the Sharpe Site) or other animals and, as a result, are subjected to subsurface environmental conditions for portions of their lifecycle.

DLA Installation Support at San Joaquin has conducted population monitoring of the burrowing owls for 14 years; the data provide a line of evidence for characterizing site-related threats to burrowing owls. Even though wild populations of animals naturally fluctuate and are subjected to a variety of

[1] Because of their proximity to each other and similar remediation history, Sites P-1A, P-1B, and P-1C are combined into one site summary.

environmental and biological stressors (e.g., weather and predators, respectively) independent of any threat from subsurface chemicals, these population monitoring data indicate a generally stable or slightly increasing population of burrowing owls at the Sharpe Site. Therefore, presence of burrowing owls, coupled with a stable (or increasing) population, indicate no discernable or measurable adverse effect in the owl population from environmental, biological, or residual chemical stressors. However, because concentrations of lead at a few individual sample locations at metals sites S-3 and S-26 exceed effect-based soil screening levels for three site-specific scenarios (URS, 2011), annual monitoring to ensure burrowing owls do not inhabit Sites S-3 and S-26 is recommended. No threats to the environment were identified at the TCE sites.

In addition, the Sharpe Site has implemented a burrowing owl management plan (Albion Environmental, Inc., 1997), which calls for pre-activity surveys at any area of the Sharpe Site scheduled for a change in land use (e.g., remediation or construction); these surveys and subsequent mitigative measures recommended in the management plan minimize the potential impacts to the burrowing owl population. Because this management plan is implemented depot-wide, it can also account for the mobility of the burrowing owls, which might occupy one area during one year and occupy a different area in a subsequent year.



Modified from: URS, 2010. *DDJC-Sharpe FFA Annual Progress Report: October 2008 through September 2009*. Final. May.

Figure A-1
Location of TCE Sites and TCE and PCE Concentrations in A Zone Groundwater Third Quarter 2009 Sharpe Site

L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\Sharpe_TCE_PCE_Sites_A_v4.mxd AVS 6/9/2011 SAC

This page intentionally left blank

TABLE OF CONTENTS

Page

Introduction to Site Summaries i

Sites P-1A, P-1B, and P-1C A1-1
Site P-1D A2-1
Site P-1E A3-1
Site P-1F A4-1
Site P-1G A5-1
Site P-2A A6-1
Site P-2B A7-1
Site P-3A A8-1
Site P-4A A9-1
Site P-4B A10-1
Site P-4C A11-1
Site P-5A A12-1
Site P-6A A13-1
Site P-8A A14-1
Site S-3 ..... A15-1
Site S-26 ..... A16-1
Site S-30 ..... A17-1
Site S-33/29 ..... A18-1
Site S-36 ..... A19-1

References A20-1

TABLES

Page

1-1 TCE in Soil Vapor, SVE Closure/Confirmation Sampling, Sites P-1A, P-1B, and P-1C A1-4
2-1 TCE in Soil Vapor, Post-ROD Sampling, Site P-1D A2-4
3-1 TCE in Soil Vapor, SVE Closure/Confirmation Sampling, Site P-1E A3-4
4-1 TCE in Soil Vapor, Post-ROD Sampling, Site P-1F A4-4
5-1 TCE in Soil Vapor, Post-ROD Sampling, Site P-1G A5-3
6-1 TCE in Soil Vapor, Post-ROD Sampling, Site P-2A A6-3
7-1 TCE in Soil Vapor, Post-ROD Sampling, Site P-2B A7-4
8-1 TCE in Soil Vapor, Post-ROD Sampling, Site P-3A A8-4
9-1 TCE in Soil Vapor, Post-ROD Sampling, Site P-4A A9-3
10-1 TCE in Soil Vapor, Post-ROD Sampling, Site P-4B A10-4
11-1 TCE in Soil Vapor, Post-ROD Sampling, Site P-4C A11-4
12-1 TCE in Soil Vapor, Post-ROD Sampling, Site P-5A A12-3
13-1 TCE in Soil Vapor, SVE Closure/Confirmation Sampling, Site P-6A A13-4
14-1 TCE in Soil Vapor, Post-Pilot SVE and Post-ROD Sampling, Site P-8A A14-4
15-1 Summary of Chromium Concentrations in Soil, Site S-3 ..... A15-3
15-2 Summary of Lead Concentrations in Soil, Site S-3 ..... A15-4

TABLES (Continued)

Page

16-1 Summary of Chromium Concentrations in Soil, Site S-26 ..... A16-4
16-2 Summary of Lead Concentrations in Soil, Site S-26 ..... A16-6
17-1 Summary of Chromium Concentrations in Soil, Site S-30 ..... A17-3
17-2 Summary of Lead Concentrations in Soil, Site S-30 ..... A17-4
18-1 Summary of Chromium Concentrations in Soil, Site S-33/29 ..... A18-3
18-2 Summary of Lead Concentrations in Soil, Site S-33/29 ..... A18-4
19-1 Summary of Chromium Concentrations in Soil, Site S-36 ..... A19-3
19-2 Summary of Lead Concentrations in Soil, Site S-36 ..... A19-4

FIGURES

A-1 Location of TCE Sites and TCE and PCE Concentrations in A Zone Groundwater, Third Quarter 2009 iii

1-1 TCE Concentrations in Soil Vapor and A Zone Groundwater, Sites P-1A, P-1B, and P-1C A1-7
2-1 TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-1D A2-5
3-1 TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-1E A3-5
4-1 TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-1F A4-5
5-1 TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-1G A5-5
6-1 TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-2A A6-5
7-1 TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-2B A7-5
8-1 TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-3A A8-7
9-1 TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-4A A9-5
10-1 TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-4B A10-7
11-1 TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-4C A11-5
12-1 TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-5A A12-5
13-1 TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-6A A13-7
14-1 TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-8A A14-7
15-1 Chromium Concentrations in Soil, Site S-3 ..... A15-5
15-2 Lead Concentrations in Soil, Site S-3 ..... A15-6
16-1 Chromium Concentrations in Soil, Site S-26 ..... A16-9
16-2 Lead Concentrations in Soil, Site S-26 ..... A16-10
17-1 Chromium Concentrations in Soil, Site S-30 ..... A17-5
17-2 Lead Concentrations in Soil, Site S-30 ..... A17-6
18-1 Chromium Concentrations in Soil, Site S-33/29 ..... A18-5
18-2 Lead Concentrations in Soil, Site S-33/29 ..... A18-6
19-1 Chromium Concentrations in Soil, Site S-36 ..... A19-5
19-2 Lead Concentrations in Soil, Site S-36 ..... A19-6

LIST OF ACRONYMS AND ABBREVIATIONS

ACL	aquifer cleanup level
AAFES	Army and Air Force Exchange Service
atm	atmosphere
bgs	below ground surface
CCl_4	carbon tetrachloride
CDFG	California Department of Fish and Game
COC	contaminant of concern
DI-WET	deionized water waste extraction test
DTSC	California Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
ESE	Environmental Science and Engineering, Inc.
MCL	maximum contaminant level
OU	operable unit
PCE	tetrachloroethene
ppbv	parts per billion by volume
RI	remedial investigation
ROD	record of decision
SVE	soil vapor extraction
TCE	trichloroethene
TEFA	technical and economic feasibility analysis
URS	URS Group, Inc.
VEW	vapor extraction well
VMW	vapor monitoring well
VOC	volatile organic compound
µg/g	microgram per gram
µg/L	microgram per liter
$\mu g/m^3$	microgram per cubic meter
°C	degree Celsius

SITES P-1A, P-1B, AND P-1C

Conceptual Site Model

Sites P-1A, P-1B, and P-1C are located in the eastern portion of the South Balloon at the Sharpe Site (Figure 1-1). The ground surface at Sites P-1A, P-1B, and P-1C is covered with gravelly and compacted soil supporting grasses. No structures currently exist at the sites; however, Building 605, located just north of Site P-1A, is a hazardous waste staging facility. One employee occupies the building approximately 4 hours per workday.

Potential Sources: The area encompassing Sites P-1A, P-1B, and P-1C contained multiple historical disposal and burn pits. The vadose zone beneath the sites is composed of sand, silty sand, and sandy silt.

Groundwater: Depths to groundwater measured in the vicinity of these sites ranged from approximately 12.5 to 18 feet below ground surface (bgs) during 2008 and the first half of 2009. Results from the third quarter 2009 groundwater samples from A Zone monitoring wells downgradient from Sites P-1A, P-1B, and P-1C indicate trichloroethene (TCE) concentrations in groundwater are less than 1 microgram per liter (μg/L), which is less than the TCE aquifer cleanup level (ACL) of 5 μg/L (Figure 1-1).

Land Use: With the exception of Building 605 north of Site P-1A, the sites are not being used. Any future use of the sites is expected to be industrial/storage.

CERCLA History

Soil Vapor Sampling: Eighty-three soil vapor samples were collected during the 1987 remedial investigation (RI) at Sites P-1A, P-1B, and P-1C (Environmental Science and Engineering, Inc. [ESE], 1990) (Figure 1-1). Approximately 40% of the sample locations had TCE concentrations greater than 350 parts per billion by volume (ppbv). The maximum concentration of TCE detected in soil vapor was 193,000 ppbv. All RI soil vapor samples were collected at depths between 1 and 5 feet bgs. The *Record of Decision, Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) identified Sites P-1A, P-1B, and P-1C as requiring remedial action because TCE concentrations at the sites exceeded the cleanup standard of 350 ppbv (ESE, 1996). The sample density was considered sufficient to characterize the sites and reach the decision that soil vapor extraction (SVE) was the appropriate remedy for TCE in soil vapor. The total mass in the vadose zone was estimated to be approximately 2.3 pounds at Site P-1A, 1.4 pounds at Site P-1B, and 3.3 pounds at Site P-1C (Radian International, 1997a).

SVE Operation: Following post-ROD characterization to further define the soil vapor plumes, an SVE system was constructed in 1998 and operated in phases (extraction followed by periods of rebound) from approximately September 1998 to December 2001. A site closure/confirmation study was conducted in December 2000 at the three sites, but TCE concentrations greater than the cleanup standard were reported at all three sites with a maximum concentration of 4,200 ppbv at Site P-1B. Therefore, SVE was restarted in February 2001 and operated until December 2001 with efforts focused in areas where residual mass had been identified (URS Group, Inc. [URS], 2002).

Post-Closure Sampling: In January 2002, a second site closure study was conducted, and soil vapor confirmation samples were collected from all three sites. Table 1-1 and Figure 1-1 provide the 2002 confirmation sampling locations and results for Sites P-1A, P-1B, and P-1C. At Site P-1A, soil vapor samples were collected from 13 boring locations, 7 vapor extraction wells (VEWs), and 1 vapor monitoring well (VMW). Concentrations of TCE in soil vapor greater than the cleanup standard were detected in 2 of the 13 boring locations, both at approximately 7 feet bgs. Concentrations greater than the cleanup standard were also detected in two of the seven VEWs and in the VMW (URS, 2002).

At Site P-1B, the 2002 confirmation samples were collected from three borings, two VEWs, and one VMW. Only the soil vapor sample collected from the VMW had a TCE concentration (800 ppbv) greater than the cleanup standard (URS, 2002).

At Site P-1C, the 2002 confirmation samples were collected from six borings, three VEWs, and one VMW. Only the soil vapor sample collected from the VEW had a TCE concentration (800 ppbv) greater than the cleanup standard (URS, 2002).

SVE operations removed 23 pounds from Site P-1A, 2.19 pounds from Site P-1B, and 15.55 pounds from Site P-1C. The density of post-closure sampling was considered adequate to reach a decision regarding the need for further action at Sites P-1A, P-1B, and P-1C (URS, 2002).

The 2002 confirmation sample results were input into a migration model (VapourT) and a groundwater mixing model to evaluate potential future effects on groundwater from the residual TCE mass in soil. For each site, the models predicted TCE concentrations in leachate and groundwater beneath the sites will never exceed the TCE ACL and will decrease to non-detectable concentrations (less than 0.10 µg/L) in five years or less (URS, 2002).

Potential Site Risk: The 2002 closure/confirmation sample results were also used to evaluate risk associated with the vapor intrusion pathway. Results for all volatile organic compounds used in the risk calculations are provided in Attachments B1, B2, and B3 to Appendix B. Residential cumulative cancer risk estimates and residential noncancer hazard indices were calculated by the EPA screening method, the DTSC screening method, and the Johnson-Ettinger method using site-specific data (see details of these calculations in Appendix B, including discussion of the limitations with the three methods). The results for the three methods are shown in the table below.

Residential Risk and Hazard Estimates, Vapor Intrusion Pathway, Sites P-1A, P-1B, and P-1C			
	EPA Screening	**DTSC Screening**	**Site-Specific**
P-1A Cumulative cancer risk	3.4E-05	6.7E-06	4.0E-06
P-1A Hazard index	0.1	0.015	0.0066
P-1B Cumulative cancer risk	3.5E-05	7.1E-06	3.0E-06
P-1B Hazard index	0.075	0.015	0.0092
P-1C Cumulative cancer risk	3.5E-05	7.1E-06	4.3E-06
P-1C Hazard index	0.082	0.016	0.0092

TCE contributes approximately 89% of the risk by the vapor intrusion pathway at Site P-1A. Tetrachloroethene and chloroform also contribute to the risk. TCE contributes approximately 100% of the risk by the vapor intrusion pathway at Site P-1B and Site P-1C.

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

Land use controls to prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing are recommended for soil at Sites P-1A, P-1B, and P-1C for the following reasons:

- SVE was conducted. Although seven post-SVE soil vapor samples had TCE concentrations greater than the ROD-specified 350 ppbv cleanup standard, there is no evidence those concentrations are impacting groundwater.

- The area of the three sites is open space. Hence, there is no unacceptable risk to current industrial receptors. However, estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1E-04 to 1E-06.

- The sites are not ready for unlimited use and unrestricted exposure because of the potential risk by the vapor intrusion pathway.

Table 1-1. TCE in Soil Vapor, SVE Closure/Confirmation Sampling, Sites P-1A, P-1B, and P-1C, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
Site P-1A					
CP0941	1/7/2002	5.5	M18MS	ND	200
CP0941	1/7/2002	8.5	M18MS	ND	200
CP0941	1/7/2002	10.5	M18MS	ND	200
CP0942	1/7/2002	6.5	M18MS	ND	200
CP0942	1/7/2002	9.5	M18MS	ND	200
CP0942	1/7/2002	13	M18MS	ND	200
CP0943	1/8/2002	7.5	M18MS	380	200
CP0943	1/8/2002	10.5	M18MS	ND	200
CP0943	1/8/2002	12.5	M18MS	ND	200
CP0944	1/8/2002	7	M18MS	ND	200
CP0944	1/8/2002	10	M18MS	ND	200
CP0944	1/8/2002	12.5	M18MS	ND	200
CP0945	1/7/2002	6	M18MS	ND	200
CP0945	1/7/2002	9.5	M18MS	ND	200
CP0945	1/7/2002	13.5	M18MS	ND	200
CP0946	1/7/2002	6	M18MS	ND	200
CP0946	1/7/2002	9	M18MS	ND	200
CP0947	1/7/2002	7	M18MS	580	200
CP0947	1/7/2002	10.5	M18MS	ND	200
CP0948	1/7/2002	6.5	M18MS	ND	200
CP0948	1/7/2002	9.5	M18MS	ND	200
CP0949	1/7/2002	6.5	M18MS	ND	200
CP0949	1/7/2002	9	M18MS	ND	200
CP0949	1/7/2002	13	M18MS	ND	200
CP0950	1/7/2002	5.5	M18MS	ND	200
CP0950	1/7/2002	8.5	M18MS	ND	200
CP0950	1/7/2002	12.5	M18MS	ND	200
CP0951	1/8/2002	6.5	M18MS	ND	200
CP0951	1/8/2002	10.5	M18MS	ND	200
CP0951	1/8/2002	12.6	M18MS	ND	200
CP1021	1/9/2002	6.5	M18MS	ND	200
CP1021	1/9/2002	10	M18MS	220	200
CP1022	1/9/2002	6.5	M18MS	ND	200
CP1022	1/9/2002	10.5	TO15	0.84	0.056
VEW-1A1	1/7/2002	15	M18MS	310	200
VEW-1A2	1/7/2002	15	M18MS	ND	200
VEW-1A4	1/8/2002	15	M18MS	360	200
VEW-1A5	1/8/2002	15	M18MS	270	200
VEW-1A6	1/8/2002	15	M18MS	ND	200
VEW-1A7	1/8/2002	15	M18MS	ND	200
VEW-1A8	1/8/2002	15	M18MS	660	200
VMW-1A5	1/8/2002	4.5	M18MS	490	200
Site P-1B					
CP0952	1/8/2002	5.5	M18MS	ND	200
CP0952	1/8/2002	10.5	M18MS	ND	200
CP0953	1/8/2002	6	M18MS	ND	200
CP0953	1/8/2002	10.5	M18MS	ND	200
CP0954	1/8/2002	7	M18MS	ND	200
CP0954	1/8/2002	10.3	M18MS	ND	200

Table 1-1. (Continued)

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
Site P-1B (cont'd)					
VEW-1B1	1/7/2002	12.5	M18MS	ND	200
VEW-1B2	1/7/2002	12.5	M18MS	330	200
VMW-1B1	1/9/2002	4.5	M18MS	ND	200
VMW-1B1	1/9/2002	9.5	M18MS	800	200
Site P-1C					
CP0955	1/8/2002	7.25	M18MS	ND	200
CP0956	1/8/2002	6.5	M18MS	ND	200
CP0956	1/8/2002	9	M18MS	ND	200
CP0956	1/8/2002	12.5	M18MS	ND	200
CP0957	1/8/2002	6	M18MS	ND	200
CP0957	1/8/2002	9.5	M18MS	ND	200
CP0957	1/8/2002	12	M18MS	ND	200
CP0958	1/8/2002	6.5	M18MS	ND	200
CP0958	1/8/2002	10	M18MS	ND	200
CP0958	1/8/2002	12.5	M18MS	ND	200
CP0959	1/8/2002	6.5	M18MS	ND	200
CP0959	1/8/2002	10.5	M18MS	ND	200
CP0960	1/8/2002	6.5	M18MS	ND	200
CP0960	1/8/2002	8.8	M18MS	ND	200
CP0960	1/8/2002	13	M18MS	ND	200
VEW-1C2	1/7/2002	12.5	M18MS	800	200
VEW-1C3	1/7/2002	12.5	M18MS	310	200
VEW-1C4	1/7/2002	12.5	M18MS	ND	200
VMW-1C1	1/9/2002	5.5	M18MS	ND	200
VMW-1C1	1/9/2002	10.5	M18MS	ND	200
VMW-1C1	1/9/2002	13.5	TO15	24	0.056

Note: All SVE closure/confirmation sample results (2002) are presented in this table.

bgs = below ground surface
ND = not detected
ppbv = parts per billion by volume
SVE = soil vapor extraction
TCE = trichloroethene

This page intentionally left blank

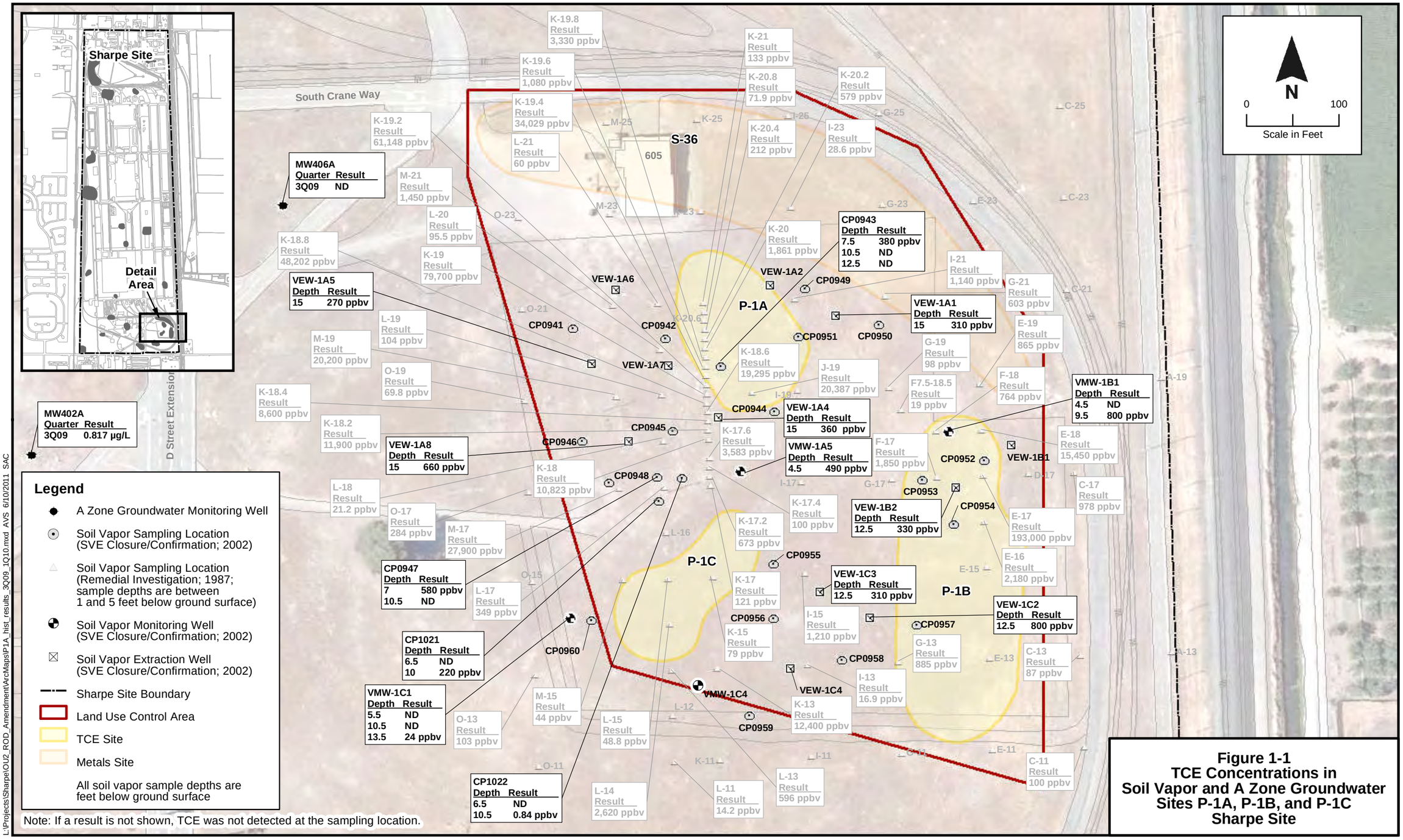


Figure 1-1
TCE Concentrations in Soil Vapor and A Zone Groundwater Sites P-1A, P-1B, and P-1C
Sharpe Site

SITE P-1D

Conceptual Site Model

Site P-1D is in the southwestern corner of the Sharpe Site (Figure 2-1). The surface of Site P-1D is covered with soil that supports natural vegetation. No structures are present at the site. Drainage ditches run parallel to the perimeter roads south and west of the site. The ditches were installed in 1984, but historical photographs show evidence of trenching in the area in 1963.

Potential Sources: There is no known history of waste disposal at Site P-1D. The site was identified after trichloroethene (TCE) was detected in soil vapor samples collected during a widespread, exploratory grid sampling program in 1987. The vadose zone beneath the site is composed of silty sand and clayey silt.

Groundwater: Depths to groundwater measured in the vicinity of Site P-1D ranged from approximately 16 to17 feet below ground surface (bgs) during 2008 and the first half of 2009. A cluster of three monitoring wells (MW440A, MW440B, and MW440C) are located within the site (Figure 2-1). There were no detections of volatile organic compounds (VOCs) in MW440A screened in the A Zone between 1995 and 2007; sampling of the cluster was suspended in 2008.

Land Use: Site P-1D is not currently being used. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Vapor Sampling: Soil vapor samples were collected from 33 locations on a 100-foot by 100-foot grid plus step-ins from some grid locations during the 1987 remedial investigation (RI) at Site P-1D (Figure 2-1). Eight samples had concentrations greater than 350 parts per billion by volume (ppbv) (Environmental Science and Engineering [ESE], 1990). The maximum TCE soil vapor concentration was 40,500 ppbv. All RI soil vapor samples were collected at depths between 1 and 5 feet bgs. Based on the RI data, the *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) identified Site P-1D as requiring remedial action because TCE soil vapor concentrations were greater than the 350 ppbv cleanup standard (ESE, 1996). The sample density was considered sufficient to make a decision that soil vapor extraction (SVE) was necessary at Site P-1D.

In a 1996 pre-design investigation, soil vapor samples were collected at five locations from depths between approximately 5 and 12 feet bgs; there was only one detection of TCE, a concentration of 1.7 ppbv. (Table 2-1, Figure 2-1) (Radian International, 1997a). In 1997, soil vapor samples were collected at an additional three locations from depths between approximately 4 and 9 feet bgs. TCE soil vapor concentrations were less than the cleanup standard (Radian International, 1997b), although one of the locations had samples at two depths with concentrations of 160 ppbv and 210 ppbv (Figure 2-1). At the request of the California Regional Water Quality Control Board−Central Valley Region, additional soil vapor samples were collected at Site P-1D in 1999 to confirm the 1996 and 1997 soil vapor data. All analytical results from the 1999 confirmation sampling event were less than the detection limit of 84 ppbv (Radian International, 2000a).

SVE Decision: The soil vapor samples collected after 1987 did not confirm the presence of soil vapor concentrations that posed a threat to groundwater. Sample density and results from the 1996 through 1999 sampling was considered sufficient to reverse the ROD decision and recommend the site for no further action (Radian International, 2000a). TCE mass was not calculated for Site P-1D because all soil vapor concentrations were less than the cleanup standard and no remediation was required.

Potential Site Risk: The analytical results from 1996 through 1999 were used to evaluate risk associated with the vapor intrusion pathway at Site P-1D. Results for all VOCs used in the risk calculations are provided in Attachment B4 to Appendix B. Residential cumulative cancer risk estimates and residential noncancer hazard indices were calculated by the EPA screening method, the DTSC screening method, and the Johnson-Ettinger method using site-specific data (see details of these calculations in Appendix B, including discussion of the limitations with the three methods). The results for the three methods are shown in the table below.

Residential Risk and Hazard Estimates, Vapor Intrusion Pathway, Site P-1D			
	EPA Screening	**DTSC Screening**	**Site-Specific**
Cumulative cancer risk	1.2E-05	2.3E-06	1.1E-06
Hazard index	0.23	0.045	0.018

TCE contributes approximately 68% of the risk by the vapor intrusion pathway. 1,4-Dichlorobenzene, 1,4-dioxane, benzene, tetrachloroethene (PCE), and ethylbenzene also contribute to the risk. These cumulative results are based on the combined exposure to the maximum concentrations of all detected analytes, regardless of location, date of sampling, or frequency of detection. At Site P-1D, these maximums were measured at three different locations from three different sampling events: benzene, 1,4-dichlorobenzene, and 1,4-dioxane were detected in 1996 at CP0086; TCE was detected in 1997 at CP0543; and ethylbenzene and PCE were detected in 1999 at CP0779 (detected concentration data are provided in Attachment B17 to Appendix B; locations are shown on Figure 2-1). Over the history of sampling at Site P-1D, TCE was detected in 4 of 36 samples (including field duplicates) and PCE was detected in 1 of 36 samples; less sampling occurred for the other analytes (benzene and 1,4-dichlorobenzene were each detected in 2 of 3 samples, and 1,4-dioxane and ethylbenzene were each detected in 1 of 3 samples.).

These cumulative risk estimates result from an assumed exposure scenario that is physically and temporally impossible (i.e., results are from multiple years from locations that are at least 100 feet apart) and rely upon the available data which demonstrate a generally low frequency of occurrence for TCE, the only contaminant of concern in soil gas at the Sharpe Site and the majority contributor to the cumulative risk estimate. In combination, these factors result in cumulative risk estimates that are the absolute highest calculable values using existing data; however, the risk estimate results are within EPA's risk management range of 1E-04 to 1E-06.

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

No further action is recommended for soil at Site P-1D based on the following lines of evidence:

- There is no continuing source of contamination.
- The only TCE soil vapor concentrations detected after 1987 are less than the ROD cleanup standard.
- Groundwater sample results from the A Zone monitoring well indicate groundwater has not been affected by TCE or any other VOC in soil vapor at Site P-1D.

- Sample density at the site was considered adequate to reach a decision that SVE was not required to protect groundwater and to propose no further action.

- The site is open space. Hence, there is no unacceptable risk to current industrial receptors. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1E-04 to 1E-06, and the estimated noncancer hazard indices are less than 1.

- Any remaining VOC mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors.

Table 2-1. TCE in Soil Vapor, Post-ROD Sampling, Site P-1D, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
CP0086	7/11/1996	6.25	TO14	1.7	0.39
CP0086	7/11/1996	10.85	M18	ND	200
CP0087	7/10/1996	6.25	M18	ND	200
CP0087	7/10/1996	12.25	M18	ND	200
CP0088	7/10/1996	7.45	M18	ND	200
CP0088	7/10/1996	12.25	M18	ND	200
CP0089	7/10/1996	5.65	M18	ND	200
CP0089	7/10/1996	11.25	M18	ND	200
CP0090	7/11/1996	6.25	M18	ND	200
CP0090	7/11/1996	10.75	M18	ND	200
CP0542	3/13/1997	4.1	E18	ND	130
CP0542	3/13/1997	9.1	E18	ND	130
CP0543	3/13/1997	4.6	E18	160	130
CP0543	3/13/1997	9.1	E18	210	150
CP0544	3/13/1997	6.1	E18	ND	110
CP0778	6/9/1999	6.6	E18	ND	84
CP0778	6/9/1999	10.1	E18	ND	84
CP0778	6/9/1999	12.3	E18	ND	84
CP0779	6/9/1999	5.3	E18	ND	84
CP0779	6/9/1999	10.2	E18	ND	84
CP0779	6/9/1999	11.2	E18	ND	84
CP0798	6/9/1999	12.6	E18	ND	84
CP0808	6/10/1999	5.1	E18	ND	84
CP0808	6/10/1999	9.6	E18	ND	84
CP0808	6/10/1999	12.1	E18	ND	84

Note: All post-ROD sample results (1996–1999) are presented in this table.

bgs = below ground surface
ND = not detected
ppbv = parts per billion by volume
ROD = record of decision
TCE = trichloroethene

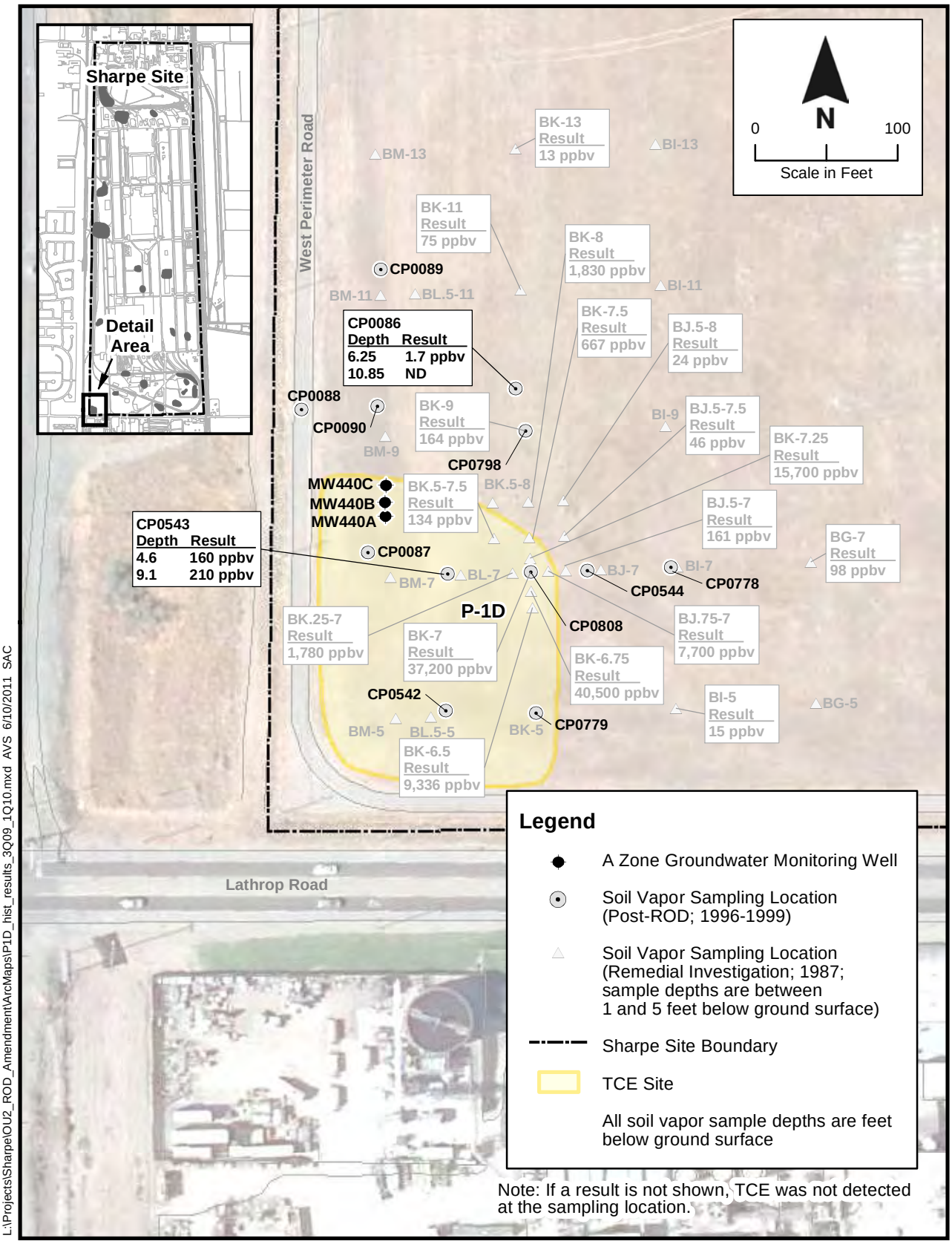


Figure 2-1. TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-1D, Sharpe Site

SITE P-1E

Conceptual Site Model

Site P-1E is in the central portion of the South Balloon at the Sharpe Site (Figure 3-1). Most of the site consists of an open asphalt-covered area southeast of Building 649. The southeast corner of Building 649 is within the site.

Potential Sources: No reports of waste disposal or releases have been identified for Site P-1E. However, a wash rack at the site was used for equipment cleaning prior to 2002 (Environmental Science and Engineering [ESE], 1990). The site was identified after trichloroethene (TCE) was detected in soil vapor samples collected during a widespread, exploratory grid sampling program in 1987. The vadose zone beneath the site is composed of sandy silt and silty clay.

Groundwater: Depths to groundwater measured in the vicinity of Site P-1E ranged from approximately 14.5 to 17 feet below ground surface (bgs) during 2008 and the first half of 2009. A groundwater plume with TCE concentrations ranging from 20 to 100 micrograms per liter (µg/L) in the A Zone (14 to 50 feet bgs) currently underlies Site P-1E and Building 649 (URS, 2010a). Concentrations in the deeper (50 to 100 feet bgs) B and C Zones may exceed 100 µg/L (URS, 2010a). These concentrations are greater than the TCE aquifer cleanup level (ACL) of 5 µg/L.

Land Use: Most of Site P-1E is not being used at this time. Building 649 is used for storage; employees are in the building less than one hour per workday. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Vapor Sampling: Site P-1E was identified as a site on the basis of results from 15 soil vapor samples collected on a 100-foot by 200-foot grid during the 1987 remedial investigation (RI) (Figure 3-1). Three of those 15 soil vapor samples had a TCE concentration greater than 350 parts per billion by volume (ppbv). All RI soil vapor samples were collected at depths between 1 and 5 feet bgs. The *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) identified Site P-1E as requiring further characterization (ESE, 1996).

The post-ROD site characterization investigation with soil vapor sampling at 22 locations across the site in 1997 identified a plume of TCE exceeding the OU 2 ROD cleanup standard of 350 ppbv. Samples were collected at three depths in all locations because of the concern that the soil vapor plume might affect groundwater. The soil vapor plume covered most of the site in the soil less than 8 feet bgs, but covered less than half the site at depths greater than 11 feet bgs. The data collected in the 1987 (RI) and 1997 (post-ROD) investigations were considered sufficient to characterize the site and design a soil vapor extraction (SVE) system. The total mass in the vadose zone at Site P-1E was estimated to be 0.52 pound (Radian International, 1997a).

SVE Operation: An SVE system was constructed at Site P-1E in 1998 and operated in phases from August 1998 to June 1999, when concentrations in soil vapor had decreased to less than the cleanup standard (URS Group, Inc. [URS], 2002). The total mass removed by the SVE system was 0.16 pound.

Post-Closure Sampling: An SVE site closure/confirmation study at Site P-1E in December 2000 included soil vapor samples from 13 boring locations, 2 soil vapor extraction wells, and 1 soil vapor monitoring well distributed across the site (Figure 3-1). Analytical results from those samples were less than the cleanup standard (Table 3-1) (URS, 2002). The highest residual TCE concentrations were

detected in two samples collected at 17.5 feet bgs, near the groundwater surface. The density of post-closure sampling was considered adequate to reach a decision regarding the need for further action at Site P-1E (URS, 2002).

The 2000 closure/confirmation sample results and vadose zone soil parameters were input into a soil vapor migration model (VapourT) and a groundwater mixing model to evaluate potential future effects on groundwater from the residual TCE mass in soil. The models predicted that TCE concentrations in leachate and groundwater beneath the site will never exceed the TCE ACL and will decrease to non-detectable concentrations (less than 0.10 µg/L) in 10 years or less (URS, 2002).

Soil vapor samples from two locations at Site P-1E were collected in October 2009 at the request of the California Department of Toxic Substances Control (DTSC). Samples were collected at two depths in each location: 7.5 feet and 15.5 feet and 8 feet and 14.5 feet, respectively. TCE was not detected in three of the samples (Table 3-1). In the fourth sample, TCE was detected in the deepest sample collected at one of the locations (DP0060; see Figure 3-1); the concentration was less than the cleanup standard.

During the October 2009 sampling at Site P-1E, soil vapor samples were also collected beneath Building 649 from two borings at two depths each to address a concern expressed by DTSC regarding the presence of a vadose zone source for groundwater contamination beneath the building. TCE was detected in a sample from 11.5 feet at a concentration of 38 ppbv, which is less than the OU 2 ROD cleanup standard. TCE was not detected in the other three samples, which were collected at 9 feet, 15.5 feet, and 17 feet (Table 3-1, Figure 3-1).

Potential Site Risk: The 2000 closure/confirmation sample results and the 2009 sample results were used to evaluate risk associated with the vapor intrusion pathway. Results for all volatile organic compounds (VOCs) used in the risk calculations are provided in Attachment B5 to Appendix B. Residential cumulative cancer risk estimates and residential noncancer hazard indices were calculated by the EPA screening method, the DTSC screening method, and the Johnson-Ettinger method using site-specific data (see details of these calculations in Appendix B, including discussion of the limitations with the three methods). The results for the three methods are shown in the table below.

Residential Risk and Hazard Estimates, Vapor Intrusion Pathway, Site P-1E			
	EPA Screening	**DTSC Screening**	**Site-Specific**
Cumulative cancer risk	1.4E-05	2.8E-06	1.7E-06
Hazard index	0.028	0.0056	0.0034

TCE contributes approximately 100% of the risk by the vapor intrusion pathway.

Building 649 is the only building at the Sharpe Site that overlies a shallow (A Zone) groundwater plume. The presence of a shallow groundwater plume raises the question of potential vapor intrusion risks caused by volatilization of VOCs in groundwater and upward migration into a building. The 38 ppbv detection of TCE in the soil vapor sample at 11.5 feet from beneath the northeastern portion of Building 649 suggests that volatilization from the shallow groundwater plume may be occurring. However, the concentration is

less than the 113 ppbv generic industrial screening level (at a risk level of 1E-06) for soil vapor greater than 5 feet bgs[2].

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

No further action is recommended for soil at Site P-1E based on the following lines of evidence.

- There is no continuing source of contamination.
- Sample density at the site was considered adequate to reach a decision on the need for SVE.
- SVE was conducted, and residual TCE soil vapor concentrations at Site P-1E are not predicted to pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause exceedance of the ACL). The occurrence of the highest residual TCE concentrations in the deep vadose zone near the groundwater surface suggests that TCE in soil vapor may originate in groundwater instead of soil. A plume of TCE groundwater contamination is present under the site.
- Sample density and results were considered adequate to terminate SVE and propose no further action.
- Most of the site is open space; Building 649, a portion of which is within the site, is occupied less than one hour per day, and concentrations in soil vapor beneath the building are less than the generic industrial screening level. Hence, there is no unacceptable risk to current industrial receptors.
- The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1E-04 to 1E-06, and the estimated noncancer hazard indices are less than 1.
- Any remaining TCE mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors.

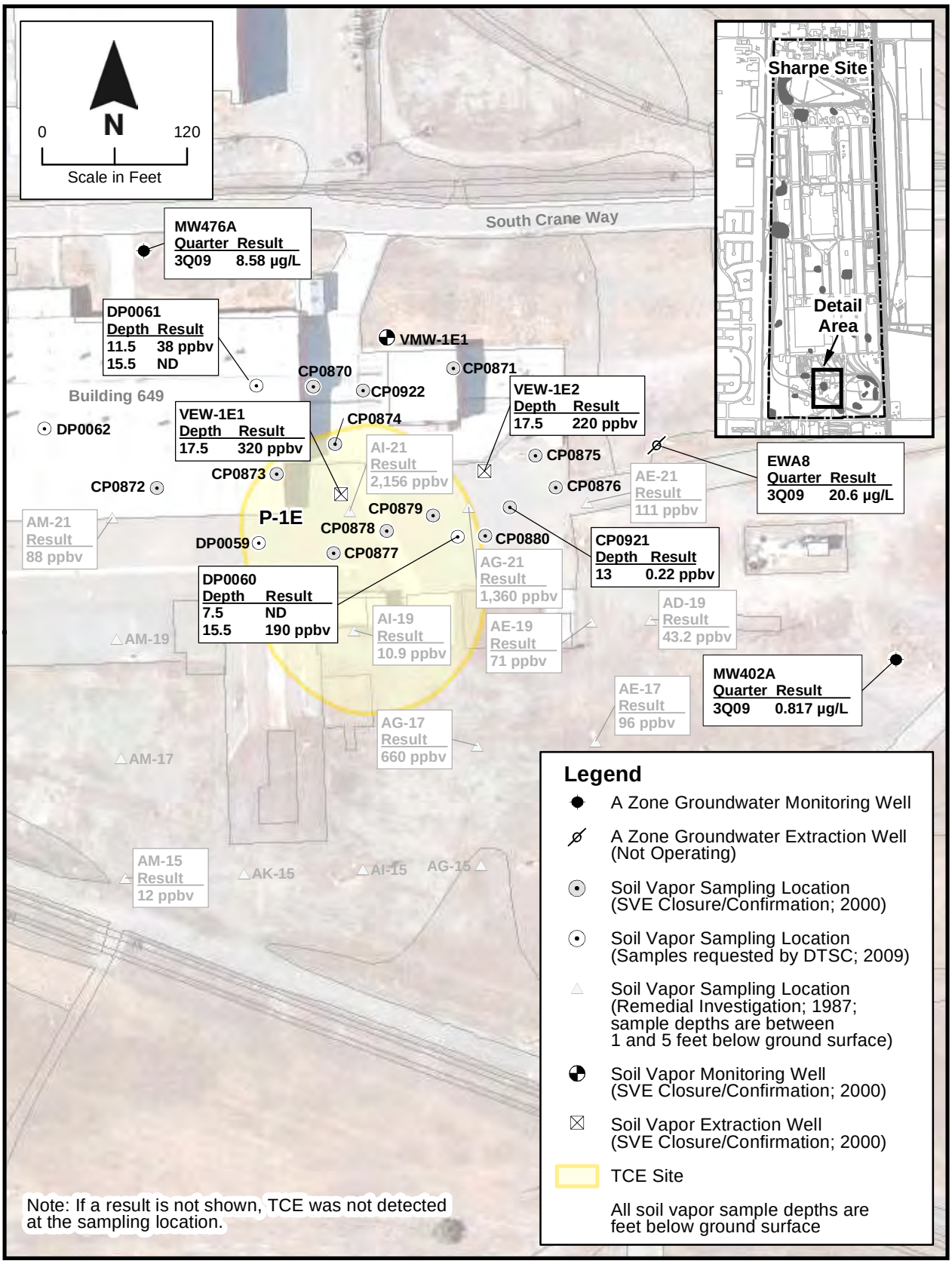
[2] The EPA Regional Screening Level for the concentration of TCE in ambient air in a commercial/industrial setting is 6.1 $\mu g/m^3$ (EPA, 2009). Based on EPA's generic screening attenuation factor for soil greater than 5 feet bgs (a dimensionless value of 0.01; EPA, 2002), the equivalent soil vapor concentration at those depths would be 610 $\mu g/m^3$. Then, converting the measurement units (assuming standard temperature [25°C] and pressure [1 atm]): 610 $\mu g/m^3$ = 113.5 ppbv.

Table 3-1. TCE in Soil Vapor, SVE Closure/Confirmation Sampling, Site P-1E, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
CP0870	12/19/2000	7	M18MS	ND	100
CP0870	12/19/2000	8.5	M18MS	ND	100
CP0871	12/19/2000	7	M18MS	ND	100
CP0871	12/19/2000	9	M18MS	ND	100
CP0872	12/19/2000	7.5	M18MS	ND	100
CP0873	12/19/2000	7	M18MS	ND	100
CP0874	12/19/2000	7	M18MS	ND	100
CP0874	12/19/2000	10	M18MS	ND	100
CP0874	12/19/2000	12	M18MS	ND	100
CP0875	12/18/2000	5.5	M18MS	ND	100
CP0875	12/18/2000	10.5	M18MS	ND	100
CP0875	12/18/2000	13	M18MS	ND	100
CP0876	12/18/2000	7	M18MS	ND	100
CP0877	12/19/2000	7	M18MS	ND	100
CP0878	12/19/2000	8.5	M18MS	ND	100
CP0878	12/19/2000	13	M18MS	ND	100
CP0879	12/18/2000	6.5	M18MS	ND	100
CP0879	12/18/2000	8.5	M18MS	ND	100
CP0879	12/18/2000	13	M18MS	ND	100
CP0880	12/18/2000	6.5	M18MS	ND	100
CP0921	12/18/2000	13	TO14	0.22	0.035
CP0922	12/19/2000	13.5	M18MS	ND	100
VEW-1E1	12/20/2000	17.5	M18MS	320	100
VEW-1E2	12/20/2000	17.5	M18MS	220	100
VMW-1E1	12/20/2000	9	M18MS	ND	100
DP0059	10/19/09	8	TO15	ND	1.20
DP0059	10/19/09	14.5	TO15	ND	1.10
DP0060	10/19/09	7.5	TO15	ND	1.10
DP0060	10/19/09	15.5	TO15	190	1.20
DP0061	10/19/09	11.5	TO15	38	1.20
DP0061	10/19/09	15.5	TO15	ND	1.20
DP0062	10/5/09	9.5	TO15	ND	1.10
DP0062	10/19/09	17	TO15	ND	6.30

Note: All SVE closure/confirmation sample results (2000 and 2009) are presented in this table.

bgs = below ground surface
ND = not detected
ppbv = parts per billion by volume
SVE = soil vapor extraction
TCE = trichloroethene



L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\P1E_hist_results_3Q09_1Q10.mxd AVS 6/10/2011 SAC

Figure 3-1. TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-1E, Sharpe Site

SITE P-1F

Conceptual Site Model

Site P-1F encompasses an open area to the south of the former location of Building 691 in the southwestern portion of the South Balloon Area at the Sharpe Site (Figure 4-1). The surface of Site P-1F is covered with a mixture of natural vegetation and compacted soil. No structures are present at Site P-1F.

Potential Sources: There is no known history of waste disposal at the site, although northwest-trending soil stains were observed in a 1963 aerial photograph of the area. Prior to its removal in 2004, Building 691 was a chemical processing, storage, and distribution facility during the 1980s and 1990s; however, there is no evidence that any chemical releases occurred there. The site was identified after trichloroethene (TCE) was detected in soil vapor samples collected during a widespread, exploratory grid sampling program in 1987. The vadose zone beneath the site is composed of silty sand and clayey silt.

Groundwater: Depths to groundwater measured in the vicinity of Site P-1F ranged from approximately 17.5 to 19.5 feet below ground surface (bgs) during 2008 and the first half of 2009. It can be assumed that volatile organic compound (VOC) contamination is present in A Zone groundwater beneath the site, even though there are no monitoring wells at the site. At A Zone piezometer P5A cross-gradient to the southwest of Site P-1F, the TCE concentration was 3.2 micrograms per liter (μg/L) in the third quarter of 2009 (Figure 4-1). This concentration is less than the TCE aquifer cleanup level of 5 μg/L. No other VOC contaminants of concern (COCs) were detected in groundwater at piezometer P5A in the third quarter of 2009.

Land Use: The site is open space and is not being used. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Vapor Sampling: Nineteen soil vapor samples were collected on a 100-foot by 100-foot grid at Site P-1F during the remedial investigation (RI) in 1987 (Figure 4-1). Only two samples had concentrations greater than 350 parts per billion by volume (ppbv); the two samples were collected at locations AX-15 and AY-15 shown on Figure 4-1. The maximum TCE soil vapor concentration detected was 3,930 ppbv. All RI soil vapor samples at Site P-1F were collected at depths between 1 and 5 feet bgs. The *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) identified Site P-1F as requiring further characterization to determine whether vadose zone TCE contamination could be a future source of groundwater degradation (Environmental Science and Engineering, Inc. [ESE], 1996).

During a post-ROD investigation in 1996, soil vapor samples were collected at five locations (CP0161 to CP0165) at depths between 6.75 and 13.5 feet bgs (Table 4-1, Figure 4-1). Additional soil vapor characterization samples were collected in 1997 at CP0545, where the 1987 sample (AY-15) had been 910 ppbv. All analytical results from the 1996 and 1997 investigations were less than the TCE vadose zone cleanup standard (350 ppbv) (Radian International, 1997a; 1997b).

To resolve the differences between the 1987 RI data and the 1996 and 1997 site characterization data, additional soil vapor samples were collected in 1999 at the request of the California Regional Water Quality Control Board−Central Valley Region. The 1999 soil vapor samples were collected from three locations at depths between 6 and 13.8 feet bgs. CP0780 was co-located with the sample location (AX-15) where the 1987 soil vapor sample contained 3,930 ppbv. All TCE results from the 1999 sampling were less than the detection limit of 84 ppbv (Radian International, 2000a).

SVE Decision: Results of samples collected after 1987 indicated that there was no threat to groundwater quality from Site P-1F because all concentrations were less than the vadose zone cleanup standard. Sample density was considered sufficient to reach the decision that soil vapor extraction (SVE) would not be necessary at the site (Radian International, 2000a). TCE mass was not calculated for Site P-1F because all post-ROD TCE soil vapor concentrations were less than the detection limit with one exception (2.7 ppbv), and no remediation was required.

Potential Site Risk: The 1996 through 1999 sample results were used to evaluate risk associated with the vapor intrusion pathway. Results for all VOCs used in the risk calculations are provided in Attachment B6 to Appendix B. Residential cumulative cancer risk and residential noncancer hazard indices were calculated by the EPA screening method, the DTSC screening method, and the Johnson-Ettinger method using site-specific data (see details of these calculations in Appendix B, including discussion of the limitations with the three methods). The results for the three methods are shown in the table below.

Residential Risk and Hazard Estimates, Vapor Intrusion Pathway, Site P-1F			
	EPA Screening	**DTSC Screening**	**Site-Specific**
Cumulative cancer risk	3.2E-06	6.4E-07	1.8E-07
Hazard index	0.16	0.032	0.011

TCE contributes approximately 5% of the risk by the vapor intrusion pathway. Ethylbenzene (39%), 1,4-dichlorobenzene (36%), and benzene (20%) also contribute to the risk. These cumulative results are based on the combined exposure to the maximum concentrations of all detected analytes, regardless of location, date of sampling, or frequency of detection. At Site P-1F, these maximums were measured at three different locations from three different sampling events: 1,4-dichlorobenzene was detected in 1996 at CP0161; ethylbenzene and TCE were detected in 1997 at CP0545; and benzene was detected in 1999 at CP0782 (detected concentration data are provided in Attachment B17 of Appendix B; locations are shown on Figure 4-1). Over the history of sampling at Site P-1F, TCE was detected in 1 of 27 samples (including field duplicates); less sampling occurred for the other analytes (benzene and ethylbenzene were detected in 2 of 4 samples, and 1,4-dichlorobenzene was detected in 1 of 4 samples).

These cumulative risk estimates result from an assumed exposure scenario that is physically and temporally impossible (i.e., results are from multiple years from locations that are approximately 100 feet apart) and rely upon the available data which demonstrate a low frequency of occurrence for TCE, the only COC in soil gas at the Sharpe Site. In combination, these factors result in cumulative risk estimates that are the absolute highest calculable values using existing data; however, the risk estimate results are within or below EPA's risk management range of 1E-04 to 1E-06.

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

No further action is recommended for soil at Site P-1F based on the following lines of evidence:

- There is no continuing source of contamination.
- Sample density at the site was considered adequate to reach a decision that SVE was not required to protect groundwater and to propose no further action.

- The site is open space. Hence, there is no unacceptable risk to current industrial receptors. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within or below the risk management range of 1E-04 to 1E-06, and the estimated noncancer hazard indices are less than 1.

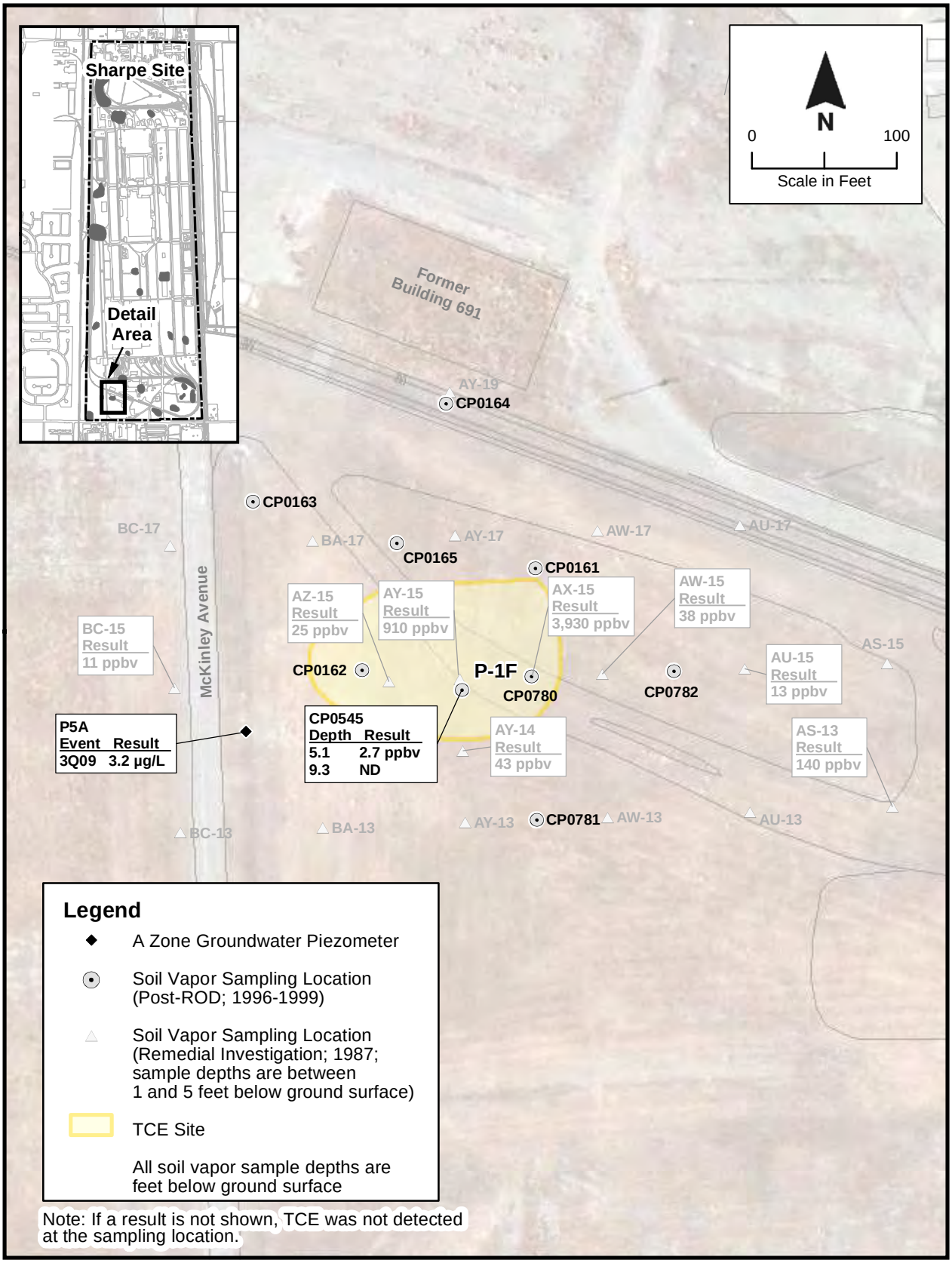
- Any remaining VOC mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors.

Table 4-1. TCE in Soil Vapor, Post-ROD Sampling, Site P-1F, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
CP0161	7/10/1996	9.25	M18	ND	200
CP0161	7/10/1996	13.15	M18	ND	200
CP0162	7/10/1996	8.45	M18	ND	200
CP0162	7/10/1996	13.55	M18	ND	200
CP0163	7/10/1996	7.25	M18	ND	200
CP0163	7/10/1996	10.75	M18	ND	200
CP0164	7/10/1996	8.25	M18	ND	200
CP0164	7/10/1996	12.25	M18	ND	200
CP0165	7/11/1996	6.75	M18	ND	200
CP0165	7/11/1996	12.25	M18	ND	200
CP0545	3/13/1997	5.1	TO14	2.7	0.79
CP0545	3/13/1997	9.3	E18	ND	130
CP0780	6/9/1999	7.6	E18	ND	84
CP0780	6/9/1999	10.1	E18	ND	84
CP0780	6/9/1999	13.8	E18	ND	84
CP0781	6/9/1999	6.1	E18	ND	84
CP0781	6/9/1999	10.6	E18	ND	84
CP0781	6/9/1999	13.2	E18	ND	84
CP0782	6/9/1999	5.9	E18	ND	84
CP0782	6/9/1999	10.6	E18	ND	84
CP0782	6/9/1999	12.1	E18	ND	84

Note: All post-ROD sample results (1996–1999) are presented in this table.

bgs = below ground surface
ND = not detected
ppbv = parts per billion by volume
ROD = record of decision
TCE = trichloroethene



L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\P1F_hist_results_3Q09_1Q10.mxd AVS 6/10/2011 SAC

Figure 4-1. TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-1F, Sharpe Site

SITE P-1G

Conceptual Site Model

Site P-1G is northwest of Building 649 and west of Building 655 in the southwestern portion of the central South Balloon at the Sharpe Site (Figure 5-1). Approximately 90% of the ground surface at the site is covered by an asphalt parking lot, driveways, and a two-lane street. The remaining portion is covered with compacted soil supporting natural grasses.

Potential Sources: There is no known history of waste disposal at Site P-1G; however, ground stains were identified north, west, and east of Building 649 during a study of aerial photographs from 1963 and 1968 (Environmental Science and Engineering, Inc. [ESE], 1986). The site was identified after trichloroethene (TCE) was detected in soil vapor samples collected during a widespread, exploratory grid sampling program in 1987. Furthermore, HydroPunch samples collected north of Building 649 in 2008 indicated TCE concentrations in the saturated zone beneath a sewer/industrial waste line (URS Group, Inc. [URS], 2009). The vadose zone beneath the site is composed of sandy silt and silty clay.

Groundwater: Depths to groundwater measured in the vicinity of Site P-1G ranged from approximately 14.5 to 17 feet below ground surface (bgs) during 2008 and the first half of 2009. In the third quarter of 2009, the TCE concentration in the A Zone monitoring well nearest to the site, MW418AR, was 117 micrograms per liter (μg/L); MW476A, to the east of the site, had a TCE concentration of 8.58 μg/L in the third quarter of 2009. Samples from these two monitoring wells may not fully represent TCE in the A Zone. The shallowest (24 to 30 feet bgs) HydroPunch samples collected in the A Zone during 2008 had TCE concentrations as great as 450 μg/L (URS, 2009). These concentrations are greater than the TCE aquifer cleanup level of 5 μg/L.

Land Use: Most of the site consists of lightly used asphalt parking lots and South Crane Way, a main access road for the South Balloon area. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Vapor Sampling: Twenty-nine soil vapor samples were collected at Site P-1G during the 1987 remedial investigation (RI) (ESE, 1990) (Figure 5-1). In seven of the samples, concentrations of TCE were greater than 350 parts per billion by volume (ppbv). The maximum TCE concentration detected in soil vapor at Site P-1G was 2,929 ppbv. All RI soil vapor samples were collected at depths between 1 and 5 feet bgs. The *Record of Decision, Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) required further characterization to determine whether Site P-1G was causing groundwater degradation (ESE, 1996).

Post-ROD characterization in 1996 and 1997 consisted of completing 18 borings and collecting 36 soil vapor samples at depths ranging from 0 to approximately 15 feet bgs. TCE was detected in 19 of the 36 samples at concentrations ranging from 21 to 1,600 ppbv. Only 6 of the 36 samples had TCE concentrations greater than the OU 2 ROD cleanup standard of 350 ppbv (Table 5-1, Figure 5-1) (Radian International, 1997a; 1997b).

In 1999, soil vapor samples were collected from an additional four borings at the request of the California Regional Water Quality Control Board−Central Valley Region to resolve differences between the 1987 RI data and the 1996 and 1997 post-ROD characterization data. The 1999 samples were collected at depths ranging from 5.3 to 11.6 feet bgs. TCE was not detected in any of the samples (Radian International, 2000a).

SVE Decision: The mass of TCE in the vadose zone at Site P-1G was estimated to be approximately 0.25 pound. Migration modeling using VapourT and a groundwater mixing model predicted that it is unlikely this small amount of TCE mass in the vadose zone will increase the total time to remediate groundwater. In addition, a technical and economic feasibility analysis (TEFA) compared the cost of implementing and operating a soil vapor extraction (SVE) system to the incremental cost of groundwater remediation if the vadose zone contamination was not removed. The TEFA concluded that, even though SVE at Site P-1G may be a technically feasible alternative, the predicted cost is not warranted when compared to the additional costs incurred if cleanup is solely achieved with the existing groundwater treatment system (Radian International, 2000a). Therefore, SVE was not implemented at Site P-1G.

Potential Site Risk: The analytical results from 1996 through 1999 were used to evaluate risk associated with the vapor intrusion pathway. Results for all volatile organic compounds used in the risk calculations are provided in Attachment B7 to Appendix B. Residential cumulative cancer risk estimates and residential noncancer hazard indices were calculated by the EPA screening method, the DTSC screening method, and the Johnson-Ettinger method using site-specific data (see details of these calculations in Appendix B, including discussion of the limitations with the three methods). The results for the three methods are shown in the table below.

Residential Risk and Hazard Estimates, Vapor Intrusion Pathway, Site P-1G			
	EPA Screening	**DTSC Screening**	**Site-Specific**
Cumulative cancer risk	7.6E-05	1.5E-05	5.3E-06
Hazard index	0.33	0.066	0.031

TCE contributes 91% of the risk via the vapor intrusion pathway. 1,4-Dioxane, 1,3-butadiene, benzene, and ethylbenzene also contribute to the risk.

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

Land use controls to prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing are recommended for soil at Site P-1G for the following reasons:

- Soil vapor samples collected in 1997 had TCE concentrations greater than the ROD-specified 350 ppbv cleanup standard.
- Soil vapor concentrations beneath the site do not pose a threat to groundwater quality. TCE concentrations in the A Zone groundwater are greater than 100 µg/L beneath Site P-1G. Additional remedial actions for TCE in the saturated zone are being evaluated for feasibility (URS, in preparation).
- The site is mostly open space, and soil gas concentrations are lower near buildings than they are under open space areas. Hence, there is no unacceptable risk to current industrial receptors. However, estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1E-04 to 1E-06.
- The site is not ready for unlimited use and unrestricted exposure because of the potential risk by the vapor intrusion pathway.

Table 5-1. TCE in Soil Vapor, Post-ROD Sampling, Site P-1G, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
CP0186	7/9/1996	7.75	M18	ND	200
CP0186	7/9/1996	12.15	M18	ND	200
CP0187	7/9/1996	7.25	M18	ND	200
CP0187	7/9/1996	12.25	M18	ND	200
CP0188	7/9/1996	7.75	M18	220	200
CP0188	7/9/1996	12.75	M18	ND	200
CP0189	7/9/1996	8.75	M18	250	200
CP0189	7/9/1996	11.75	M18	ND	200
CP0190	7/10/1996	6.65	M18	ND	200
CP0190	7/10/1996	10.35	M18	ND	200
CP0190	7/10/1996	14.25	M18	ND	200
CP0546	3/13/1997	5.1	E18	ND	110
CP0546	3/13/1997	10.1	E18	160	100
CP0547	3/13/1997	5.1	E18	180	130
CP0547	3/13/1997	10.1	E18	940	120
CP0548	3/13/1997	6.1	E18	ND	120
CP0548	3/13/1997	10.8	TO14	21	0.72
CP0567	3/13/1997	5.2	E18	330	130
CP0567	3/13/1997	9.6	E18	390	130
CP0571	4/5/1997	5.8	E18	340	120
CP0571	4/5/1997	9.7	E18	480	120
CP0572	4/5/1997	4.7	TO14	26	0.6
CP0572	4/5/1997	8.2	E18	ND	130
CP0573	6/27/1997	7	E18	230	130
CP0573	6/27/1997	10	E18	150	140
CP0574	6/27/1997	7	E18	150	110
CP0574	6/27/1997	10	E18	ND	130
CP0575	6/27/1997	7	E18	330	130
CP0575	6/27/1997	10	E18	210	130
CP0576	6/3/1997	4	E18	ND	110
CP0576	6/3/1997	6.75	E18	ND	110
CP0577	6/3/1997	5.25	E18	1,100	110
CP0577	6/3/1997	9	E18	1,600	100
CP0578	6/3/1997	4.75	E18	1,100	100
CP0578	6/3/1997	9.75	E18	250	100
CP0582	6/27/1997	0	E18	270	110
CP0783	6/9/1999	6.1	E18	ND	84
CP0783	6/9/1999	9.6	E18	ND	84
CP0783	6/9/1999	11.6	E18	ND	84
CP0784	6/9/1999	5.3	E18	ND	84
CP0784	6/9/1999	9.6	E18	ND	84
CP0784	6/9/1999	11.6	E18	ND	84
CP0785	6/9/1999	5.9	E18	ND	84
CP0785	6/9/1999	8.6	E18	ND	84
CP0785	6/9/1999	11.6	E18	ND	84
CP0786	6/9/1999	9.1	E18	ND	84
CP0786	6/9/1999	11.4	E18	ND	84

Note: All post-ROD sample results (1996–1999) are presented in this table.
bgs = below ground surface
ND = not detected
ppbv = parts per billion by volume
ROD = record of decision
TCE = trichloroethene

This page intentionally left blank

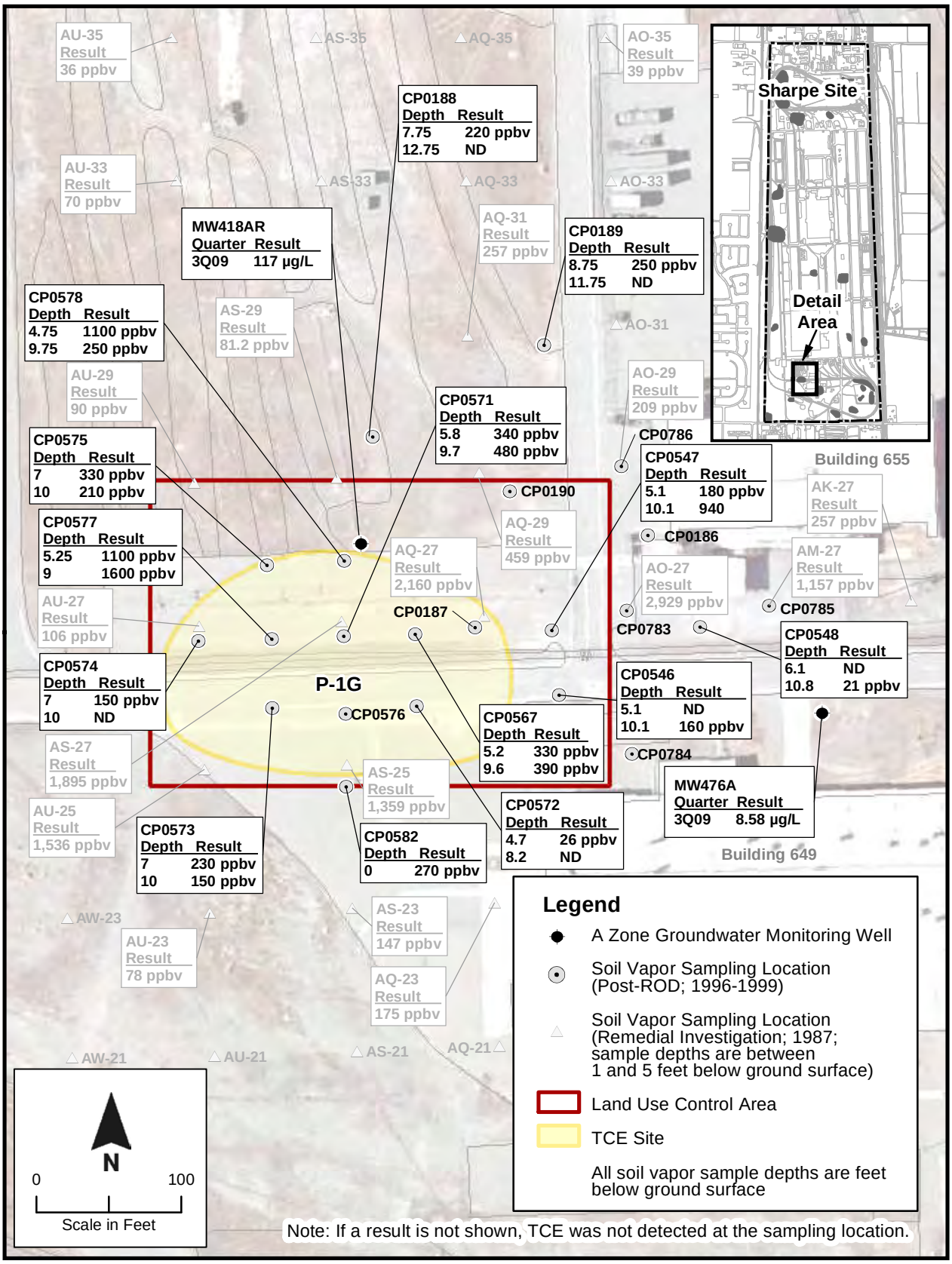


Figure 5-1. TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-1G, Sharpe Site

SITE P-2A

Conceptual Site Model

Site P-2A is located in the Central Area at the Sharpe Site (Figure 6-1). No structures are present at Site P-2A. The surface is covered with gravel, compacted soil, and the asphalt of B and C Streets.

Potential Sources: Historically, Site P-2A was used for drummed waste storage. No reports of waste disposal or releases have been identified for this site. The highest concentrations in soil vapor occur beneath the pavement of B Street; this suggests accidental spillage during loading/unloading of containers. The vadose zone beneath the site is composed of sand, silty sand, and silt.

Groundwater: Depths to groundwater measured in the vicinity of Site P-2A ranged from approximately 14 to 14.5 feet below ground surface (bgs) during 2008 and the first half of 2009. A Zone monitoring well MW441A, located in Site P-2A, did not have a detection of trichloroethene (TCE) or any other volatile organic compound (VOC) from the third quarter of 1997 through the third quarter of 2003, when it was last sampled.

Land Use: Site P-2A is not currently being used. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Vapor Sampling: Soil vapor at nine locations was sampled during the 1987 remedial investigation (RI) at Site P-2A (Figure 6-1). In two of the samples, concentrations of TCE were greater than 350 parts per billion by volume (ppbv). The maximum TCE soil vapor concentration detected during the RI was 1,413 ppbv. All RI soil vapor samples were collected at depths between 1 and 5 feet bgs. The *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) required additional characterization to determine whether vadose zone contamination at Site P-2A could be a future source of groundwater degradation (Environmental Science and Engineering, Inc. [ESE], 1996).

Post-ROD characterization of the eastern portion of Site P-2A occurred in 1996, with the completion of nine borings and the collection of 26 soil vapor samples at depths ranging from 4.25 to 14.25 feet bgs. TCE concentrations ranged from less than detection limits to 1,700 ppbv. Six of the 26 samples had TCE concentrations greater than the OU 2 ROD cleanup standard of 350 ppbv (Table 6-1, Figure 6-1) (Radian International, 1997a).

SVE Decision: The mass of TCE in the vadose zone in the eastern portion of Site P-2A was estimated to be approximately 0.18 pound (Radian International, 2000a). Migration modeling using VapourT and a groundwater mixing model was completed to evaluate the potential effect of this small amount of mass on groundwater. The model predicted that it is unlikely the small mass of TCE in the vadose zone at Site P-2A will increase the total time to remediate groundwater. In addition, a technical and economic feasibility analysis (TEFA) compared the cost of implementing and operating a soil vapor extraction (SVE) system to the incremental cost of groundwater remediation if the vadose zone contamination was not removed from the eastern portion of Site P-2A. The TEFA concluded that, although SVE at Site P-2A may be a technically feasible alternative, the predicted cost is not warranted when compared to the additional costs incurred if cleanup is solely achieved with the existing groundwater extraction and treatment system (Radian International, 2000a). Sample density and results were considered sufficient to reach the decision that SVE was not necessary to protect groundwater (Radian International, 2000a).

Additional Soil Vapor Sampling: Post-ROD characterization of the western portion of Site P-2A was completed in 2007. Four borings were completed, and eight soil vapor samples were collected at depths between 4.5 and 10 feet bgs. There was only one detection of TCE (36 ppbv), and it was less than the OU 2 ROD cleanup standard of 350 ppbv (Table 6-1, Figure 6-1) (URS, 2007a and 2009). Sampling density in the western portion of Site P-2A was considered sufficient to determine that SVE was not warranted in that area. TCE mass was not calculated for the western portion of Site P-2A because all soil vapor concentrations were less than the cleanup standard and no remediation was required.

Potential Site Risk: The analytical results from 1996 through 2007 were used to evaluate risk associated with the vapor intrusion pathway. Results for all VOCs used in the risk calculations are provided in Attachment B8 to Appendix B. Residential cumulative cancer risk estimates and residential noncancer hazard indices were calculated by the EPA screening method, the DTSC screening method, and the Johnson-Ettinger method using site-specific data (see details of these calculations in Appendix B, including discussion of the limitations with the three methods). The results for the three methods are shown in the table below.

Residential Risk and Hazard Estimates, Vapor Intrusion Pathway, Site P-2A			
	EPA Screening	**DTSC Screening**	**Site-Specific**
Cumulative cancer risk	7.6E-05	1.5E-05	5.3E-06
Hazard index	0.18	0.036	0.012

TCE contributes 99% of the risk via the vapor intrusion pathway. Tetrachloroethene and benzene also contribute to the risk.

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendations

Land use controls to prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing are recommended for soil at Site P-2A for the following reasons:

- Soil vapor samples collected in 1996 had TCE concentrations greater than the ROD-specified 350 ppbv cleanup standard; however, there is no evidence those concentrations are impacting groundwater.

- The site is open space. Hence, there is no unacceptable risk to current industrial receptors. However, estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1E-04 to 1E-06.

- The site is not ready for unlimited use and unrestricted exposure because of the potential risk by the vapor intrusion pathway.

Table 6-1. TCE in Soil Vapor, Post-ROD Sampling, Site P-2A, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
CP0236	7/12/1996	4.25	M18	ND	200
CP0236	7/12/1996	10.25	M18	ND	200
CP0236	7/12/1996	14.25	M18	ND	200
CP0237	7/12/1996	5.25	M18	ND	200
CP0237	7/12/1996	9.25	M18	ND	200
CP0239	7/12/1996	4.25	M18	ND	200
CP0239	7/12/1996	7.75	TO14	9.7	1.9
CP0239	7/12/1996	10.25	M18	ND	200
CP0240	7/15/1996	5.25	M18	1,700	200
CP0240	7/15/1996	8.75	M18	570	200
CP0240	7/15/1996	12.25	M18	510	200
CP0241	7/31/1996	5.25	M18	490 J	200
CP0241	7/31/1996	9.55	M18	620 J	200
CP0241	7/31/1996	13.75	M18	ND	200
CP0242	7/31/1996	6.25	M18	ND	200
CP0242	7/31/1996	9.25	M18	490	200
CP0242	7/31/1996	13.5	M18	ND	200
CP0243	8/1/1996	6.05	M18	280	200
CP0243	8/1/1996	10.25	M18	ND	200
CP0243	8/1/1996	11.75	M18	ND	200
CP0244	8/7/1996	5.25	M18	ND	200
CP0244	8/7/1996	9.25	M18	ND	200
CP0244	8/7/1996	13.25	M18	ND	200
CP0245	8/7/1996	5.5	M18	ND	200
CP0245	8/7/1996	9.25	M18	ND	200
CP0245	8/7/1996	13.65	M18	ND	200
CP1116	10/26/2007	6.5	TO15	ND	3.4
CP1116	10/26/2007	9	TO15	ND	3.3
CP1117	10/26/2007	5	TO15	ND	3.1
CP1117	10/26/2007	10	TO15	36	3.1
CP1118	10/26/2007	5	TO15	ND	3.1
CP1118	10/26/2007	9	TO15	ND	3.2
CP1119	10/26/2007	4.5	TO15	ND	3.2
CP1119	10/26/2007	9	TO15	ND	3

Notes: Post-ROD samples from the eastern portion of Site P-2A were collected in 1996.
Post-ROD samples from the western portion of Site P-2A were collected in 2007.

bgs = below ground surface
J = estimated concentration
ND = not detected
ppbv = parts per billion by volume
ROD = record of decision
TCE = trichloroethene

This page intentionally left blank

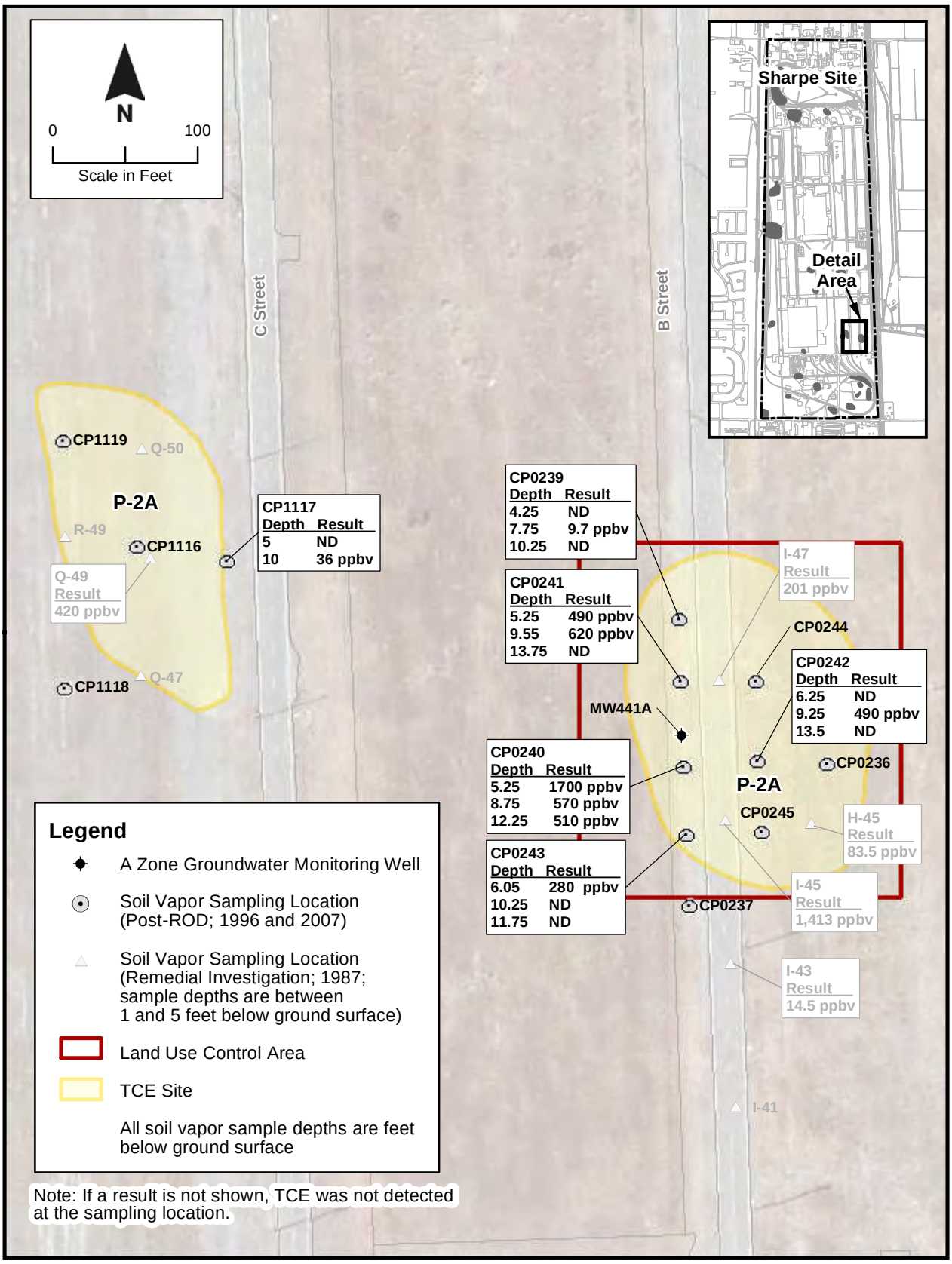


Figure 6-1. TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-2A, Sharpe Site

SITE P-2B

Conceptual Site Model

Site P-2B is located in the southwestern portion of the Central Area at the Sharpe Site (Figure 7-1). The surface of Site P-2B is currently covered with landscaping (grass) and compacted soil. The northern one-quarter of the site is covered by the Army and Air Force Exchange Service (AAFES) warehouse that was constructed in 2000.

Potential Sources: No waste disposal or releases have been reported in the area surrounding Site P-2B. The site was identified after trichloroethene (TCE) was detected in soil vapor samples collected during a widespread, exploratory grid sampling program in 1987. The vadose zone beneath the site is composed of sandy silt and silty clay.

Groundwater: Depths to groundwater measured in the vicinity of Site P-2B ranged from approximately 14.5 to 17 feet below ground surface (bgs) during 2008 and the first half of 2009. There are no monitoring wells at the site. In the fourth quarter of 2009, a non-operating extraction well, EWA1, downgradient from Site P-2B had a TCE concentration of 6.29 micrograms per liter (µg/L), which is slightly greater than the TCE aquifer cleanup level (ACL) of 5 µg/L. No other volatile organic compound (VOC) contaminants of concern were detected in groundwater greater than their respective ACLs in the fourth quarter of 2009.

Land Use: The northern portion of the site is covered by the AAFES warehouse, and the southern portion of the site is open space. Any future use of the site is expected to be industrial/warehouse.

CERCLA History

Soil Vapor Sampling: During the remedial investigation (RI) in 1987, nine samples were collected in a 200-foot by 200-foot grid within the area now identified as Site P-2B (Figure 7-1). The maximum TCE concentration among the nine samples was 247 parts per billion by volume (ppbv). All RI soil vapor samples were collected at depths between 1 and 5 feet bgs. Site P-2B was not included in the *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) as a site requiring remediation or further characterization. However, during preparation of the *Operable Unit 2 Remedial Design Work Plan*, Site P-2B was added to the characterization effort because a review of RI data indicated that this site may be degrading groundwater (Radian Corporation, 1996).

In the post-ROD characterization completed in 1996, 16 borings were completed and 38 soil vapor samples collected at depths between 4.25 and 16.15 feet bgs (Table 7-1, Figure 7-1). TCE at concentrations greater than the cleanup standard of 350 ppbv were detected in 3 of the 38 soil vapor samples (Radian International, 1997a).

At the request of the California Regional Water Quality Control Board−Central Valley Region, additional soil vapor samples were collected from three borings in 1999. All analytical results were less than the detection limit of 84 ppbv (Radian International, 2000a).

SVE Decision: The mass of TCE in the vadose zone at Site P-2B was estimated to be approximately 0.24 pound. Migration modeling using VapourT and a groundwater mixing model predicted that it is unlikely this small amount of TCE mass in the vadose zone will increase the total time to remediate groundwater. In addition, a technical and economic feasibility analysis (TEFA) compared the cost of implementing and operating a soil vapor extraction (SVE) system to the incremental cost of groundwater remediation if the vadose zone contamination at Site P-2B was not removed. The TEFA concluded that,

even though SVE at the site may be a technically feasible alternative, the predicted cost is not warranted when compared to the additional costs incurred if cleanup is solely achieved with the existing groundwater treatment system (Radian International, 2000a). Sample density and results were considered sufficient to reach the decision that SVE was not necessary to protect groundwater.

Potential Site Risk: The analytical results from 1996 through 1999 were used to evaluate risk associated with the vapor intrusion pathway. Results for all VOCs used in the risk calculations are provided in Attachment B9 to Appendix B. Residential cumulative cancer risk estimates and residential noncancer hazard indices were calculated by the EPA screening method, the DTSC screening method, and the Johnson-Ettinger method using site-specific data (see details of these calculations in Appendix B, including discussion of the limitations with the three methods). The results for the three methods are shown in the table below.

Residential Risk and Hazard Estimates, Vapor Intrusion Pathway, Site P-2B			
	EPA Screening	**DTSC Screening**	**Site-Specific**
Cumulative cancer risk	2.0E-04	4.0E-05	1.1E-05
Hazard index	15	3.0	1.7

TCE contributes approximately 12% of the risk by the vapor intrusion pathway. Carbon tetrachloride (CCl_4) (80%), tetrachloroethene (PCE) (5%), and 1,4-dioxane (1%) also contribute to the total risk. These cumulative results are based on the combined exposure to the maximum concentrations of all detected analytes, regardless of location, date of sampling, or frequency of detection. At Site P-2B, these maximums were measured at three different locations from two different sampling events: TCE was detected in July 1996 at CP0263; CCl_4 was detected in August 1996 at CP0272, and 1,4-dioxane and PCE were detected in August 1996 at location CP0267 (detected concentration data are provided in Attachment B17 of Appendix B; locations are shown on Figure 7-1). Over the history of sampling at Site P-2B, TCE was detected in 6 of 58 samples (including field duplicates), CCl_4 was detected in 2 of 58 samples, and PCE was detected in 1 of 58 samples; less sampling occurred for 1,4-dioxane (detected in 1 of 3 samples).

These cumulative risk estimates result from an assumed exposure scenario that is physically impossible (i.e., results are from locations that are at least 100 feet apart) and rely upon the available data which demonstrate a very low frequency of occurrence for TCE, the only contaminant of concern in soil gas at the Sharpe Site. The majority contributor to the cumulative risk at this site, CCl_4, is also detected at a very low frequency (3%). In combination, these factors result in cumulative risk estimates that are the absolute highest calculable values using existing data; the EPA screening risk estimate is outside of the EPA's risk management range of 1E-04 to 1E-06, but estimates derived from the other two methods are within that range.

Most of Site P-2B is open space; however, the northern one-quarter of the site is covered by the AAFES warehouse that was constructed after the post-ROD characterization sampling. Because VOCs were detected in one soil gas sample (CP0272) beneath the footprint of the AAFES warehouse and at two sample locations (CP0263 and CP0265) along the perimeter of the building, there is the potential for risk through the vapor intrusion pathway to employees who work in enclosed spaces within the southern portion of the warehouse. It should be noted that the floor of the warehouse consists of sealed concrete. DLA Installation Support at San Joaquin collected an air sample in the warehouse to assure that employees are not being exposed to VOCs from soil vapor beneath the building. The indoor air sample was collected in a 6-liter SUMMA canister with a 24-hour flow controller from 29 to 30 June 2010. The sample was collected approximately 40 feet north of the southern wall of the building at the approximate location of boring CP0272 (Figure 7-1). VOCs were not detected. A photoionization detector was also

used to collect field measurements in the area of sample collection, as well as along the floor at the southern wall of the building. VOCs were not detected. Assuming the results of the June 2010 sampling represent typical air quality in the building, there is no unacceptable risk to current industrial receptors (i.e., warehouse employees).

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

Land use controls to prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing are recommended for soil at Site P-2B for the following reasons:

- Soil vapor samples collected in 1996 had TCE concentrations greater than the ROD-specified 350 ppbv cleanup standard.

- Most of the site is open space; however, the northern one-quarter of the site is covered by the AAFES warehouse. DLA Installation Support at San Joaquin collected an indoor air sample in the warehouse to assure that employees are not being exposed to VOCs from soil vapor beneath the building; VOCs were not detected. There is no unacceptable risk to current industrial receptors.

- Estimated cancer risk levels modeled with site-specific data or with the DTSC screening calculation for the residential vapor intrusion pathway are within the risk management range of 1E-04 to 1E-06; the risk calculated with the EPA screening method exceeds the upper bound of the risk management range. Furthermore, the hazard indices for noncancer risk calculated by the three methods are greater than one.

- The site is not ready for unlimited use and unrestricted exposure because of the potential risk by the vapor intrusion pathway.

Table 7-1. TCE in Soil Vapor, Post-ROD Sampling, Site P-2B, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
CP0261	7/8/1996	10.25	M18	ND	200
CP0261	7/8/1996	14.75	M18	ND	200
CP0262	7/8/1996	10.25	M18	ND	200
CP0262	7/8/1996	13.05	M18	ND	200
CP0263	7/8/1996	10.75	M18	520	200
CP0264	7/9/1996	5.25	M18	ND	200
CP0264	7/9/1996	10.15	M18	ND	200
CP0264	7/9/1996	15.15	M18	ND	200
CP0265	7/9/1996	4.25	M18	420	200
CP0265	7/16/1996	10.25	TO14	3	1.4
CP0266	8/1/1996	10.25	M18	ND	200
CP0266	8/1/1996	15.15	M18	ND	200
CP0267	8/1/1996	6.25	TO14	7.9	0.88
CP0267	8/1/1996	12.55	M18	ND	200
CP0267	8/1/1996	15.25	M18	ND	200
CP0268	8/1/1996	5.65	M18	ND	200
CP0268	8/1/1996	14.15	M18	ND	200
CP0268	8/1/1996	16.15	M18	ND	200
CP0269	8/1/1996	5.25	M18	ND	200
CP0269	8/1/1996	9.05	M18	ND	200
CP0269	8/1/1996	15.75	M18	ND	200
CP0270	8/7/1996	5.25	M18	ND	200
CP0270	8/7/1996	10.25	M18	ND	200
CP0270	8/7/1996	14.25	M18	ND	200
CP0271	8/13/1996	6.15	M18	ND	200
CP0271	8/13/1996	9.55	M18	ND	200
CP0272	8/13/1996	9.25	M18	ND	200
CP0272	8/13/1996	12.75	M18	460	200
CP0273	8/13/1996	6.55	M18	ND	200
CP0273	8/13/1996	10.25	M18	ND	200
CP0273	8/13/1996	13.75	M18	290	200
CP0274	8/12/1996	5.75	M18	ND	200
CP0274	8/12/1996	10.75	M18	ND	200
CP0275	8/13/1996	5.75	M18	ND	200
CP0275	8/13/1996	10.25	M18	ND	200
CP0275	8/13/1996	13.25	M18	ND	200
CP0276	8/13/1996	6.25	M18	ND	200
CP0276	8/13/1996	10.25	M18	ND	200
CP0787	6/7/1999	6.1	E18	ND	84
CP0787	6/7/1999	9.6	E18	ND	84
CP0787	6/7/1999	11.6	E18	ND	84
CP0788	6/7/1999	6.6	E18	ND	84
CP0788	6/7/1999	9.6	E18	ND	84
CP0788	6/7/1999	11.6	E18	ND	84
CP0789	6/7/1999	6.1	E18	ND	84
CP0789	6/7/1999	9.1	E18	ND	84
CP0789	6/7/1999	11.9	E18	ND	84

Note: All post-ROD sample results (1996–1999) are presented in this table.

bgs = below ground surface
ND = not detected
ppbv = parts per billion by volume
ROD = record of decision
TCE = trichloroethene

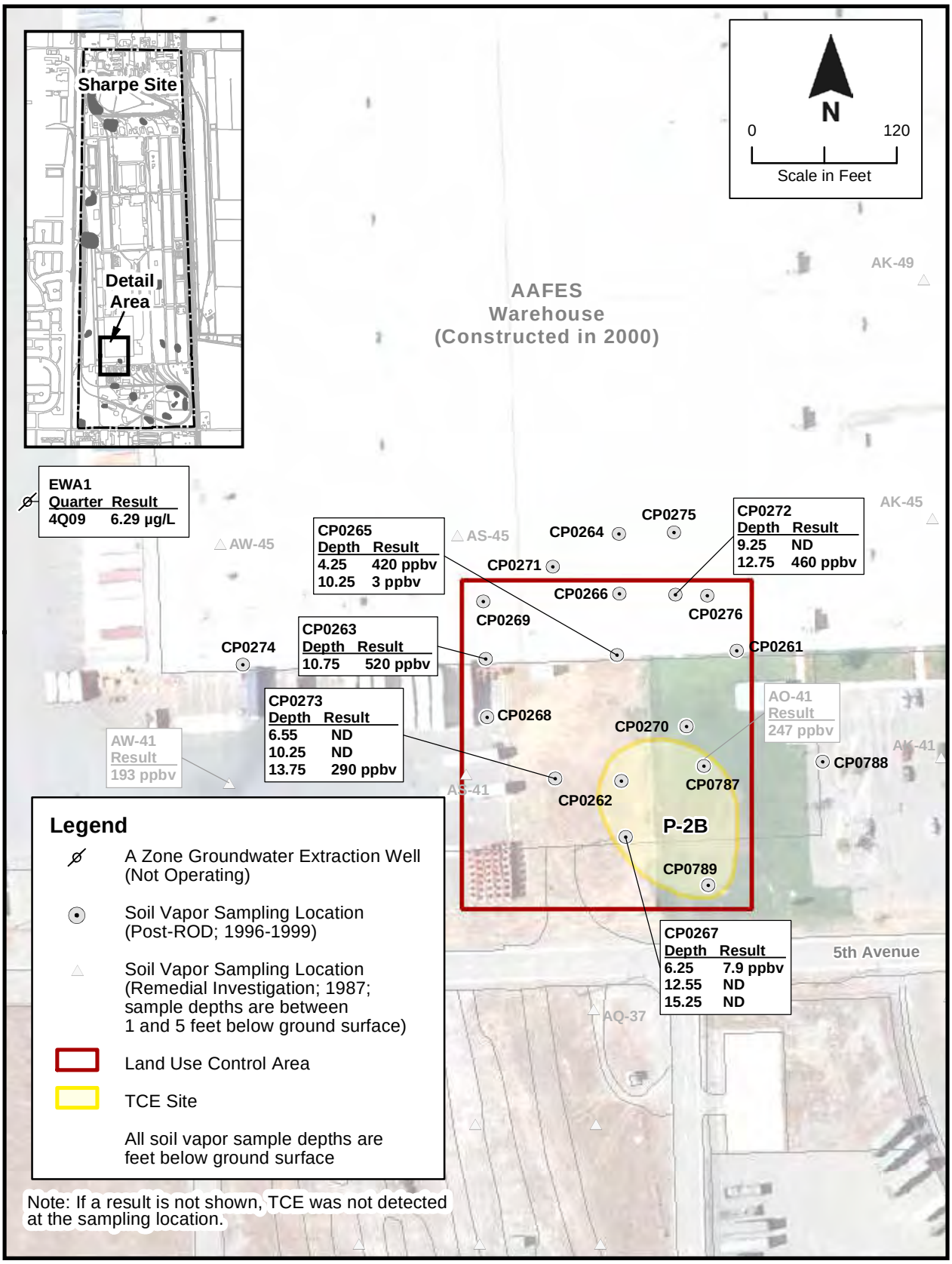


Figure 7-1. TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-2B, Sharpe Site

SITE P-3A

Conceptual Site Model

Site P-3A is in the southwestern portion of the Central Area at the Sharpe Site (Figure 8-1). It is located between Union Pacific Railroad tracks and outside storage for the Army and Air Force Exchange Service (AAFES) warehouse. An aircraft runway passed through the eastern side of the site until the AAFES warehouse was constructed in 2000. The surface of Site P-3A is covered with soil supporting natural grasses and contains evidence of active burrowing owl nests.

Potential Sources: No waste disposal or releases have been reported at Site P-3A. The site was identified after trichloroethene (TCE) was detected in soil vapor samples collected during a widespread, exploratory grid sampling program in 1987. The vadose zone beneath the site is composed of sand, silt, and clay.

Groundwater: Depths to groundwater measured in the vicinity of Site P-3A ranged from approximately 15.5 to 22 feet below ground surface (bgs) during 2008 and the first half of 2009. In 1996, TCE concentrations near the upper groundwater surface were 12 micrograms per liter (μg/L) at HydroPunch location CP0288 and 37 μg/L at CP0290 (Radian International, 1997b). In the first quarter of 2010, TCE was not detected in monitoring well MW407A (Figure 8-1) (URS, 2010b). At EWCA1, TCE was detected at a concentration of 5.39 μg/L, which is slightly greater than the 5 μg/L aquifer cleanup level (ACL).

Land Use: Site P-3A is not currently being used. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Vapor Sampling: During the remedial investigation (RI), 12 soil vapor samples were collected on a 100-foot by 100-foot grid plus step-ins from some grid locations at Site P-3A (Figure 8-1). Two of the samples, distributed across the site, had concentrations greater than 350 parts per billion by volume (ppbv) (Environmental Science and Engineering, Inc. [ESE], 1990). The maximum TCE concentration reported in soil vapor at Site P-3A was 1,546 ppbv. All RI soil vapor samples were collected at depths between 1 and 5 feet bgs. The *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) required further characterization to determine whether vadose zone TCE contamination could be a future source of groundwater degradation (ESE, 1996).

Post-ROD characterization in 1996 consisted of completing 13 borings and collecting 39 soil vapor samples from depths between 4.25 and 16.75 feet bgs. Three of the 39 samples had TCE concentrations greater than the 350 ppbv cleanup standard (Table 8-1, Figure 8-1) (Radian International, 1997a). In 1997, five additional locations (10 samples) were sampled to collect data for soil vapor modeling. One of the 10 samples had a TCE concentration greater than the cleanup standard (Radian International, 1997b).

The California Regional Water Quality Control Board−Central Valley Region requested that additional site characterization data be collected. In 1999, soil vapor samples were collected from three locations at depths between 6.6 and 12.9 feet bgs. TCE was not detected at concentrations above the detection limit of 84 ppbv (Radian International, 2000a).

SVE Decision: The mass of TCE in the vadose zone at Site P-3A was estimated to be approximately 0.15 pound in 1999. Migration modeling using VapourT and a groundwater mixing model predicted that much of the impact from Site P-3A vadose zone contamination had already taken place by 1997 and that it is unlikely the small amount of TCE mass in the vadose zone will increase the total time to remediate groundwater. In addition, a technical and economic feasibility analysis (TEFA) compared the cost of

implementing and operating a soil vapor extraction (SVE) system to the incremental cost of groundwater remediation if the vadose zone contamination at Site P-3A was not removed. The TEFA concluded that, although SVE at Site P-3A may be a technically feasible alternative, the predicted cost is not warranted when compared to the additional costs incurred if cleanup is solely achieved with the existing groundwater treatment system (Radian International, 2000a). Sample density and results were considered sufficient to reach the decision that SVE was not necessary to protect groundwater.

Potential Site Risk: The analytical results from 1996 through 1999 were used to evaluate risk associated with the vapor intrusion pathway. Results for all volatile organic compounds (VOCs) used in the risk calculations are provided in Attachment B10 to Appendix B. Residential cumulative cancer risk estimates and residential noncancer hazard indices were calculated by the EPA screening method, the DTSC screening method, and the Johnson-Ettinger method using site-specific data (see details of these calculations in Appendix B, including discussion of the limitations with the three methods). The results for the three methods are shown in the table below.

Residential Risk and Hazard Estimates, Vapor Intrusion Pathway, Site P-3A			
	EPA Screening	**DTSC Screening**	**Site-Specific**
Cumulative cancer risk	3.2E-05	6.4E-06	3.3E-06
Hazard index	0.15	0.029	0.012

TCE contributes approximately 96% of the risk by the vapor intrusion pathway. Tetrachloroethene, benzene, and ethylbenzene also contribute to the risk.

Burrowing owls, which have been observed to inhabit Site P-3A, constitute a valued ecological resource that is present at the Sharpe Site. Conceivably, if burrowing owls were to occupy burrows in areas of residual TCE contamination in soil gas, the birds could be exposed via inhalation of burrow air. Ensuring protection of burrowing owls was addressed by DTSC and the California Department of Fish and Game (CDFG). Inhalation toxicity in birds exposed to TCE has not been studied. Therefore, these agencies estimated risk from inhalation for an alternative burrowing animal, the California ground squirrel. They used the lower (i.e., more-protective) of two published no-effect toxicity values (Gallegos et al., 2007; MWH, 2010) for burrowing mammals. The agencies compared the maximum residual TCE concentration at Site P-3A to the toxicity value, and the ratio of exposure concentration to toxicity concentration was less than 1. A ratio less than one indicates that exposure is less than the no-effect toxicity value, and indicates no ecological hazard. DTSC and CDFG concluded that there is de minimis (inconsequential) inhalation risk to a surrogate burrow-occupying receptor—the California ground squirrel—based on the exposure:toxicity ratio method of indicating ecological hazard (DTSC and CDFG, 2010). Based on this information, there are no mitigative measures necessary to protect burrowing owls at Site P-3A.

Recommendation

No further action is recommended for soil at Site P-3A based on the following lines of evidence:

- There is no continuing source of contamination.
- The total TCE mass estimated in the vadose zone in 1999 was 0.15 pound, and the TEFA concluded it is unlikely the small amount of mass in the vadose zone will increase the total time to remediate groundwater. (The TCE concentration in groundwater at EWCA1, an operating extraction well, is only slightly above the ACL in 2010; TCE concentrations have shown a statistically significant decreasing trend since the 1990s.)

- Sample density at the site was considered adequate to reach a decision that SVE was not required to protect groundwater and to propose no further action.

- TCE concentrations in soil vapor in 1996 and 1997 were widely distributed horizontally and vertically in the vadose zone at the site.

- The site is open space. Hence, there is no unacceptable risk to current industrial receptors. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1E-04 to 1E-06, and the estimated noncancer hazard indices are less than 1.

- Any remaining VOC mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors.

Table 8-1. TCE in Soil Vapor, Post-ROD Sampling, Site P-3A, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
CP0286	7/10/1996	4.75	M18	420	200
CP0286	7/10/1996	11.25	M18	570	200
CP0286	7/10/1996	13.25	M18	ND	200
CP0287	7/10/1996	5.25	M18	340	200
CP0287	7/10/1996	9.75	M18	ND	200
CP0287	7/10/1996	14.5	M18	ND	200
CP0288	7/11/1996	5.25	M18	ND	200
CP0288	7/11/1996	9.75	TO14	36	2.8
CP0288	7/11/1996	12.75	M18	ND	200
CP0289	7/11/1996	4.75	M18	670	200
CP0289	7/11/1996	9.75	M18	ND	200
CP0289	7/11/1996	12.25	M18	ND	200
CP0290	7/11/1996	4.25	M18	ND	200
CP0290	7/11/1996	9.25	M18	ND	200
CP0290	7/11/1996	12.25	M18	ND	200
CP0291	8/1/1996	9.05	M18	ND	200
CP0291	8/1/1996	13.5	M18	ND	200
CP0291	8/1/1996	16.75	M18	ND	200
CP0292	8/1/1996	6.15	M18	ND	200
CP0292	8/1/1996	9.6	M18	ND	200
CP0292	8/1/1996	12.75	M18	ND	200
CP0293	8/1/1996	9.65	M18	ND	200
CP0293	8/1/1996	13.25	TO14	13	0.88
CP0293	8/1/1996	15.25	M18	ND	200
CP0294	8/7/1996	5.25	M18	ND	200
CP0294	8/7/1996	9.25	M18	ND	200
CP0294	8/7/1996	13.25	M18	ND	200
CP0295	8/8/1996	6.75	M18	ND	200
CP0295	8/8/1996	10.55	M18	ND	200
CP0295	8/8/1996	14.55	M18	ND	200
CP0296	8/8/1996	8.95	M18	200	200
CP0296	8/8/1996	11.55	TO14	51	0.39
CP0296	8/8/1996	13.75	M18	ND	200
CP0297	8/8/1996	9.45	M18	ND	200
CP0297	8/8/1996	11.75	M18	ND	200
CP0297	8/8/1996	13.25	M18	ND	200
CP0298	8/12/1996	7.05	TO14	5	0.9
CP0298	8/12/1996	10.05	M18	ND	200
CP0298	8/12/1996	13.75	M18	ND	200
CP0549	3/13/1997	7.1	E18	ND	130
CP0549	3/13/1997	13	E18	120	110
CP0550	3/13/1997	5.6	E18	ND	130
CP0550	3/13/1997	12.6	E18	140	130
CP0551	3/13/1997	5.6	E18	480	88
CP0551	3/13/1997	12.1	E18	200	130
CP0569	4/5/1997	6.7	E18	ND	120
CP0569	4/5/1997	13	E18	ND	120
CP0570	4/5/1997	5.7	E18	ND	130

Table 8-1. (Continued)

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
CP0570	4/5/1997	13.2	E18	ND	100
CP0805	6/8/1999	6.6	E18	ND	84
CP0805	6/8/1999	10.1	E18	ND	84
CP0805	6/8/1999	12.9	E18	ND	84
CP0806	6/8/1999	8.6	E18	ND	84
CP0809	6/10/1999	9.8	E18	ND	84
CP0809	6/10/1999	9.8	E18	ND	84

Note: All post-ROD sample results (1996–1999) are presented in this table.

bgs = below ground surface
ND = not detected
ppbv = parts per billion by volume
ROD = record of decision
TCE = trichloroethene

This page intentionally left blank

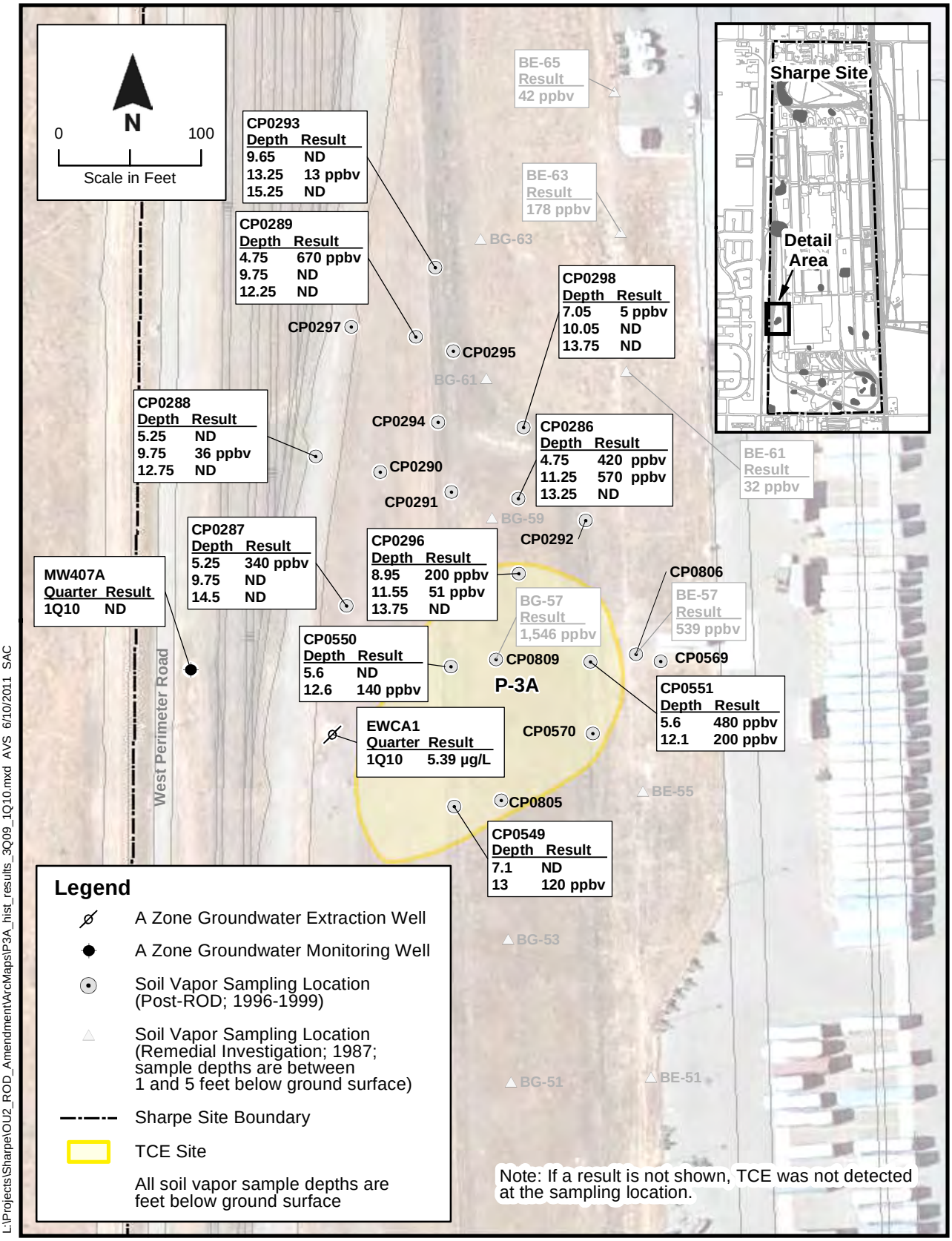


Figure 8-1. TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-3A, Sharpe Site

SITE P-4A

Conceptual Site Model

Site P-4A is located in the eastern portion of the Central Area at the Sharpe Site (Figure 9-1). The surface of Site P-4A consists of compacted soil and gravel. No structures are present at Site P-4A.

Potential Sources: There is no known history of waste disposal at Site P-4A; a darkened area of the soil surface was noted in a 1952 aerial photograph. The site was identified after trichloroethene (TCE) was detected in soil vapor samples collected during a widespread, exploratory grid sampling program in 1987. The vadose zone beneath the site is composed of sandy silt, silty clay, and clayey silt.

Groundwater: Depths to groundwater measured in the vicinity of Site P-4A ranged from approximately 13 to 16.5 feet below ground surface (bgs) during 2008 and the first half of 2009. It can be assumed that volatile organic compound (VOC) contamination is present in A Zone groundwater beneath the site, even though there are no monitoring wells at the site. At monitoring well MW443A downgradient to the northwest of Site P-4A, the TCE concentration was 28.1 micrograms per liter (µg/L) in the third quarter of 2009 (Figure 9-1). This concentration exceeds the TCE aquifer cleanup level of 5 µg/L. TCE was detected at 6.30 µg/L and 6.70 µg/L in HydroPunch samples collected at CP0315 and CP0313, respectively, in July 1996 (Radian International, 1997a).

Land Use: Site P-4A is not currently being used. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Vapor Sampling: In 1987, 15 soil vapor samples were collected on a 90-foot by 180-foot grid over the area that includes Site P-4A (Figure 9-1). Nine of the samples had TCE concentrations greater than 350 parts per billion by volume (ppbv). The maximum TCE soil vapor concentration at Site P-4A was 3,191 ppbv. All remedial investigation (RI) soil vapor samples were collected at depths between 1 and 5 feet bgs. The *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) required further characterization of Site P-4A to determine whether vadose zone TCE contamination could be a future source of groundwater degradation (Environmental Science and Engineering, Inc. [ESE], 1996).

During the 1996 and 1997 post-ROD field investigations, 19 soil vapor samples were collected from eight locations at depths between approximately 3 and 13 feet bgs. All concentrations were less than detection limits, with the exception of a 190 ppbv result (Table 9-1, Figure 9-1) (Radian International, 1997a; 1997b).

At the request of the California Regional Water Quality Control Board–Central Valley Region, soil vapor samples were collected from two additional locations in 1999 to resolve differences between the 1987 RI data and the 1996/1997 characterization data. All analytical results were less than the detection limit of 84 ppbv (Radian International, 2000a) (Table 9-1).

SVE Decision: Results of samples collected after 1987 indicated that there was no threat to groundwater quality from Site P-4A because all concentrations were less than the vadose zone cleanup standard of 350 ppbv. Sample density was considered sufficient to reach the decision that SVE was not necessary to protect groundwater (Radian International, 2000a). TCE mass was not calculated for Site P-4A because all soil vapor concentrations were less than the cleanup standard and no remediation was required.

Potential Site Risk: The analytical results from 1995 through 1999 were used to evaluate risk associated with the vapor intrusion pathway. Results for all VOCs used in the risk calculations are provided in Attachment B11 to Appendix B. Residential cumulative cancer risk estimates and residential noncancer hazard indices were calculated by the EPA screening method, the DTSC screening method, and the Johnson-Ettinger method using site-specific data (see details of these calculations in Appendix B, including discussion of the limitations with the three methods). The results for the three methods are shown in the table below.

Residential Risk and Hazard Estimates, Vapor Intrusion Pathway, Site P-4A			
	EPA Screening	**DTSC Screening**	**Site-Specific**
Cumulative cancer risk	8.4E-06	1.7E-06	6.4E-07
Hazard index	0.068	0.014	0.0067

TCE contributes approximately 99.4% of the risk by the vapor intrusion pathway.

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

No further action is recommended for soil at Site P-4A based on the following lines of evidence:

- There is no continuing source of contamination.
- The only soil vapor concentration (190 ppbv at CP0559) detected after 1987 is probably the result of volatilization from a TCE plume in A Zone groundwater.
- Sample density at the site was considered adequate to reach a decision that SVE was not required to protect groundwater and to propose no further action.
- Analytical results of soil vapor samples collected after 1987 were less than detection limits except for one TCE detection (190 ppbv); consequently, the remaining TCE mass was not estimated.
- The site is open space. Hence, there is no unacceptable risk to current industrial receptors. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within or below the risk management range of 1E-04 to 1E-06, and the estimated noncancer hazard indices are less than 1.
- Any remaining TCE mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors.

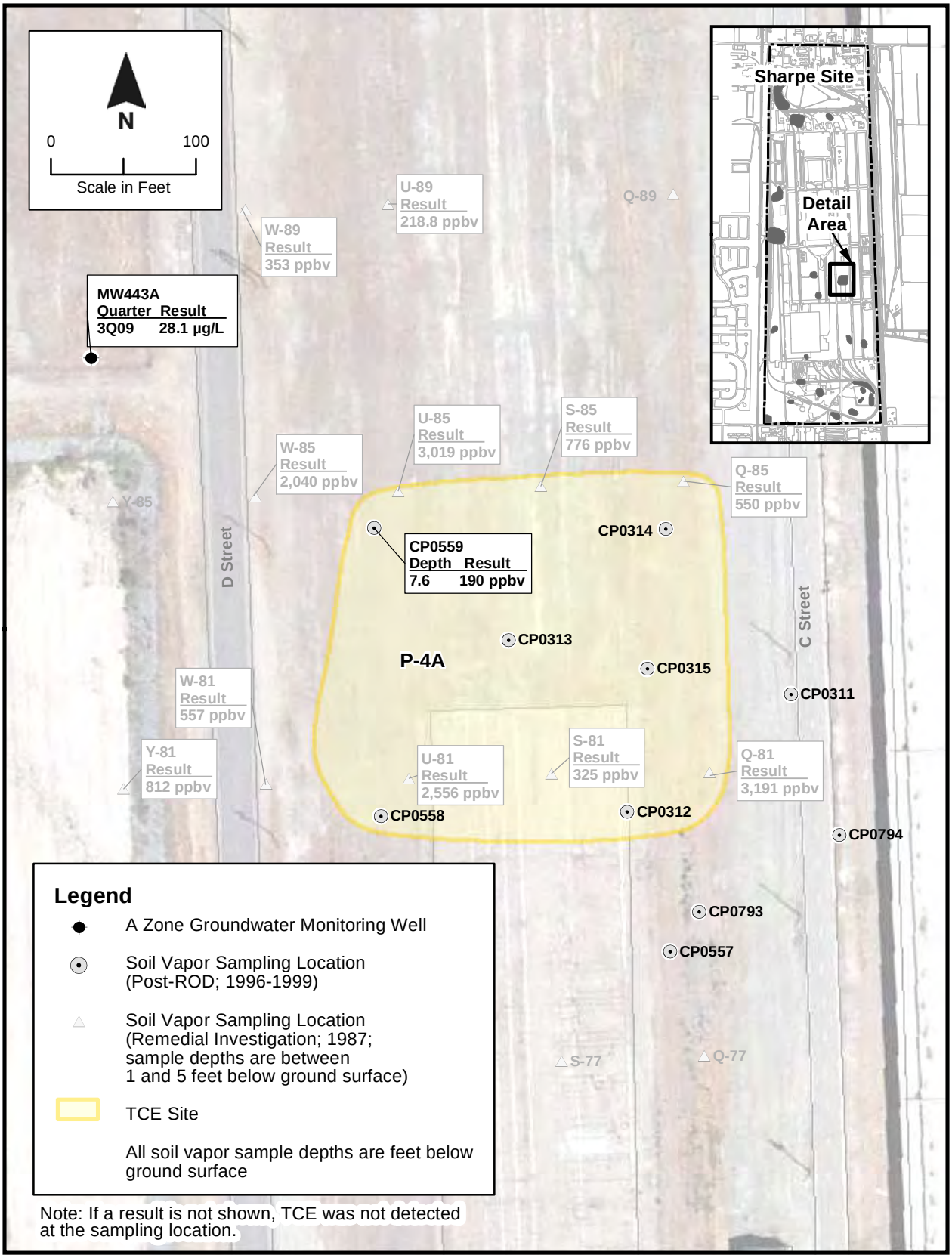
Table 9-1. TCE in Soil Vapor, Post-ROD Sampling, Site P-4A, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
CP0311	7/12/1996	5.25	M18	ND	200
CP0311	7/12/1996	9.75	M18	ND	200
CP0311	7/12/1996	12.75	M18	ND	200
CP0312	7/12/1996	4.25	M18	ND	200
CP0312	7/12/1996	8.25	M18	ND	200
CP0312	7/12/1996	12.5	M18	ND	200
CP0313	7/12/1996	3.75	M18	ND	200
CP0313	7/12/1996	10.75	M18	ND	200
CP0313	7/12/1996	13.25	M18	ND	200
CP0314	7/12/1996	3.75	M18	ND	200
CP0314	7/12/1996	9.25	M18	ND	200
CP0314	7/12/1996	12.25	M18	ND	200
CP0315	7/12/1996	5.25	M18	ND	200
CP0315	7/12/1996	10.25	M18	ND	200
CP0315	7/12/1996	12.25	M18	ND	200
CP0557	3/12/1997	6.1	E18	ND	110
CP0558	3/11/1997	5.2	E18	ND	100
CP0558	3/11/1997	13.6	E18	ND	110
CP0559	3/11/1997	7.6	E18	190	120
CP0793	6/7/1999	7.8	E18	ND	84
CP0793	6/7/1999	10.6	E18	ND	84
CP0793	6/7/1999	12.8	E18	ND	84
CP0794	6/7/1999	5.5	E18	ND	84
CP0794	6/7/1999	9.1	E18	ND	84
CP0794	6/7/1999	11.1	E18	ND	84

Note: All post-ROD sample results (1996–1999) are presented in this table.

bgs = below ground surface
ND = not detected
ppbv = parts per billion by volume
ROD = record of decision
TCE = trichloroethene

This page intentionally left blank



L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\P4A_hist_results_3Q09_1Q10.mxd AVS 6/10/2011 SAC

Figure 9-1. TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-4A, Sharpe Site

SITE P-4B

Conceptual Site Model

Site P-4B is located in the central portion of the Central Area at the Sharpe Site, east of the former runway (Figure 10-1). The surface of Site P-4B is covered with asphalt, gravel, and compacted soil.

Potential Sources: There were no reports of waste releases, no historical excavation/burial, and no soil staining identified in the Site P-4B area. The site was identified after trichloroethene (TCE) was detected in soil vapor samples collected during a widespread, exploratory grid sampling program in 1987. Historical reports of rail spur lines running through the area encompassing Site P-4B suggest a potential contaminant source associated with railroad car loading, unloading, and/or storage (Environmental Science and Engineering, Inc. [ESE], 1990). The vadose zone beneath the site is composed of sandy silt and silty clay.

Groundwater: Depths to groundwater measured in the vicinity of Site P-4B ranged from approximately 13.5 to 16.5 feet below ground surface (bgs) during 2008 and the first half of 2009. Three monitoring wells are just outside Site P-4B. MW443A is upgradient to the east, MW453A is downgradient to the west, and MW457A is cross-gradient to the northeast. A TCE plume extends under the site in the A Zone. In the third quarter of 2009, MW443A had a TCE concentration of 28.1 micrograms per liter (μg/L); MW453A had a concentration of 11.4 μg/L; and MW457A had a concentration of 13.2 μg/L. These concentrations are greater than the TCE aquifer cleanup level of 5 μg/L.

Land Use: Site P-4B is being used for parking of trailer trucks and portable storage containers. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Vapor Sampling: Twenty-two soil vapor samples were collected across the site in a 100-foot by 200-foot grid plus step-in locations during the 1987 remedial investigation (RI) at Site P-4B (Figure 10-1) (ESE, 1990). Four of the samples had TCE concentrations exceeding 350 parts per billion by volume (ppbv). The maximum TCE concentration detected in soil vapor was 1,177 ppbv. All RI soil vapor samples were collected from 1 to 5 feet bgs. The *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) required additional characterization to determine whether vadose zone contamination at Site P-4B could be a future source of groundwater degradation (ESE, 1996).

The first post-ROD investigation took place in 1996. Three of the 25 soil vapor samples had TCE concentrations greater than the OU 2 ROD cleanup standard of 350 ppbv (Radian International, 1997a). In 1997, additional data were collected for modeling purposes (Radian International, 1997b). Table 10-1 and Figure 10-1 provide all post-ROD data.

In 1999, soil vapor samples were collected at the request of the California Regional Water Quality Control Board−Central Valley Region to resolve differences between the 1987 RI data, the 1996 site characterization data, and the 1997 modeling data. TCE concentrations were less than the detection limit of 84 ppbv in seven of the eight samples collected; the TCE concentration in the eighth sample was 540 ppbv (Radian International, 2000a).

Two rounds of follow-up sampling were completed in July and November/December of 2000 to define vadose zone TCE concentrations at Site P-4B. Forty-eight soil vapor samples were collected from 30 boring locations at depths between 6.5 and 11.5 feet bgs. Seven of the 48 samples had TCE

concentrations greater than or equal to the cleanup standard (Table 10-1, Figure 10-1) (Radian International, 2000a).

SVE Decision: The mass of TCE in the vadose zone at Site P-4B was estimated to be approximately 0.14 pound. Migration modeling using VapourT and a groundwater mixing model predicted that it is unlikely the small amount of TCE mass in the vadose zone will increase the total time to remediate groundwater beneath the site. In addition, a technical and economic feasibility analysis (TEFA) compared the cost of implementing and operating a soil vapor extraction (SVE) system to the incremental cost of groundwater remediation if the vadose zone contamination was not removed. The TEFA concluded that, although SVE at Site P-4B may be a technically feasible alternative, the predicted cost is not warranted when compared to the additional costs incurred if cleanup is solely achieved with the existing groundwater treatment system (Radian International, 2000a). Therefore, SVE was not implemented at Site P-4B.

Potential Site Risk: The analytical results from 1996 through 2000 were used to evaluate risk associated with the vapor intrusion pathway. Results for all volatile organic compounds used in the risk calculations are provided in Attachment B12 to Appendix B. Residential cumulative cancer risk estimates and residential noncancer hazard indices were calculated by the EPA screening method, the DTSC screening method, and the Johnson-Ettinger method using site-specific data (see details of these calculations in Appendix B, including discussion of the limitations with the three methods). The results for the three methods are shown in the table below.

Residential Risk and Hazard Estimates, Vapor Intrusion Pathway, Site P-4B			
	EPA Screening	**DTSC Screening**	**Site-Specific**
Cumulative cancer risk	1.6E-04	3.2E-05	9.4E-06
Hazard index	1.8	0.37	0.099

TCE contributes approximately 77% of the risk by the vapor intrusion pathway. Ethylbenzene, chloroform, 1,4-dioxane, and benzene also contribute to the risk.

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

Land use controls to prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing are recommended for soil at Site P-4B for the following reasons:

- Soil vapor samples collected in 2000 had concentrations greater than the ROD-specified 350 ppbv cleanup standard. There is a groundwater plume migrating beneath the site from an upgradient source. Most of the samples collected below 11.5 feet, 2 to 5 feet above the groundwater surface, had no detections of TCE; therefore, the evidence suggests the groundwater plume is not contributing to soil vapor contamination.

- The site is open space. Hence, there is no unacceptable risk to current industrial receptors. Estimated cancer risk levels modeled with site-specific data or with the DTSC screening calculation for the residential vapor intrusion pathway are within the risk management range of 1E-04 to 1E-06, and noncancer hazard indices for those two methods are less than one. The risk

calculated with the EPA screening method exceeds the upper bound of the management range, and the hazard index is greater than one.

- The site is not ready for unlimited use and unrestricted exposure because of the potential risk by the vapor intrusion pathway.

Table 10-1. TCE in Soil Vapor, Post-ROD Sampling, Site P-4B, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
CP0336	7/15/1996	4.25	M18	320	200
CP0336	7/15/1996	9.75	M18	360	200
CP0336	7/15/1996	14.25	M18	ND	200
CP0337	7/15/1996	5.25	M18	ND	200
CP0337	7/15/1996	9.25	M18	ND	200
CP0337	7/15/1996	12.25	M18	ND	200
CP0338	7/15/1996	5.25	M18	ND	200
CP0338	7/15/1996	9.25	M18	360	200
CP0338	7/15/1996	12.25	M18	ND	200
CP0339	7/15/1996	5.25	M18	ND	200
CP0339	7/15/1996	7.75	M18	ND	200
CP0339	7/15/1996	11.75	M18	ND	200
CP0340	7/16/1996	5.25	M18	270	200
CP0340	7/15/1996	8.75	M18	ND	200
CP0340	7/15/1996	12.85	M18	ND	200
CP0341	8/1/1996	8.25	M18	ND	200
CP0341	8/1/1996	14.65	M18	ND	200
CP0341	8/1/1996	16.65	M18	ND	200
CP0342	8/2/1996	6.75	TO14	280	0.88
CP0342	8/2/1996	12.75	M18	ND	200
CP0342	8/2/1996	14.75	M18	ND	200
CP0343	8/1/1996	7.75	M18	430	200
CP0344	8/1/1996	10.5	M18	ND	200
CP0344	8/1/1996	13.05	M18	ND	200
CP0344	8/1/1996	15.25	M18	ND	200
CP0555	3/12/1997	4.1	E18	210	120
CP0555	3/12/1997	10.1	E18	310	92
CP0556	3/12/1997	6.1	E18	220	120
CP0790	6/8/1999	6.6	E18	ND	84
CP0790	6/8/1999	10.6	E18	ND	84
CP0790	6/8/1999	12.1	E18	ND	84
CP0791	6/8/1999	6.6	E18	ND	84
CP0791	6/8/1999	9.6	E18	ND	84
CP0791	6/8/1999	11.6	E18	ND	84
CP0792	6/8/1999	8.6	TO14	540	2
CP0792	6/8/1999	11.6	E18	ND	84
CP0821	7/25/2000	8.5	TO14	ND	1.5
CP0821	7/25/2000	11.5	TO14	5.1	0.54
CP0822	7/25/2000	6.5	TO14	ND	2
CP0822	7/25/2000	8.5	TO14	66	1.6
CP0822	7/25/2000	11.5	TO14	ND	2.2
CP0823	7/25/2000	6.5	TO14	ND	2.1
CP0823	7/25/2000	8.5	TO14	150	1.7
CP0824	7/25/2000	6.5	TO14	180	1.6
CP0824	7/25/2000	8.5	TO14	ND	1.6
CP0824	7/25/2000	11.5	TO14	130 J	2.5
CP0825	11/1/2000	8.5	M18MS	ND	100
CP0826	11/1/2000	6.5	M18MS	350	100

Table 10-1. (Continued)

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
CP0826	11/1/2000	11.5	M18MS	ND	100
CP0827	11/1/2000	6.5	M18MS	ND	100
CP0827	11/1/2000	8.5	M18MS	ND	100
CP0827	11/1/2000	11.5	M18MS	ND	100
CP0828	11/1/2000	6.5	M18MS	ND	100
CP0828	11/1/2000	8.5	M18MS	ND	100
CP0828	11/1/2000	11.5	M18MS	ND	100
CP0829	7/25/2000	8.5	TO14	100	2.8
CP0830	7/25/2000	6.5	TO14	610	2.6
CP0830	7/25/2000	8.5	TO14	710	1.9
CP0831	7/25/2000	6.5	TO14	2,700	3.3
CP0832	7/25/2000	8.5	TO14	640	1.5
CP0834	7/25/2000	8.5	TO14	110	1.6
CP0835	7/25/2000	8.5	TO14	970	1.1
CP0836	7/25/2000	8.5	TO14	230	0.34
CP0838	7/25/2000	8.5	TO14	100	0.34
CP0961	11/1/2000	8.5	M18MS	ND	100
CP0962	11/1/2000	6.5	M18MS	420	100
CP0962	11/1/2000	8.5	TO14	270 J+	1.4
CP0963	11/1/2000	8.5	M18MS	ND	100
CP0965	11/1/2000	6.5	M18MS	200	100
CP0966	11/1/2000	6.5	M18MS	ND	100
CP0968	12/15/2000	6.5	M18MS	ND	100
CP0968	11/1/2000	8.5	M18MS	ND	100
CP0969	11/1/2000	6.5	M18MS	ND	100
CP0970	11/1/2000	8.5	M18MS	ND	100
CP0970	11/1/2000	11.5	TO14	27 J+	1.2
CP0971	11/1/2000	6.5	M18MS	ND	100
CP0972	11/1/2000	8.5	M18MS	ND	100
CP0972	11/1/2000	11.5	M18MS	ND	100
CP0973	11/1/2000	11.5	M18MS	ND	100
CP0974	11/1/2000	8.5	M18MS	ND	100
CP0974	11/1/2000	11.5	M18MS	ND	100
CP0981	12/13/2000	6.5	M18MS	ND	100
CP0981	12/15/2000	6.5	M18MS	ND	100
CP0982	12/13/2000	8.5	M18MS	ND	100

Note: All post-ROD sample results (1996–2000) are presented in this table.

bgs = below ground surface
ND = not detected
J = estimated concentration
J+ = estimated concentration, biased high
ppbv = parts per billion by volume
ROD = record of decision
TCE = trichloroethene

This page intentionally left blank

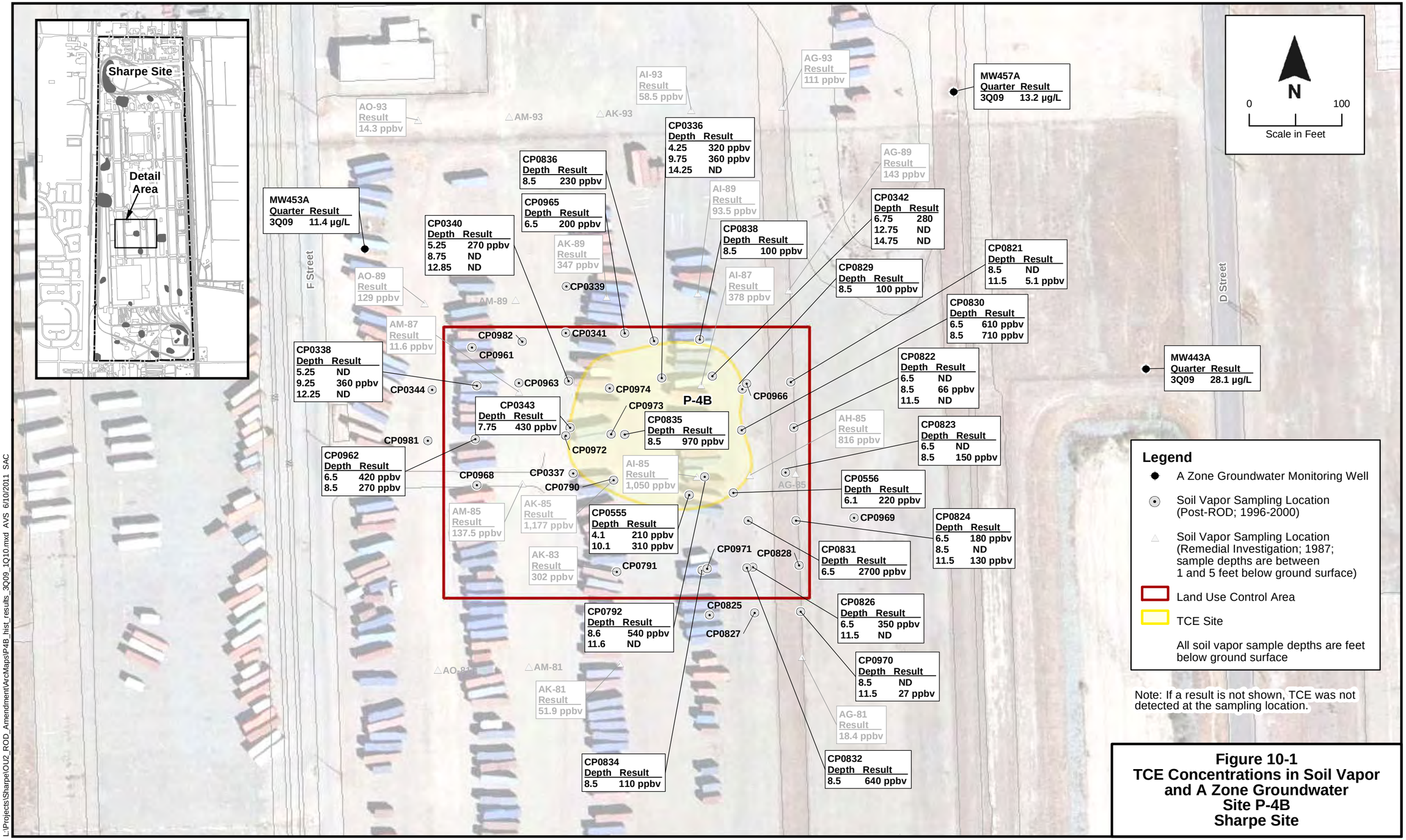


Figure 10-1
TCE Concentrations in Soil Vapor and A Zone Groundwater
Site P-4B
Sharpe Site

SITE P-4C

Conceptual Site Model

Site P-4C, located in the southern portion of the Central Area at the Sharpe Site (Figure 11-1), was previously used as an open storage lot for piping, lumber, vehicles, scrap metal, etc. The surface of Site P-4C is covered with grasses, compacted soil, gravel, and asphalt. No structures are present at Site P-4C.

Potential Sources: There is no known history of waste disposal at Site P-4C and no evidence of any discharges. The site was identified after trichloroethene (TCE) was detected in soil vapor samples collected during a widespread, exploratory grid sampling program in 1987. The vadose zone beneath the site is composed of sandy silt, silty clay, and clayey silt.

Groundwater: Depths to groundwater measured in the vicinity of Site P-4C ranged from approximately 13 to 17.5 feet below ground surface (bgs) during 2008 and the first half of 2009. The third quarter 2009 TCE concentration of 3.87 micrograms per liter (μg/L) at MW442A (Figure 11-1) suggests that the groundwater plume is not present in the A Zone beneath the site at concentrations greater than the aquifer cleanup level (ACL) of 5 μg/L. No other volatile organic compounds (VOCs) were detected in groundwater in the third quarter of 2009.

Land Use: Site P-4C is not being used at this time. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Vapor Sampling: Site P-4C was identified as a site on the basis of results from 13 samples collected on a 100-foot by 100-foot grid during the 1987 remedial investigation (RI) (Figure 11-1). Two of the samples had TCE concentrations greater than 350 parts per billion by volume (ppbv). The maximum TCE concentration was 1,609 parts per billion by volume (ppbv). All RI soil vapor samples were collected at depths between 1 and 5 feet bgs. Site P-4C was selected for additional characterization after the *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) (Environmental Science and Engineering [ESE], 1996) to determine whether vadose zone TCE contamination at Site P-4C could be a future source of groundwater degradation.

Post-ROD soil vapor investigations took place in 1996 and 1997. Seventeen samples were collected from eight borings at depths between approximately 4 and 15 feet bgs. All results were less than the OU 2 ROD cleanup standard of 350 ppbv (Radian International, 1997a; 1997b). In fact, 15 of the 17 sample results were less than detection limits (Table 11-1, Figure 11-1). The two detections were each less than 6 ppbv.

In 1999, soil vapor samples were collected from an additional boring at the request of the California Regional Water Quality Control Board−Central Valley Region to resolve differences between the 1987 RI data and the 1996/1997 characterization data. The 1999 analytical results were less than the detection limit of 84 ppbv (Radian International, 2000a). After that sampling, the sampling density was considered sufficient to make a decision about Site P-4C.

SVE Decision: With TCE concentrations detected in only two samples and no results exceeding the cleanup standard 10 years after the site was first sampled, the decision was made that remediation by soil vapor extraction (SVE) was not needed (Radian International, 2000a). TCE mass was not calculated for

Site P-4C because all soil vapor concentrations were less than the cleanup standard and no remediation was required.

Potential Site Risk: The 1996-1999 post-ROD sample results were used to evaluate risk associated with the vapor intrusion pathway. Results for all VOCs used in the risk calculations are provided in Attachment B13 to Appendix B. Residential cumulative cancer risk estimates and residential noncancer hazard indices were calculated by the EPA screening method, the DTSC screening method, and the Johnson-Ettinger method using site-specific data (see details of these calculations in Appendix B, including discussion of the limitations with the three methods). The results for the three methods are shown in the table below.

Residential Risk and Hazard Estimates, Vapor Intrusion Pathway, Site P-4C			
	EPA Screening	**DTSC Screening**	**Site-Specific**
Cumulative cancer risk	2.8E-06	5.5E-07	1.1E-07
Hazard index	0.064	0.013	0.0024

TCE contributes approximately 10% of the risk by the vapor intrusion pathway. 1,4-Dioxane (45%), 1,4-dichlorobenzene (13%), benzene (12%), tetrachloroethene (PCE) (11%), and ethylbenzene (10%) also contribute to the risk. These cumulative results are based on the combined exposure to the maximum concentrations of all detected analytes, regardless of location, date of sampling, or frequency of detection. At Site P-4C, these maximums were measured at two different locations from two different sampling events: benzene, 1,4-dichlorobenzene, and 1,4-dioxane were detected in 1996 at CP0365; ethylbenzene, PCE, and TCE were detected in 1997 at CP0552 (detected concentration data are provided in Attachment B17 of Appendix B; locations are shown on Figure 11-1). Over the history of sampling at Site P-4C, TCE was detected in 2 of 24 samples (including field duplicates), and PCE was detected in 1 of 24 samples; less sampling occurred for the other analytes (1,4-dioxane was detected in 2 of 2 samples, and benzene, 1,4-dichlorobenzene, and ethylbenzene were each detected in 1 of 2 samples).

These cumulative risk estimates result from an assumed exposure scenario that is physically and temporally impossible (i.e., results are from different years from locations that are approximately 200 feet apart) and rely upon the available data which demonstrate a generally low frequency of occurrence for TCE, the only contaminant of concern in soil gas at the Sharpe Site. In combination, these factors result in cumulative risk estimates that are the absolute highest calculable values using existing data; however, the risk estimate results are within or below EPA's risk management range of 1E-04 to 1E-06.

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

No further action is recommended for soil at Site P-4C based on the following lines of evidence.

- There is no continuing source of contamination.
- Sample density was considered adequate to reach a decision on the need for SVE.
- The low remaining VOC concentrations in soil vapor do not pose a threat to groundwater quality, and the occurrence of the highest TCE concentration in the deep vadose zone near the groundwater surface suggests that TCE in soil vapor may originate in groundwater instead of soil.

However, a groundwater plume is not present in the A Zone beneath the site at concentrations greater than the ACL.

- There is no enclosed work space at the site; hence, there is no unacceptable risk to industrial receptors. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are at the bottom of or below the risk management range of 1E-04 to 1E-06, and the estimated noncancer hazard indices are less than 1.

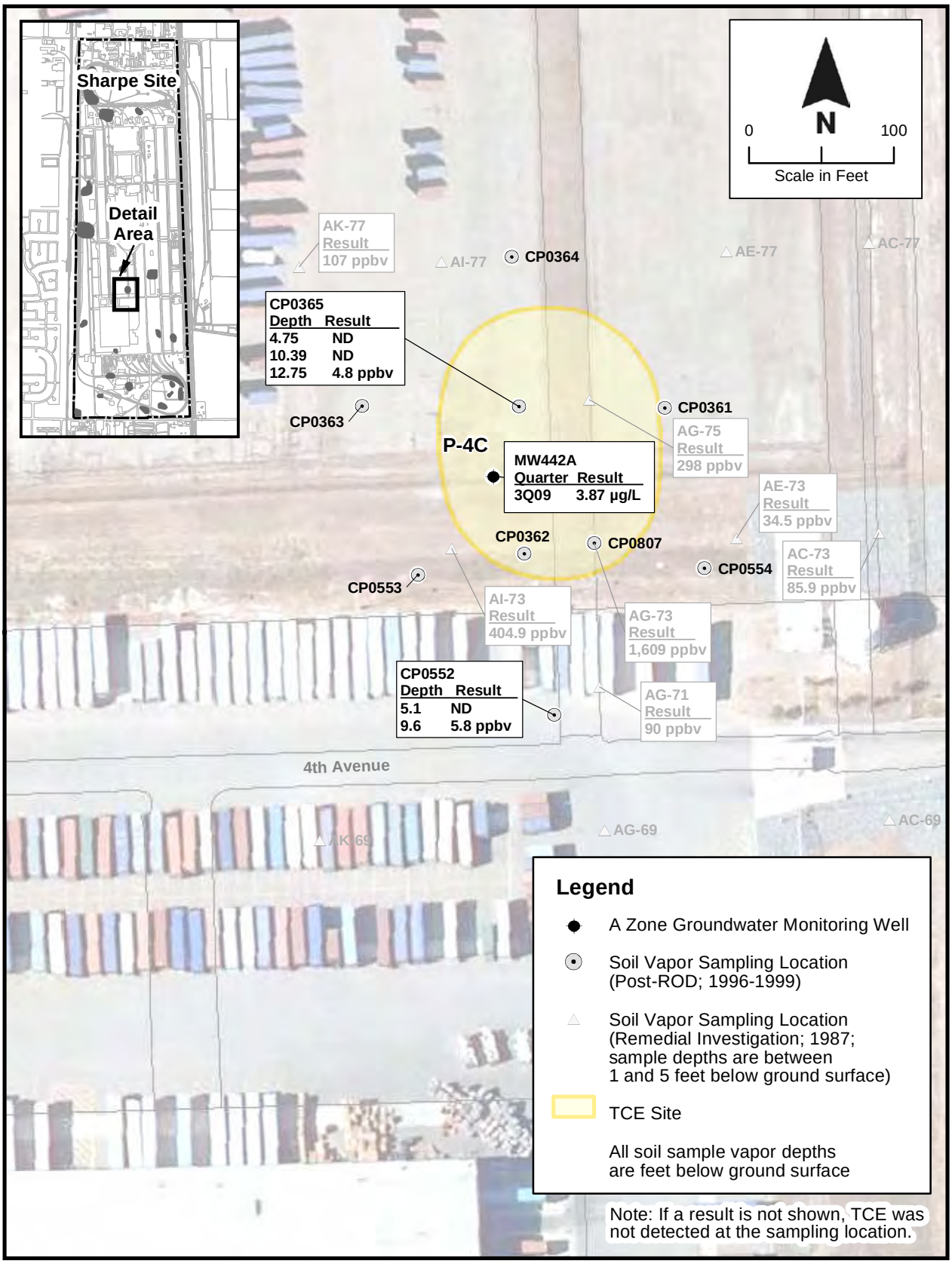
- Any remaining VOC mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors.

Table 11-1. TCE in Soil Vapor, Post-ROD Sampling, Site P-4C, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
CP0361	7/8/1996	8.25	M18	ND	200
CP0361	7/8/1996	13.25	M18	ND	200
CP0361	7/8/1996	16.75	M18	ND	200
CP0362	7/8/1996	9.4	M18	ND	200
CP0362	7/8/1996	14.92	M18	ND	200
CP0363	7/8/1996	8.25	M18	ND	200
CP0363	7/8/1996	13.34	M18	ND	200
CP0364	7/9/1996	6.75	M18	ND	200
CP0364	7/9/1996	14.75	M18	ND	200
CP0365	7/9/1996	4.75	M18	ND	200
CP0365	7/9/1996	10.39	M18	ND	200
CP0365	7/16/1996	12.75	TO14	4.8	0.39
CP0552	3/12/1997	5.1	E18	ND	130
CP0552	3/12/1997	9.6	TO14	5.8	0.65
CP0553	3/12/1997	5.1	E18	ND	130
CP0554	3/12/1997	4.6	E18	ND	120
CP0554	3/12/1997	9.6	E18	ND	120
CP0807	6/8/1999	5.6	E18	ND	84
CP0807	6/8/1999	9.6	E18	ND	84
CP0807	6/8/1999	12.6	E18	ND	84

Note: All post-ROD sample results (1996–1999) are presented in this table.

bgs = below ground surface
ND = not detected
ppbv = parts per billion by volume
ROD = record of decision
TCE = trichloroethene



L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\P4C_hist_results_3Q09_1Q10.mxd AVS 6/10/2011 SAC

Figure 11-1. TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-4C, Sharpe Site

SITE P-5A

Conceptual Site Model

Site P-5A is in the far western portion of the Central Area at the Sharpe Site (Figure 12-1). The ground surface at Site P-5A is covered with compacted soil supporting natural grasses and the northern extent of the former runway (asphalt).

Potential Sources: Site P-5A occupies the general area of "runway ponds" identified in the remedial investigation (RI) as disposal areas for paint stripper sludge generated at Building 389. A firefighter training area near the end of the runway was also associated with Site P-5A. The number and exact locations of the ponds and the fire-training area are not certain, although it was reported that four or five ponds were used for disposal. The vadose zone beneath the site is composed of silt, silty clay, and clay.

Groundwater: Depths to groundwater measured in the vicinity of the site ranged from approximately 16 to 18 feet below ground surface (bgs) during the last half of 2008 and the first half of 2009. A trichloroethene (TCE) plume is present in A Zone groundwater beneath Site P-5A. A sample from MW325A, located within the site, had a concentration of 41.9 micrograms per liter (μg/L) in the third quarter of 2009. This concentration exceeds the aquifer cleanup level of 5 μg/L.

Land Use: The paved, former runway is used for open storage of materials; soil-covered areas are not used. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Vapor Sampling: Thirty soil vapor samples were collected in a 100-foot by 100-foot grid plus step-in locations during the 1987 RI (Figure 12-1). Five samples had concentrations exceeding 350 parts per billion by volume (ppbv). The maximum TCE concentration in soil vapor samples from Site P-5A was 22,503 ppbv. All RI soil vapor samples were collected at depths between 1 and 5 feet bgs. The *Record of Decision, Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) required remedial action at the site (Environmental Science and Engineering, Inc. [ESE], 1996). The OU 2 ROD specified soil vapor extraction (SVE) as the remedial action for sites with TCE concentrations in the vadose zone exceeding the OU 2 ROD cleanup standard of 350 ppbv that could degrade groundwater quality.

Pre-design/site characterization investigations were completed in 1996 and 1997. No concentrations of TCE greater than the OU 2 ROD cleanup standard were detected (Radian International, 1997a; 1997b). In 1998, the California Regional Water Quality Control Board–Central Valley Region requested that additional site characterization data be collected. Additional soil vapor samples were collected in 1999 from locations at and within 100 feet of the highest TCE concentration reported during the RI; TCE was not detected (Radian International, 2000a).

SVE Decision: The low soil vapor concentrations, limited number of detections, and apparent limited extent of TCE in groundwater were used to decide that SVE would not be necessary at the site (Radian International, 2000a). TCE mass in soil vapor was not calculated for Site P-5A because all post-ROD concentrations were less than the cleanup standard and no remediation was required.

Persistent concentrations of TCE in groundwater samples (up to 650 μg/L in 2002) collected from the MW437 monitoring well cluster downgradient from the Site P-5A area prompted DLA Installation Support at San Joaquin to conduct a soil vapor investigation in 2006 to assess whether there was a continuing source of TCE to groundwater (URS Group, Inc. [URS], 2007b). Soil vapor samples were collected from 12 soil borings at depths ranging from 5 to 12.5 feet bgs. Concentrations of TCE in soil

vapor greater than or equal to the cleanup standard were reported in 5 of the 24 samples collected, with a maximum concentration of 1,600 ppbv; TCE was not detected in 15 of the 24 samples collected (Table 12-1, Figure 12-1).

Another soil vapor investigation was conducted in 2007 to delineate the extent of TCE concentrations in soil vapor exceeding 350 ppbv (URS, 2007a; 2009). TCE was detected in 23 of the 38 soil vapor samples collected, with concentrations ranging from 12 to 8,300 ppbv; however, only 5 of the samples had TCE concentrations greater than the cleanup standard (Table 12-1). Figure 12-1 shows isopleths of TCE soil vapor concentrations. Using data obtained in 2007, the mass of TCE in soil vapor at Site P-5A was estimated to be 0.32 pound. As a result of these investigations, a decision was made to implement SVE at Site P-5A. An SVE system was constructed at Site P-5A and extraction began in April 2010.

Potential Site Risk: Analytical results from 2006 and 2007 were used to evaluate risk associated with the vapor intrusion pathway. Results for all volatile organic compounds used in the risk calculations are provided in Attachment B14 to Appendix B. Residential cumulative cancer risk estimates and residential noncancer hazard indices were calculated by the EPA screening method, the DTSC screening method, and the Johnson-Ettinger method using site-specific data (see details of these calculations in Appendix B, including discussion of the limitations with the three methods). The results for the three methods are shown in the table below.

Residential Risk and Hazard Estimates, Vapor Intrusion Pathway, Site P-5A			
	EPA Screening	**DTSC Screening**	**Site-Specific**
Cumulative cancer risk	2.9E-04	5.8E-05	2.9E-05
Hazard index	0.57	0.11	0.057

TCE contributes approximately 100% of the risk by the vapor intrusion pathway.

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

The SVE system is expected to reduce soil vapor concentrations; however, volatilization of TCE from the groundwater surface is likely to result in rebounding concentrations for a period of time. Therefore, land use controls to prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing are recommended for soil at Site P-5A. Additional reasons for land use controls are as follows:

- The site is open space. Hence, there is no unacceptable risk to current industrial receptors. Estimated cancer risk levels modeled with site-specific data or with the DTSC screening calculation for the residential vapor intrusion pathway are within the risk management range of 1E-04 to 1E-06, and noncancer hazard indices calculated using EPA, DTSC, and site-specific estimating methods are less than one. The cancer risk calculated with the EPA screening method exceeds the upper bound of the management range.

- The site is not ready for unlimited use and unrestricted exposure because of the potential risk by the vapor intrusion pathway.

Table 12-1. TCE in Soil Vapor, Post-ROD Sampling, Site P-5A, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
SB1103	7/6/2006	5	TO14DI	ND	2.9
SB1103	7/6/2006	10	TO14DI	ND	2.9
SB1104	7/6/2006	5	TO14DI	20	2.8
SB1104	7/6/2006	10	TO14DI	1,600	2.8
SB1105	7/6/2006	5.5	TO14DI	780	3
SB1105	7/6/2006	9	TO14DI	1,400	3.1
SB1106	7/6/2006	5	TO14DI	350	3
SB1106	7/6/2006	10	TO14DI	100	3
SB1107	7/7/2006	7.5	TO14DI	220	3.5
SB1107	7/7/2006	12.5	TO14DI	1,400	3.5
SB1108	7/7/2006	5.5	TO14DI	ND	3.5
SB1108	7/7/2006	10.5	TO14DI	120	3.3
SB1109	7/7/2006	6.5	TO14DI	ND	3.3
SB1109	7/7/2006	10.5	TO14DI	ND	3.4
SB1110	7/7/2006	6.5	TO14DI	ND	3.3
SB1110	7/7/2006	10	TO14DI	ND	3.3
SB1111	7/7/2006	6.5	TO14DI	ND	3.3
SB1111	7/7/2006	10.5	TO14DI	ND	3.2
SB1112	7/7/2006	5.5	TO14DI	ND	3.2
SB1112	7/10/2006	10.5	TO14DI	ND	3.5
SB1113	7/10/2006	7	TO14DI	ND	3.5
SB1113	7/10/2006	10.5	TO14DI	ND	3.5
SB1114	7/10/2006	6.5	TO14DI	ND	3.5
SB1114	7/10/2006	10	TO14DI	ND	3.4
CP1126	10/25/2007	7	TO15	31	3.1
CP1126	10/25/2007	10	TO15	82	3.3
CP1127	10/23/2007	5	TO15	1,200	3.1
CP1127	10/23/2007	11	TO15	31	3.2
CP1128	10/23/2007	5	TO15	160	3.3
CP1128	10/23/2007	12	TO15	550	3.3
CP1129	10/25/2007	5	TO15	ND	3.3
CP1129	10/25/2007	9	TO15	ND	3.1
CP1130	10/25/2007	5	TO15	ND	3.3
CP1130	10/25/2007	10	TO15	ND	3.1
CP1131	10/23/2007	5	TO15	17	3.1
CP1131	10/23/2007	10	TO15	12	3.2
CP1132	10/23/2007	5	TO15	ND	3.3
CP1132	10/23/2007	10	TO15	15	3.3
CP1133	10/25/2007	6	TO15	55	3.2
CP1133	10/25/2007	11	TO15	110	3.3
CP1137	11/1/2007	5	TO15	ND	0.31
CP1137	11/1/2007	11	TO15	ND	0.32
CP1138	11/1/2007	5.5	TO15	ND	0.32
CP1138	11/1/2007	10	TO15	ND	0.3
CP1139	11/1/2007	5	TO15	98	0.33
CP1139	11/1/2007	11	TO15	140	0.31
CP1140	11/2/2007	5	TO15	ND	0.039
CP1140	11/2/2007	11	TO15	ND	0.04

Table 12-1. (Continued)

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
CP1141	11/2/2007	5	TO15	ND	0.042
CP1141	11/2/2007	8.5	TO15	16	0.04
CP1142	11/1/2007	6	TO15	130	0.04
CP1142	11/1/2007	10	TO15	210	0.041
CP1143	11/1/2007	6	TO15	ND	0.044
CP1143	11/1/2007	10	TO15	15	0.039
CP1144	11/2/2007	5	TO15	ND	0.039
CP1144	11/2/2007	10	TO15	ND	0.039
CP1145	11/7/2007	5	TO15	6,600	1.2
CP1145	11/7/2007	10	TO15	8,300	1.4
CP1146	11/7/2007	5	TO15	51	3.3
CP1146	11/7/2007	10	TO15	84	3.3
CP1147	11/7/2007	6.5	TO15	160	1.3
CP1147	11/7/2007	11	TO15	480	1.3

Note: Although post-ROD soil gas samples were collected at Site P-5A between 1996 and 1999, the most recent samples collected in 2006 and 2007 are presented in this table and were used to evaluate whether a remedial action is necessary at this site.

bgs = below ground surface
ND = not detected
ppbv = parts per billion by volume
ROD = record of decision
TCE = trichloroethene

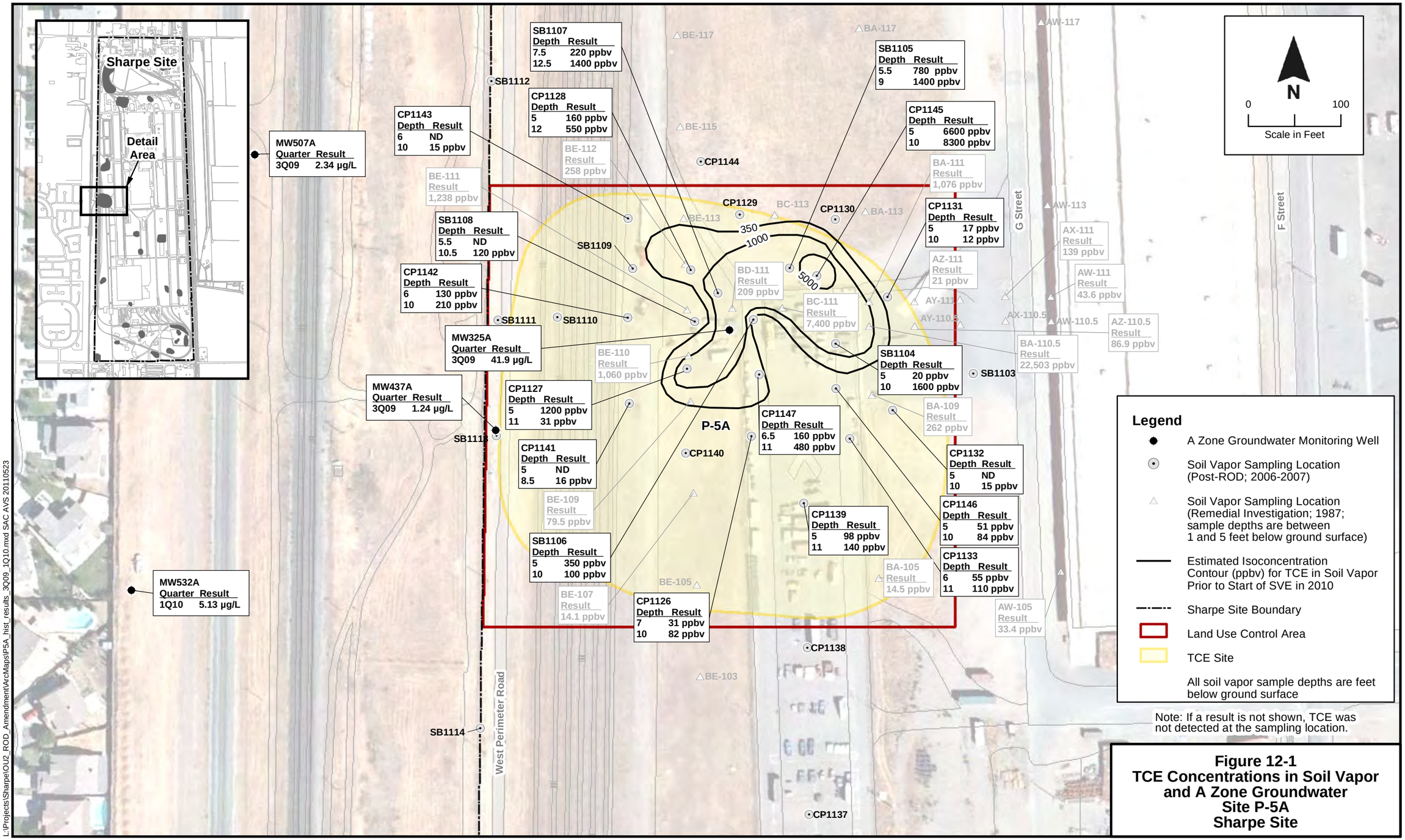


Figure 12-1
TCE Concentrations in Soil Vapor and A Zone Groundwater
Site P-5A
Sharpe Site

SITE P-6A

Conceptual Site Model

Site P-6A, located in the far western portion of the Central Area at the Sharpe Site (Figure 13-1), is near the former location of Building 391. No structures currently exist over the site. The ground surface at Site P-6A is covered with soil supporting natural grasses.

Potential Sources: Building 391 was reportedly used for firefighter training exercises. Petroleum, oils, lubricants, and volatile organic compounds (VOCs) were dumped and ignited in a catch basin that is no longer present at the site (Environmental Science and Engineering, Inc. [ESE], 1990). The vadose zone beneath the site is composed of silt, silty sand, and silty clay.

Groundwater: Depths to groundwater measured in the vicinity of the site ranged from approximately 9 to 14 feet below ground surface (bgs) during 2008 and the first half of 2009. Concentrations of VOCs in A Zone groundwater are less than the detection limit in the nearest wells, MW444A and MW511A (Figure 13-1). MW455A, the monitoring well closest to Site P-6A, has not been sampled since the third quarter of 2005 because trichloroethene (TCE) concentrations had been less than the TCE aquifer cleanup level (ACL) of 5 micrograms per liter (μg/L) since the fourth quarter of 1998. A TCE plume exceeding the ACL in the B Zone beneath the site is undergoing remediation by extraction.

Land Use: The nearest permanent structure to the site is the Central Area Groundwater Treatment Plant that borders the site on the northeast. There is open storage on the site. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Vapor Sampling: Twenty-three soil vapor samples were collected during the 1987 remedial investigation (RI) (Figure 13-1). TCE soil vapor concentrations in nine of the samples exceeded 350 parts per billion by volume (ppbv). All RI soil vapor samples were collected at depths between 1 and 5 feet bgs. In addition to the soil vapor samples, 60 soil samples were collected at depths from 1 to 15 feet bgs in 18 borings distributed across Site P-6A; the soils were analyzed for TCE. The highest concentrations of TCE in soil were detected in the depth interval 10 to 15 feet bgs, near the groundwater surface. Data density was sufficient to reach the decision to remediate the site. The *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) required remedial action at Site P-6A because TCE concentrations in the vadose zone exceeded the OU 2 ROD cleanup standard of 350 ppbv that could degrade groundwater quality (ESE, 1996).

SVE Decision: Following post-ROD characterization to further define the soil vapor plume, a soil vapor extraction (SVE) system was constructed in 1998. The Site P-6A system consisted of four SVE circuits (two northern and two southern circuits) that operated in two to four phases (extraction followed by periods of rebound) from July 1998 through December 2001. The total TCE mass in the vadose zone at Site P-6A was estimated to be approximately 4 pounds (Radian International, 1997a).

SVE Operation: The first two phases of SVE operation were conducted from July 1998 through December 1999 when operational data at the northern and southern circuits indicated that vapor concentrations were less than the OU 2 ROD cleanup standard. A site closure/confirmation study was conducted in December 2000. The total mass removed by the four SVE circuits after the first and second phases of operation was less than 1 pound.

At the northern SVE circuits, the December 2000 closure/confirmation soil vapor sample results indicated that TCE concentrations were less than the cleanup standard in all samples, and SVE was terminated (Table 13-1, Figure 13-1) (URS Group, Inc. [URS], 2002). The highest residual TCE concentrations were detected in two samples collected at approximately 10 feet bgs, which was near the groundwater surface at the time. Groundwater concentrations of 1 to 2 μg/L in the A Zone could produce the soil vapor concentrations detected because of volatilization; MW455A had concentrations in this range in 1998 to 2003. The low soil vapor (<350 ppbv) and groundwater concentrations (<5 μg/L) indicated that the northern SVE circuit did not require another phase of operation (URS, 2002).

At the southern circuits, the SVE system was restarted for the third and fourth phases of SVE and operated from mid-April to mid-December 2001 until operational data indicated vapor concentrations were less than the OU 2 ROD cleanup standard.

Post-Closure Sampling: A second site closure/confirmation study was conducted on the two southern circuits in January 2002. Samples were collected from nine boring locations, six vapor extraction wells and one vapor monitoring well at locations across Site P-6A (Figure 13-1). All results were less than the cleanup standard (Table 13-1, Figure 13-1) (URS, 2002). The total TCE mass removed by the southern SVE circuits during the third and fourth phases of SVE was less than 1 pound. The density of post-closure sampling was considered adequate to reach a decision regarding the need for further action at Site P-6A (URS, 2002).

The closure/confirmation results were input into a migration model (VapourT) and a groundwater mixing model to evaluate potential future effects on groundwater from the residual TCE mass in soil. The VapourT model predicted that the TCE concentration in leachate beneath the site will exceed the ACL for TCE within one year and then decrease to non-detectable concentrations in 10 years. The groundwater mixing model predicted that groundwater concentrations will not exceed the ACL in any year and will decrease with time (URS, 2002).

Potential Site Risk: The 2000 and 2002 closure/confirmation results were used to evaluate risk associated with the vapor intrusion pathway. Results for all VOCs used in the risk calculations are provided in Attachment B15 to Appendix B. Residential cumulative cancer risk estimates and residential noncancer hazard indices were calculated by the EPA screening method, the DTSC screening method, and the Johnson-Ettinger method using site-specific data (see details of these calculations in Appendix B, including discussion of the limitations with the three methods). The results for the three methods are shown in the table below.

Residential Risk and Hazard Estimates, Vapor Intrusion Pathway, Site P-6A			
	EPA Screening	**DTSC Screening**	**Site-Specific**
Cumulative cancer risk	1.2E-05	2.5E-06	9.3E-07
Hazard index	0.03	0.0068	0.0023

TCE contributes approximately 99% of the risk by the vapor intrusion pathway.

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

No further action is recommended for soil at Site P-6A based on the following lines of evidence:

- There is no continuing source of contamination, and the remaining concentrations were not confined to one part of the site.

- Sample density at the site was considered adequate to reach a decision on the need for SVE.

- SVE was conducted. Residual TCE soil vapor concentrations at Site P-6A are not predicted to pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause exceedance of the ACL). The TCE concentrations detected after SVE in the deep vadose zone near the groundwater surface may have resulted from volatilization from groundwater instead of soil. Groundwater concentrations present in the A Zone beneath the site in 2000 were less than the ACL and above the detection limit.

- Sample density and results were considered adequate to terminate SVE and propose no further action.

- The site is open space. Hence, there is no unacceptable risk to current industrial receptors. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1E-04 to 1E-06, and the estimated noncancer hazard indices are less than 1.

- Any remaining TCE mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors.

Table 13-1. TCE in Soil Vapor, SVE Closure/Confirmation Sampling, Site P-6A, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
CP0839	12/20/2000	9.5	M18MS	ND	100
CP0840	12/21/2000	6.5	TO14	0.29 J	0.026
CP0840	12/21/2000	9.5	M18MS	ND	100
CP0840	12/21/2000	12	M18MS	ND	100
CP0842	12/20/2000	6.5	M18MS	ND	100
CP0843	12/19/2000	9.5	M18MS	ND	100
CP0844	12/21/2000	9	M18MS	ND	100
CP0845	12/21/2000	7.5	M18MS	ND	100
CP0845	12/21/2000	10.5	M18MS	ND	100
CP0845	12/21/2000	12	M18MS	ND	100
CP0846	12/21/2000	6.5	M18MS	ND	100
CP0846	12/21/2000	9.5	M18MS	ND	100
CP0846	12/21/2000	12.5	M18MS	ND	100
CP0847	12/20/2000	6.5	M18MS	ND	100
CP0847	12/20/2000	9.5	M18MS	ND	100
CP0848	12/20/2000	6.5	M18MS	ND	100
CP0848	12/20/2000	9.5	TO14	6.6 J	0.035
CP0848	12/20/2000	11.5	M18MS	ND	100
CP0850	12/19/2000	7	M18MS	ND	100
CP0850	12/19/2000	9.5	M18MS	ND	100
CP0851	12/20/2000	10.5	M18MS	ND	100
CP0852	12/21/2000	7	M18MS	ND	100
CP0853	12/19/2000	7	M18MS	ND	100
CP0853	12/19/2000	10	M18MS	ND	100
CP0853	12/19/2000	13	M18MS	ND	100
CP0854	12/21/2000	13	M18MS	ND	100
CP0855	12/19/2000	7.5	M18MS	ND	100
CP0855	12/19/2000	9.5	M18MS	ND	100
CP0855	12/19/2000	13.5	M18MS	ND	100
CP0856	12/20/2000	8.5	M18MS	ND	100
CP0857	12/21/2000	6.5	M18MS	ND	100
CP0857	12/21/2000	9	M18MS	ND	100
CP0858	12/20/2000	7.5	M18MS	ND	100
CP0858	12/20/2000	10	M18MS	ND	100
CP0858	12/20/2000	12.5	M18MS	ND	100
CP0859	12/19/2000	7.2	M18MS	ND	100
CP0859	12/19/2000	9.5	M18MS	ND	100
CP0859	12/19/2000	12.5	M18MS	ND	100
CP0860	12/19/2000	12.5	M18MS	ND	100
CP0933	12/21/2000	6.7	M18MS	ND	100
CP0933	12/21/2000	9	M18MS	ND	100
VEW-6A3	12/20/2000	10	M18MS	ND	100
VEW-6A4	12/20/2000	10	M18MS	ND	100
VEW-6A9	12/20/2000	10	M18MS	280	100
VEW-6A10	12/20/2000	10	M18MS	ND	100
VEW-6A11	12/20/2000	10	M18MS	ND	100
VMW-6A2	12/20/2000	5.5	M18MS	ND	100
VMW-6A2	12/20/2000	11.5	M18MS	ND	100

Table 13-1. (Continued)

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
VMW-6A3	12/20/2000	5.5	M18MS	ND	100
VMW-6A3	12/20/2000	10.5	M18MS	200	100
VMW-6A4	12/20/2000	5.5	M18MS	ND	100
VMW-6A4	12/20/2000	9.5	M18MS	ND	100
VMW-6A5	12/20/2000	5.5	M18MS	ND	100
VMW-6A5	12/20/2000	10.5	M18MS	ND	100
VMW-6A6	12/20/2000	12.5	M18MS	ND	100
CP0934	1/8/2002	6	M18MS	ND	200
CP0934	1/8/2002	9.5	M18MS	ND	200
CP0934	1/8/2002	12.5	M18MS	ND	200
CP0935	1/9/2002	13	M18MS	ND	200
CP0936	1/9/2002	7	M18MS	ND	200
CP0936	1/9/2002	10	M18MS	ND	200
CP0937	1/9/2002	5.7	M18MS	ND	200
CP0937	1/9/2002	9	M18MS	ND	200
CP0937	1/9/2002	12.5	M18MS	ND	200
CP0938	1/9/2002	6	M18MS	ND	200
CP0938	1/9/2002	10.5	M18MS	ND	200
CP0938	1/9/2002	12.75	M18MS	ND	200
CP0939	1/9/2002	9.5	M18MS	ND	200
CP0940	1/9/2002	7	M18MS	ND	200
CP0940	1/9/2002	10.5	M18MS	ND	200
CP1023	1/9/2002	11.5	TO15	15	0.056
CP1024	1/9/2002	12.3	TO15	ND	0.056
VEW-6A2	1/8/2002	10	M18MS	ND	200
VEW-6A5	1/8/2002	10	M18MS	ND	200
VEW-6A6	1/8/2002	10	M18MS	ND	200
VEW-6A7	1/8/2002	10	TO15	63	0.056
VEW-6A8	1/8/2002	10	M18MS	ND	200
VEW-6A12	1/8/2002	10	M18MS	ND	200
VMW-6A1	1/8/2002	13.5	M18MS	ND	200

Notes: The December 2000 sampling confirmed that no further action was necessary for the northern portion of Site P-6A.
January 2002 sampling confirmed that no further action was necessary for the southern portion of Site P-6A.

All SVE closure/confirmation sample results (2000 and 2002) are presented in this table.

bgs = below ground surface
J = estimated concentration
ND = not detected
ppbv = parts per billion by volume
SVE = soil vapor extraction
TCE = trichloroethene

This page intentionally left blank

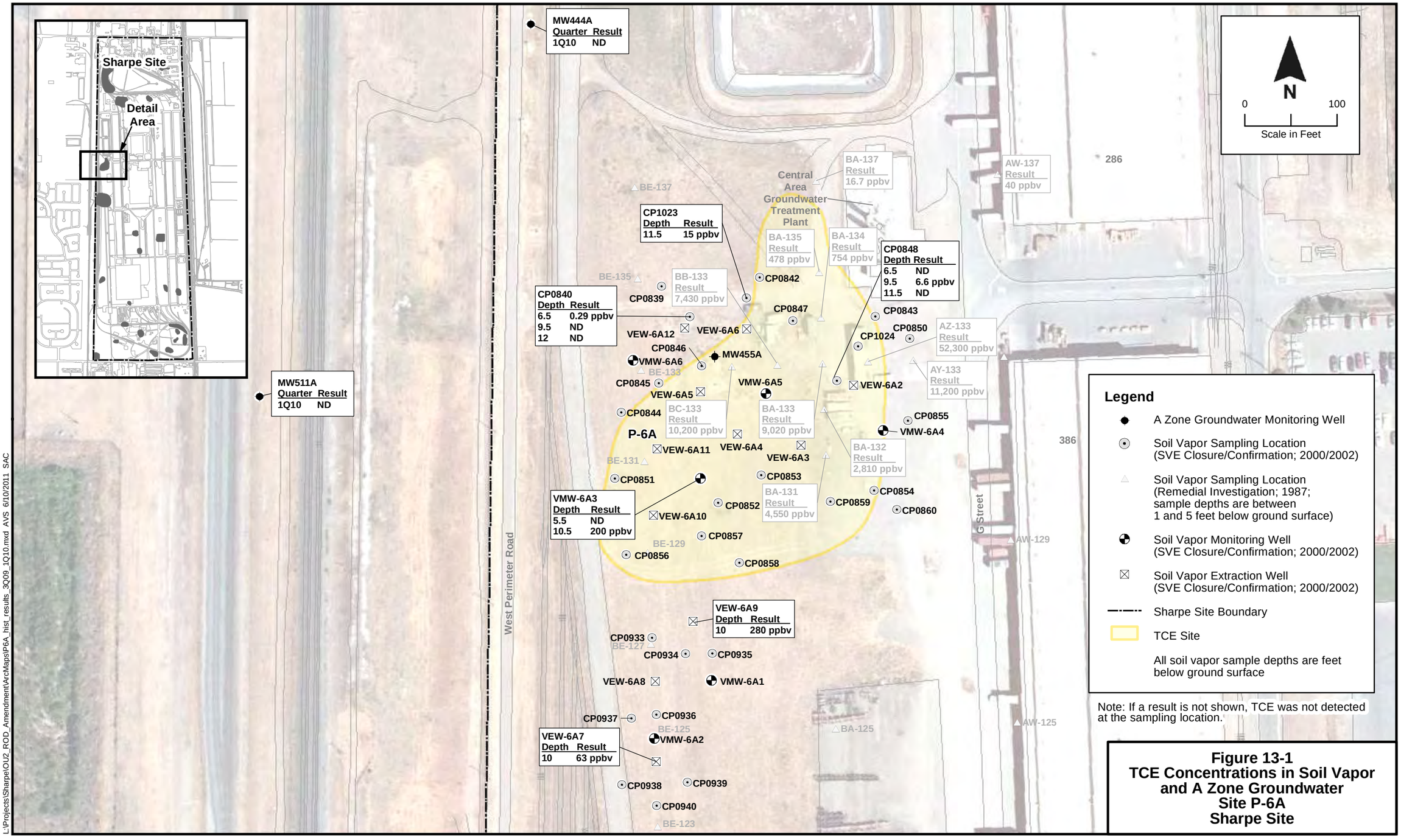


Figure 13-1
TCE Concentrations in Soil Vapor and A Zone Groundwater
Site P-6A
Sharpe Site

SITE P-8A

Conceptual Site Model

Site P-8A is located in the western portion of the North Balloon Area at the Sharpe Site (Figure 14-1). The site currently has no enclosed structures. Building 171 is located approximately 50 feet west of the site. The surface of Site P-8A is predominantly covered with asphalt.

Potential Sources: Although there is no known history of waste disposal at Site P-8A, ground stains were observed in a 1968 aerial photograph of the Site P-8A area. Building T-199, a former parts cleaning/ stripping and stormwater drop inlet, previously occupied a portion of the site (Figure 14-1). The area around the stormwater drop inlet was reportedly used for heavy equipment storage, maintenance, and repair. The site was identified after trichloroethene (TCE) was detected in soil vapor samples collected during a widespread, exploratory grid sampling program in 1987. The vadose zone beneath the site is composed of sand, silt, and clayey silt.

Groundwater: Depths to groundwater measured in the vicinity of Site P-8A ranged from approximately 15 to 17 feet below ground surface (bgs) during 2008. The TCE concentration in A Zone groundwater was less than the detection limit at the nearest well, MW439A, and less than the aquifer cleanup level (ACL) of 5 micrograms per liter (μg/L) at MW477A in the third quarter of 2009 (Figure 14-1). During the remedial investigation (RI), a sample from MW439A had a TCE concentration of 2,000 μg/L (Environmental Science and Engineering, Inc. [ESE], 1990). Therefore, TCE concentrations in shallow groundwater substantially decreased between 1987 and 2009. No other volatile organic compounds (VOCs) were detected in groundwater at MW439A in the third quarter of 2009.

Land Use: The site is open space and is not currently being used. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Vapor Sampling: Nineteen soil vapor samples were collected in the Site P-8A area in 1987 during the RI (Figure 14-1) (ESE, 1990). TCE concentrations in five of the samples exceeded 350 parts per billion by volume (ppbv), with a maximum detection of 4,120 ppbv. All samples were collected at depths between 1 and 5 feet bgs. In addition to soil vapor samples, soil samples were collected at Site P-8A to determine the extent of TCE in soil. Fifty-nine soil samples were collected from 24 borings; TCE concentrations ranged from 0.023 micrograms per gram (μg/g) to 0.292 μg/g. Additional field investigations were completed after the RI to determine the lateral and vertical extent of vadose zone contamination. The density of those data was considered sufficient to consider soil vapor extraction (SVE) at Site P-8A.

SVE Decision: Prior to preparation of the record of decision (ROD), a decision was made to test vapor extraction at Site P-8A.

SVE Operation: A pilot-scale SVE system was installed and operated at Site P-8A in 1993 and 1995. Soil vapor samples were collected from 15 locations in 1995 to evaluate the SVE pilot study. The maximum TCE concentration (840 ppbv) was detected in a soil vapor sample collected at 19 feet bgs; the second highest result, 660 ppbv, was also detected deep in the vadose zone (20.5 feet bgs) near the groundwater surface at the time (Radian International, 2000a). Sample results are provided in Table 14-1; sample locations are illustrated on Figure 14-1.

Post-Closure Sampling: The *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) established the cleanup standard for TCE in soil vapor at 350 ppbv to protect groundwater quality (ESE, 1996). Post-ROD investigations at Site P-8A were conducted in 1996, 1997, and 1999 to compare post-pilot study results to the RI data and the OU 2 ROD cleanup standard. All TCE results were less than the cleanup standard (Table 14-1, Figure 14-1) (Radian International, 1997a; 1997b; 2000a).

The remaining mass of TCE in the vadose zone at Site P-8A was estimated to be approximately 0.003 pound. Migration modeling using VapourT and a groundwater mixing model predicted it is unlikely that the small mass of TCE in the vadose zone at Site P-8A will increase the total time to remediate groundwater in the North Balloon Area (Radian International, 2000a). A technical and economic feasibility analysis (TEFA) compared the cost of implementing and operating an SVE system to the incremental cost of groundwater remediation if the vadose zone contamination was not removed at Site P-8A. The TEFA concluded that, although SVE at Site P-8A may be a technically feasible alternative, the predicted cost associated with this option is not warranted when compared to the additional costs incurred if cleanup is solely achieved with the existing groundwater treatment system (Radian International, 2000a).

Potential Site Risk: The analytical results from 1995 through 1999 were used to evaluate risk associated with the vapor intrusion pathway. Results for all VOCs used in the risk calculations are provided in Attachment B16 to Appendix B. Residential cumulative cancer risk estimates and residential noncancer hazard indices were calculated by the EPA screening method, the DTSC screening method, and the Johnson-Ettinger method using site-specific data (see details of these calculations in Appendix B, including discussion of the limitations with the three methods). The results for the three methods are shown in the table below.

Residential Risk and Hazard Estimates, Vapor Intrusion Pathway, Site P-8A			
	EPA Screening	**DTSC Screening**	**Site-Specific**
Cumulative cancer risk	5.2E-05	1.0E-05	1.3E-06
Hazard index	0.52	0.10	0.0024

TCE contributes approximately 70% of the risk by the vapor intrusion pathway. Carbon tetrachloride (CCl_4) (10%), chloroform (9%), 1,4-dichlorobenzene (3%), ethylbenzene (3%), and tetrachloroethene (PCE) (2%) also contribute to the risk. These cumulative results are based on the combined exposure to the maximum concentrations of all detected analytes, regardless of location, date of sampling, or frequency of detection. At Site P-8A, these maximums were measured at six different locations from three different sampling events: CCl_4 and chloroform were detected in 1995 at SA15-CPT9; TCE was detected in 1995 at SA15-CPT6A; ethylbenzene was detected in 1995 at SA15-CPT5; 1,4-dichlorobenzene was detected in 1996 at location CP0461; and PCE was detected in 1997 at location CP0564 (detected concentration data are provided in Attachment B17 of Appendix B; locations are shown on Figure 14-1). Over the history of sampling at Site P-8A, TCE was detected in 23 of 101 samples (including field duplicates), PCE was detected in 9 of 101 samples, chloroform was detected in 6 of 101 samples, CCl_4 was detected in 1 of 101 samples, ethylbenzene was detected in 16 of 62 samples, and 1,4-dichlorobenzene was detected in 6 of 62 samples.

These cumulative risk estimates result from an assumed exposure scenario that is physically and temporally impossible (i.e., results are from multiple years from locations that are at least 50 feet apart) and rely upon the available data which demonstrate a somewhat low frequency of occurrence for TCE, the primary contributor to the risk estimate and the only contaminant of concern in soil gas at the Sharpe Site, as well as very low detection frequencies for the other compounds. In combination, these factors

result in cumulative risk estimates that are the absolute highest calculable values using existing data; however, the risk estimate results are within EPA's risk management range of 1E-04 to 1E-06.

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

No further action is recommended for soil at Site P-8A based on the following lines of evidence:

- There is no continuing source of contamination.
- Sample density at the site was considered adequate to reach a decision on the need for SVE.
- SVE was conducted. Residual TCE soil vapor concentrations at Site P-8A are not predicted to pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause exceedance of the ACL).
- The highest concentrations of TCE after SVE were deep in the vadose zone, near A Zone groundwater, which probably had higher concentrations of TCE in 1995 than it had in 2009.
- Sample density was considered adequate to terminate SVE and propose no further action.
- The estimated mass of TCE remaining at the site in 2000 was 0.003 pound.
- The site is open space. Hence, there is no unacceptable risk to current industrial receptors. The estimated cancer risk levels associated with the vapor intrusion pathway to hypothetical residential receptors are within the risk management range of 1E-04 to 1E-06, and the estimated noncancer hazard indices are less than 1.
- The remaining mass in soil vapor is not expected to pose an unacceptable risk to any future industrial or residential receptors.

Table 14-1. TCE in Soil Vapor, Post-Pilot SVE and Post-ROD Sampling, Site P-8A, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
SA15-CPT1	10/11/1995	5.5	TO14	ND	0.21
SA15-CPT1	10/11/1995	11	TO14	ND	0.21
SA15-CPT1	10/11/1995	16	TO14	ND	0.21
SA15-CPT1	10/11/1995	20	TO14	2.8	0.21
SA15-CPT2	10/11/1995	6	TO14	3.9	0.21
SA15-CPT2	10/11/1995	17	TO14	ND	0.21
SA15-CPT2	10/11/1995	20.5	TO14	72	0.21
SA15-CPT3	10/12/1995	6	TO14	ND	0.47
SA15-CPT3	10/12/1995	13	TO14	ND	0.47
SA15-CPT3	10/12/1995	17.5	TO14	92	0.47
SA15-CPT3	10/12/1995	24	TO14	ND	0.47
SA15-CPT4	10/11/1995	6	TO14	4.1	0.21
SA15-CPT4	10/11/1995	12.5	TO14	ND	0.21
SA15-CPT4	10/11/1995	17	TO14	ND	0.21
SA15-CPT4	10/11/1995	20.5	TO14	660	0.21
SA15-CPT5	10/12/1995	0	TO14	0.82	0.21
SA15-CPT5	10/12/1995	6	TO14	ND	0.21
SA15-CPT5	10/12/1995	12	TO14	ND	0.47
SA15-CPT5	10/12/1995	17	TO14	20	0.47
SA15-CPT5	10/12/1995	20.5	TO14	ND	0.47
SA15-CPT6A	10/13/1995	6	TO14	2.1	0.47
SA15-CPT6A	10/13/1995	13	TO14	190	0.47
SA15-CPT6A	10/13/1995	19	TO14	840	0.47
SA15-CPT6A	10/13/1995	22	TO14	5.4	0.47
SA15-CPT7	10/13/1995	6	TO14	ND	0.47
SA15-CPT7	10/13/1995	13	TO14	ND	0.47
SA15-CPT7	10/13/1995	17	TO14	ND	0.47
SA15-CPT7	10/13/1995	20	TO14	ND	0.47
SA15-CPT8	10/13/1995	6	TO14	ND	0.47
SA15-CPT8	10/13/1995	13	TO14	ND	0.21
SA15-CPT8	10/13/1995	17	TO14	ND	0.47
SA15-CPT8	10/13/1995	20	TO14	ND	0.47
SA15-CPT9	10/13/1995	13	TO14	1	0.47
SA15-CPT9	10/13/1995	17	TO14	2.4	0.47
SA15-CPT9	10/13/1995	20.5	TO14	2.4	0.47
SA15-CPT10	10/13/1995	6	TO14	ND	0.47
SA15-CPT10	10/13/1995	12	TO14	ND	0.47
SA15-CPT10	10/13/1995	17	TO14	ND	0.47
SA15-CPT10	10/13/1995	20	TO14	ND	0.47
SA15-CPT11	10/13/1995	6	TO14	ND	0.47
SA15-CPT11	10/13/1995	12.5	TO14	ND	0.47
SA15-CPT11	10/13/1995	17	TO14	ND	0.47
SA15-CPT11	10/13/1995	20	TO14	ND	0.47
SA15-CPT12	10/12/1995	6	TO14	ND	0.47
SA15-CPT12	10/12/1995	12.5	TO14	ND	0.47
SA15-CPT12	10/12/1995	17.5	TO14	ND	0.47
SA15-CPT12	10/12/1995	20.5	TO14	ND	0.47
SA15-CPT13	10/12/1995	6	TO14	ND	0.21
SA15-CPT13	10/12/1995	12.5	TO14	ND	0.21
SA15-CPT13	10/12/1995	17	TO14	ND	0.21
SA15-CPT13	10/12/1995	20.5	TO14	ND	0.21

Table 14-1. (Continued)

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (ppbv)	Detection Limit (ppbv)
SA15-CPT14	10/12/1995	6	TO14	ND	0.47
SA15-CPT14	10/12/1995	12.5	TO14	ND	0.47
SA15-CPT14	10/12/1995	17	TO14	ND	0.21
SA15-CPT14	10/12/1995	22	TO14	ND	0.47
SA15-CPT15	10/12/1995	6	TO14	ND	0.47
SA15-CPT15	10/12/1995	12	TO14	ND	0.21
SA15-CPT15	10/12/1995	17	TO14	ND	0.21
SA15-CPT15	10/12/1995	21	TO14	ND	0.21
CP0461	7/12/1996	7.25	M18	ND	200
CP0461	7/12/1996	14.15	M18	ND	200
CP0461	7/12/1996	19.25	M18	ND	200
CP0462	7/15/1996	7.75	M18	ND	200
CP0462	7/15/1996	15.25	M18	ND	200
CP0462	7/15/1996	19.55	M18	ND	200
CP0463	7/15/1996	10.25	M18	ND	200
CP0463	7/15/1996	15.25	M18	ND	200
CP0463	7/15/1996	17.75	M18	ND	200
CP0464	7/15/1996	10.25	M18	ND	200
CP0464	7/15/1996	15.25	M18	ND	200
CP0464	7/15/1996	19.25	M18	ND	200
CP0465	7/15/1996	7.55	M18	ND	200
CP0465	7/15/1996	15.25	M18	ND	200
CP0465	7/15/1996	19.25	M18	ND	200
CP0564	3/12/1997	7.1	TO14	38	0.58
CP0564	3/12/1997	11.1	E18	ND	120
CP0565	3/12/1997	6.1	E18	ND	130
CP0566	3/12/1997	5.6	E18	ND	130
CP0566	3/12/1997	12.1	E18	ND	130
CP0795	6/7/1999	4.6	E18	ND	84
CP0795	6/7/1999	8.3	E18	ND	84
CP0795	6/7/1999	12.1	E18	ND	84
CP0795	6/7/1999	17.3	E18	ND	84
CP0796	6/7/1999	6.1	E18	ND	84
CP0796	6/7/1999	10.1	E18	ND	84
CP0796	6/7/1999	13.1	E18	ND	84
CP0796	6/7/1999	18.1	E18	ND	84
CP0797	6/8/1999	6.1	E18	ND	84
CP0797	6/8/1999	11	TO14	8.9 J	2.9
CP0797	6/8/1999	14	E18	ND	84
CP0797	6/8/1999	17.5	E18	ND	84
CP0801	6/8/1999	10.9	E18	ND	84
CP0801	6/8/1999	14.1	E18	ND	84
CP0801	6/8/1999	17.8	E18	ND	84

Note: Samples were collected in 1995 following pilot SVE operations at Site P-8A; samples were collected between 1996 and 1999 as part of post-ROD characterization activities.

bgs = below ground surface
J = estimated concentration
ND = not detected
ppbv = parts per billion by volume
ROD = record of decision
SVE = soil vapor extraction
TCE = trichloroethene

This page intentionally left blank

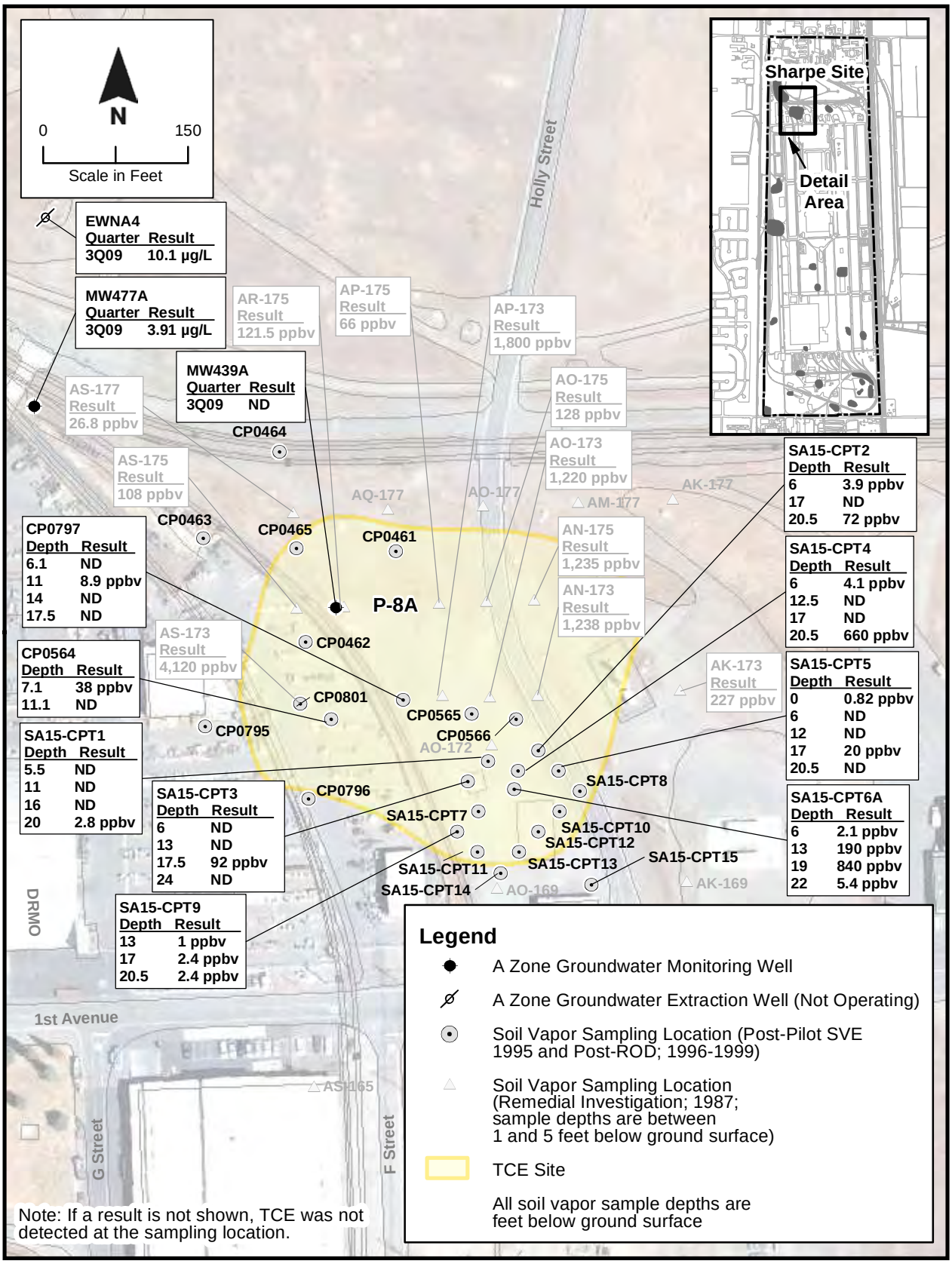


Figure 14-1. TCE Concentrations in Soil Vapor and A Zone Groundwater, Site P-8A, Sharpe Site

SITE S-3

Conceptual Site Model

Site S-3 is southeast of the North Balloon at the Sharpe Site (Figure 15-1). The surface of Site S-3 is covered with grasses, compacted soil, and gravel. No structures are present at Site S-3.

Potential Sources: Chromium and lead in surface soils at Site S-3 resulted from past activities at a spray paint booth (former Building S-119 – not shown on figures). The source of chromium and lead contamination was most likely paints and used paint solvents containing paint that were disposed in the area in the past (Environmental Science and Engineering, Inc. [ESE], 1990). The vadose zone beneath the site is composed of clayey, sandy silt.

Groundwater: Depths to groundwater measured in the vicinity of Site S-3 ranged from approximately 15 to 22.5 feet below ground surface (bgs) during 2008 and the first half of 2009. Groundwater samples for total chromium and lead analysis were collected from monitoring and extraction wells at and downgradient from Site S-3 between 1996 and 2000. The *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) required monitoring metals concentrations in groundwater relative to those that existed at the time the OU 2 ROD was signed (i.e., baseline conditions) to determine whether the concentration changes were statistically significant (ESE, 1996). Total chromium was never detected, and total lead was detected in one sample collected in the second quarter of 1996 (prior to soil excavation in 1998) at a concentration of 5.86 micrograms per liter (µg/L), which is less than the maximum contaminant level of 15 µg/L. Trend analyses could not be performed because there were too few detections in wells at and downgradient from Site S-3. Aquifer cleanup levels were not established, and groundwater sampling for total chromium and lead analysis was discontinued in 2001 (URS, 2001).

Land Use: Site S-3 is not currently being used. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Sampling: Forty-eight soil samples were field-analyzed using x-ray fluorescence at Site S-3 during the 1991 remedial investigation (ESE, 1994). The maximum concentrations of total chromium and lead detected were 1,200 milligrams per kilogram (mg/kg) and 5,115 mg/kg, respectively. The OU 2 ROD required excavation/off-site disposal of soil at Site S-3 with concentrations greater than the cleanup standards: 300 mg/kg for total chromium and 1,000 mg/kg for total lead in soil (0 to 2 feet bgs) (ESE, 1996). The OU 2 ROD also established soluble action levels for total chromium (50 µg/L) and total lead (150 µg/L) in deionized water waste extraction test (DI-WET) extracts from soil samples (ESE, 1996).

Remedial Design: Additional soil samples were collected at Site S-3 in 1996 after the OU 2 ROD was signed. The purpose of this sampling was to estimate the limits of the anticipated excavation of soil. Six locations were sampled, including one soil boring and five surface scrapes. Soil samples were collected at three different depths from the soil boring. All of the samples were analyzed for total and soluble chromium and lead. None of the samples collected from the soil boring had concentrations of total chromium or lead greater than either the cleanup standards or soluble action levels (Radian International, 1997a). Concentrations of total chromium at one surface scrape location exceeded both the cleanup standard and soluble action level, and the concentration of total lead at one other surface scrape exceeded the cleanup standard (Radian International, 1997a). Based on the soil sample results, the design estimate for the excavation area was approximately 9,530 square feet. The design estimate for the excavation volume was 177 cubic yards based on an excavation depth of 6 inches.

Soil Removal and Disposal: In 1998, a total of 183 cubic yards of soil was excavated from Site S-3 (Radian International, 2000b). Thirty-five cubic yards of soil were disposed of in a Class I landfill, and 148 cubic yards were disposed of in a Class II landfill.

"Floor" and "wall" samples, relative to the designed excavation extent, were collected and analyzed to ensure that all soil with concentrations of total chromium and/or lead greater than cleanup standards was excavated. All total chromium and lead concentrations in the floor and wall samples were less than cleanup standards (Tables 15-1, 15-2, and Figures 15-1, 15-2). In addition, the results for soluble chromium and lead did not exceed the soluble action levels from analyses of DI-WET extract of samples collected from below the excavation limits (Radian International, 2000b). Therefore, the extent of the excavation at Site S-3 was the same as predetermined in the final design.

Sample density and results were considered sufficient to reach a decision that the OU 2 ROD requirements had been achieved and that no further action was needed at Site S-3 (Radian International, 2000b).

Potential Site Risk: Concentrations of total chromium and lead in soil at Site S-3 are less than the OU 2 ROD industrial-based cleanup standards (Tables 15-1, 15-2, and Figures 15-1, 15-2). However, those cleanup standards do not allow for unlimited use and unrestricted exposure (e.g., residential use).

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Conceivably, burrowing owls that occupy burrows at the metals sites could be exposed to residual lead or chromium contamination in soil. Protection of burrowing owls was addressed in the *Ecological Risk Evaluation of Burrowing Owls at the Metals Sites, Defense Distribution Depot San Joaquin – Sharpe Site* (URS, 2011). The ecological risk evaluation concluded that concentrations of lead at a few individual sample locations at Site S-3 exceed effect-based soil screening levels for three site-specific scenarios.

Recommendation

Land use controls to prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing and annual monitoring to ensure burrowing owls do not inhabit the site are recommended for soil at Site S-3 to protect human health and the environment because chromium and lead have been left in place at concentrations that do not allow for unlimited use and unrestricted exposure.

Table 15-1. Summary of Chromium Concentrations in Soil, Site S-3, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (mg/kg)	Detection Limit (mg/kg)
SS0004	6/27/1996	0.25	SW7191	90	NA
SS0005	6/27/1996	0.25	SW7191	120	NA
SS0006	6/27/1996	0.17	SW7191	33	NA
CP0001	7/17/1996	8	SW7191	11	NA
CP0001	7/17/1996	15	SW7191	4.4	NA
CP0001	7/17/1996	18.5	SW7191	41	NA
GE0084	4/9/1998	1	SW6010A	6.74	0.356
GE0085	4/9/1998	1	SW6010A	98.6	0.361
GE0086	4/9/1998	1	SW6010A	12.9	0.393
GE0087	4/9/1998	1	SW6010A	8.41	0.376
GE0088	4/9/1998	1	SW6010A	34.8	0.356
GE0089	4/9/1998	1	SW6010A	26.4	0.365
GE0090	4/9/1998	1	SW6010A	6.27	0.348
GE0091	4/9/1998	1	SW6010A	9.84	0.385
GE0092	4/9/1998	1	SW6010A	15.5	0.364
GE0093	4/9/1998	1	SW6010A	8.87	0.376
GE0094	4/9/1998	0.5	SW6010A	11.3	0.346
GE0095	4/9/1998	0.5	SW6010A	15.9	0.346
GE0096	4/9/1998	0.5	SW6010A	27.6	0.356
GE0097	4/9/1998	0.5	SW6010A	57.5	0.352
GE0098	4/9/1998	0.5	SW6010A	15.6	0.357
GE0099	4/9/1998	0.5	SW6010A	38.3	0.352
GE0100	4/9/1998	0.5	SW6010A	18.2	0.364
GE0101	4/9/1998	0.5	SW6010A	106	0.351
GE0102	4/9/1998	0.5	SW6010A	21.3	0.358

Notes: Post-ROD/pre-excavation sample results (1996) are presented in this table if the sample locations are outside of the excavated area (see Figure 15-1).

All excavation sample results (1998) are presented in this table.

bgs = below ground surface
mg/kg = milligrams per kilogram
NA = not available
ROD = record of decision

Table 15-2. Summary of Lead Concentrations in Soil, Site S-3, Sharpe Site

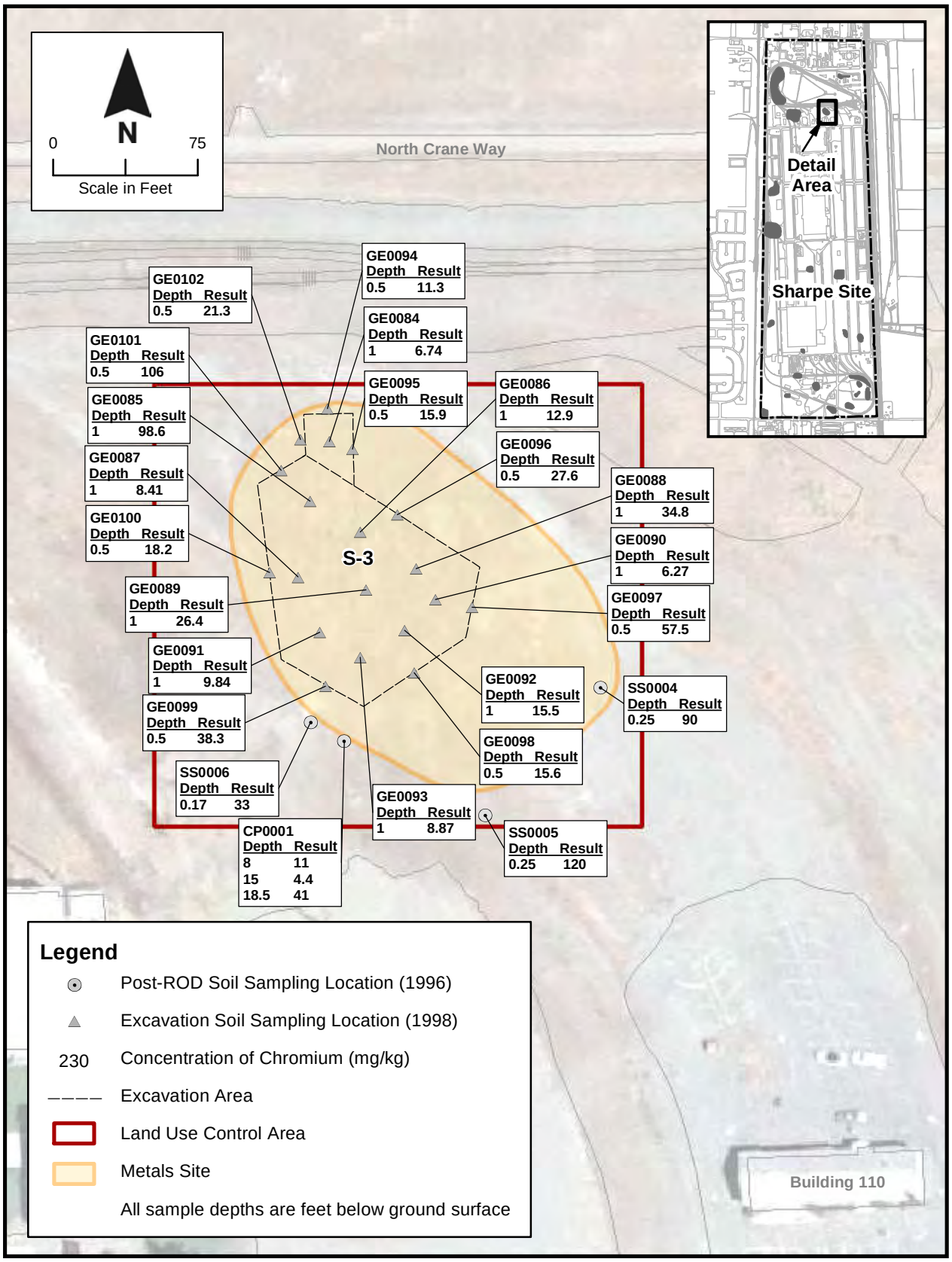
Location	Sample Date	Sample Depth (feet bgs)	Method	Result (mg/kg)	Detection Limit (mg/kg)
A-2	1/1/1991	0.5	SW7421	526	NA
AA-2	1/1/1991	0.5	SW7421	613	NA
AA-5	1/1/1991	0.5	SW7421	618	NA
B-(-1)	1/1/1991	0.5	SW7421	881	NA
B-(-2)	1/1/1991	0.5	SW7421	505	NA
B-0	1/1/1991	0.5	SW7421	546	NA
C-0	1/1/1991	0.5	SW7421	895	NA
C-5	1/1/1991	0.5	SW7421	819	NA
D-4	1/1/1991	0.5	SW7421	539	NA
E-5	1/1/1991	0.5	SW7421	472	NA
SS0004	6/27/1996	0.25	SW7421	780	6.1
SS0005	6/27/1996	0.25	SW7421	780	6.1
SS0006	6/27/1996	0.17	SW7421	190	6.1
CP0001	7/17/1996	8	SW7421	2.8	0.16
CP0001	7/17/1996	15	SW7421	1.6	0.13
CP0001	7/17/1996	18.5	SW7421	8	0.77
GE0084	4/9/1998	1	SW6010A	ND	4.27
GE0085	4/9/1998	1	SW6010A	530	4.32
GE0086	4/9/1998	1	SW6010A	21	4.44
GE0087	4/9/1998	1	SW6010A	ND	4.5
GE0088	4/9/1998	1	SW6010A	110	4.26
GE0089	4/9/1998	1	SW6010A	64.2	4.37
GE0090	4/9/1998	1	SW6010A	ND	4.17
GE0091	4/9/1998	1	SW6010A	23.3	4.61
GE0092	4/9/1998	1	SW6010A	15.7	4.36
GE0093	4/9/1998	1	SW6010A	15.3	4.37
GE0094	4/9/1998	0.5	SW6010A	12.8	4.14
GE0095	4/9/1998	0.5	SW6010A	ND	4.15
GE0096	4/9/1998	0.5	SW6010A	79.6	4.27
GE0097	4/9/1998	0.5	SW6010A	225	4.21
GE0098	4/9/1998	0.5	SW6010A	17.4	4.28
GE0099	4/9/1998	0.5	SW6010A	134	4.22
GE0100	4/9/1998	0.5	SW6010A	55.9	4.36
GE0101	4/9/1998	0.5	SW6010A	538	4.21
GE0102	4/9/1998	0.5	SW6010A	24.8	4.3

Notes: Pre-ROD sample results (1991) are presented in this table if the sample locations are outside of the excavated area and the concentrations are greater than the residential regional screening level for lead of 400 mg/kg, establishing the need for land use controls (see Figure 15-2).

Post-ROD/pre-excavation sample results (1996) are presented in this table if the sample locations are outside of the excavated area (see Figure 15-2).

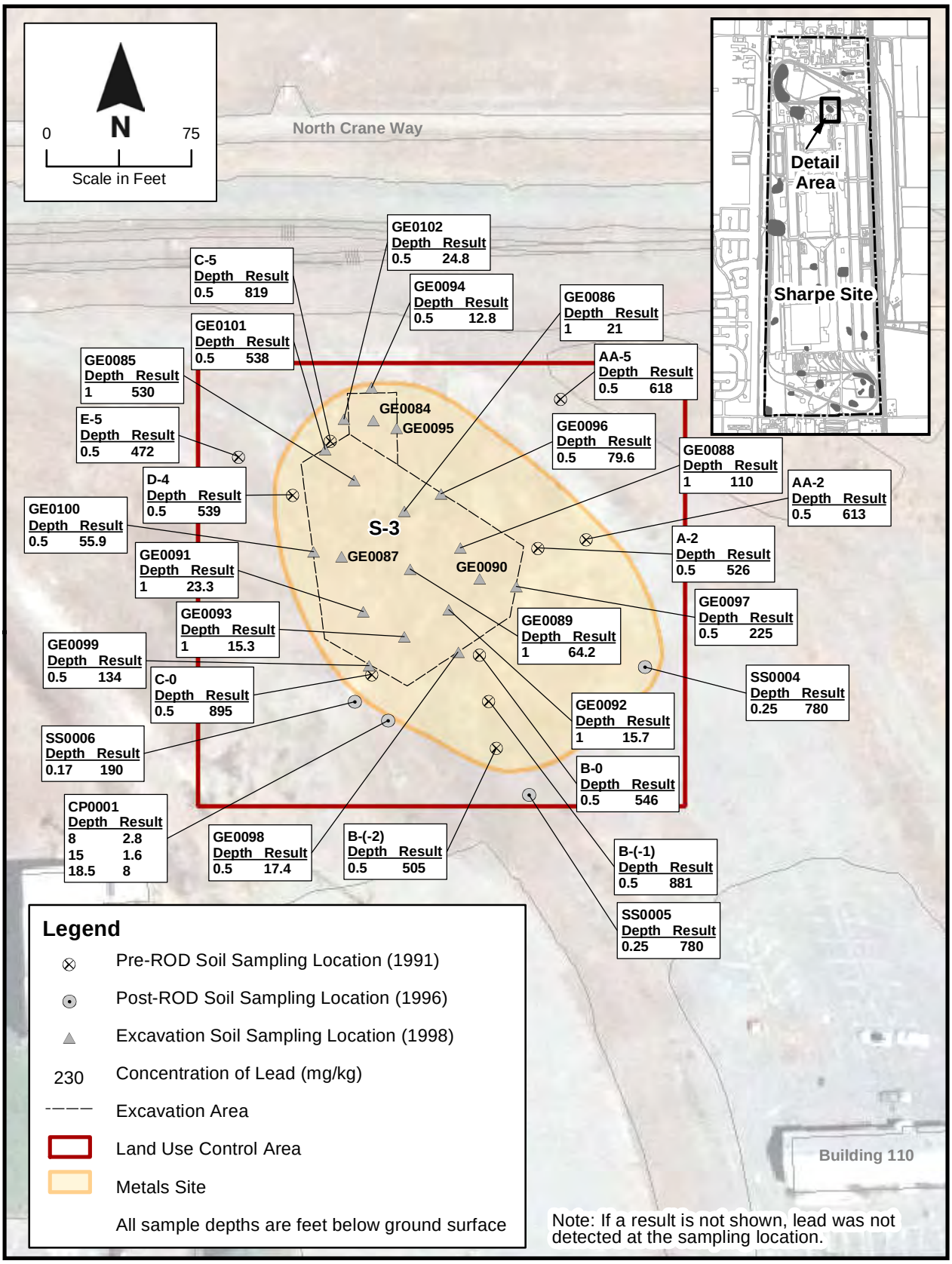
All excavation sample results (1998) are presented in this table.

bgs = below ground surface
mg/kg = milligrams per kilogram
NA = not available
ND = not detected
ROD = record of decision



L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\S3_CR_hist_results.mxd AVS 6/9/2011 SAC

Figure 15-1. Chromium Concentrations in Soil, Site S-3, Sharpe Site



L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\S3_PB_hist_results.mxd AVS 6/9/2011 SAC

Figure 15-2. Lead Concentrations in Soil, Site S-3, Sharpe Site

SITE S-26

Conceptual Site Model

Site S-26 is within the northwestern portion of the North Balloon at the Sharpe Site (Figure 16-1). The surface of Site S-26 is open ground covered by gravel, compacted soil, and sparse vegetation. No structures are present at Site S-26.

Potential Sources: Chromium and lead in surface soils at Site S-26 resulted from past open dumping of sandblasting waste that was generated by work activities in former Buildings 170 to 184 (only Buildings 178 and 179 still exist – not shown on figures). The sandblasting waste was suspected to have contained chromium- and lead-contaminated paint chips (Environmental Science and Engineering, Inc. [ESE], 1990). The vadose zone beneath the site consists of sand, silt, and clayey silt.

Groundwater: Depths to groundwater measured in the vicinity of Site S-26 ranged from approximately 16 to 26 feet below ground surface (bgs) during 2008 and the first half of 2009. Groundwater samples for total chromium and lead analysis were collected from monitoring and extraction wells at and down-gradient from Site S-26 between 1996 and 2006 and between 1996 and 2000, respectively. The *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) required monitoring metals concentrations in groundwater relative to those that existed at the time the OU 2 ROD was signed (i.e., baseline conditions) to determine whether the concentration changes were statistically significant (ESE, 1996). For total chromium and lead, concentrations exceeded the maximum contaminant levels (MCLs) of 50 micrograms per liter (µg/L) and 15 µg/L, respectively, in two samples each that were collected prior to soil excavation in 1998. The maximum total chromium and lead concentrations detected were 70 µg/L and 42.7 µg/L, respectively. After soil excavation, no groundwater samples had concentrations of total chromium or lead that exceeded the MCLs. No statistically significant increasing concentration trends were identified for total chromium concentrations over the period of sampling at Site S-26. For total lead, a trend analysis could not be performed because there were too few detections in wells at and down-gradient from Site S-26. Aquifer cleanup levels were not established, and groundwater sampling for total chromium and lead analysis was discontinued in 2007 and 2001, respectively (URS, 2007c and 2001).

Land Use: Site S-26 is not currently being used. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Sampling: Two hundred and forty-four soil samples were field-analyzed using x-ray fluorescence at Site S-26 during the 1992 remedial investigation (RI) (ESE, 1994). The maximum concentrations of total chromium and lead detected were 805 milligrams per kilogram (mg/kg) and 5,718 mg/kg, respectively. The OU 2 ROD required excavation/off-site disposal of soil at Site S-26 with concentrations greater than the cleanup standards: 300 mg/kg for total chromium and 1,000 mg/kg for total lead in soil (0 to 2 feet bgs). The OU 2 ROD also established soluble action levels for total chromium (50 µg/L) and total lead (150 µg/L) in deionized water waste extraction test (DI-WET) extracts from soil samples (ESE, 1996).

Remedial Design: After the OU 2 ROD was signed in 1996, additional soil samples were collected at Site S-26 to estimate the excavation boundaries. Eleven locations were sampled, including one soil boring and 10 surface scrapes. Soil samples were collected at three different depths from the soil boring. All of the samples were analyzed for total and soluble chromium and lead. None of the samples collected from the soil boring had concentrations of total chromium or lead greater than either the cleanup standards or soluble action levels (Radian International, 1997a). Concentrations of total chromium at one of the surface scrapes exceeded both the cleanup standard and soluble action level; the concentration of total

chromium at a second surface scrape exceeded the soluble cleanup standard; and concentrations of total lead at three other surface scrape locations exceeded the cleanup standard (Radian International, 1997a). Three additional surface scrapes were collected in 1997 to meet requirements specified in the OU 2 ROD (i.e., collect samples at three specific RI locations). None of the surface scrape samples had concentrations of total chromium or lead greater than either the cleanup standards or soluble action levels (Radian International, 1997b).

Based on the results of the 1996 and 1997 sampling events and prior events, six areas (Areas 1 through 6) of soil contamination exceeding cleanup standards were identified. The design estimate for the excavation area was approximately 27,429 square feet. The design estimate for the excavation volume was 508 cubic yards, based on an excavation depth of 6 inches.

Soil Removal and Disposal: In 1998, a total of 758 cubic yards of soil was excavated from Areas 1 through 5 (Radian International, 2000b). Six hundred and eighty cubic yards were disposed of in a Class I landfill, and 78 cubic yards were disposed of in a Class II landfill. Excavation of Area 6 was deferred because the impact to human health was considered minimal since the site was covered with railroad ballast (inhibiting wind erosion); no threat to groundwater existed from soluble chromium or lead; and the cost to relocate the railroad tracks that covered the site was considered excessive at that time.

“Floor” and “wall” samples, relative to the designed excavation extent, were collected and analyzed to ensure that all soil with concentrations of total chromium and/or lead greater than cleanup standards was excavated. Initial sample results indicated that some areas required additional excavation. Therefore, the extent of excavations at Site S-26 was greater than the predetermined excavation limits. All total chromium and lead concentrations in the floor and wall samples were less than cleanup standards at the final excavation limits (Tables 16-1, 16-2, and Figures 16-1, 16-2). In addition, the results for soluble chromium and lead did not exceed the soluble action levels from analyses of DI-WET extract of samples collected from below the excavation limits (Radian International, 2000b).

In 2006, excavation of Area 6 was completed. The remedial project managers agreed to remove soil at Area 6 that contained concentrations of total lead greater than 800 mg/kg instead of the 1,000 mg/kg cleanup standard established in the OU 2 ROD (URS Group, Inc. [URS], 2005). This cleanup level was based on the October 2004 EPA industrial preliminary remediation goal (now termed regional screening level) for total lead. The excavation area and volume for Area 6 were re-evaluated based on the revised lead cleanup standard, but no changes were required. Approximately 115 tons (87 cubic yards) of soil and railroad ballast were excavated from Site S-26, Area 6 (URS, 2008). Seventeen tons of soil and ballast were disposed of in a Class I landfill, and 98 tons were disposed of in a Class II landfill.

Following excavation at Area 6, confirmation floor and wall samples were collected and analyzed for total and soluble chromium and lead. All results were less than the cleanup standards and soluble action levels except for one sidewall sample, which had a leachable lead concentration of 613 μg/L (at 1 foot bgs). One follow-up attenuation sample was collected in January 2007 at 2 feet bgs, and the sample concentrations were less than the cleanup standards and soluble action levels (URS, 2008).

Sample density and results were considered sufficient to reach a decision that the OU 2 ROD requirements had been achieved and that no further action was needed at Site S-26 (Radian International, 2000b; 2008).

Potential Site Risk: Concentrations of total chromium and lead in soil at Site S-26 are less than the OU 2 ROD industrial-based cleanup standards (Tables 16-1, 16-2, and Figures 16-1, 16-2). However, those cleanup standards do not allow for unlimited use and unrestricted exposure (e.g., residential use).

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Conceivably, burrowing owls that occupy burrows at the metals sites could be exposed to residual lead or chromium contamination in soil. Protection of burrowing owls was addressed in the *Ecological Risk Evaluation of Burrowing Owls at the Metals Sites, Defense Distribution Depot San Joaquin – Sharpe Site* (URS, 2011). The ecological risk evaluation concluded that concentrations of lead at a few individual sample locations at Site S-26 exceed effect-based soil screening levels for three site-specific scenarios.

Recommendation

Land use controls to prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing and annual monitoring to ensure burrowing owls do not inhabit the site are recommended for soil at Site S-26 to protect human health and the environment because chromium and lead have been left in place at concentrations that do not allow for unlimited use and unrestricted exposure.

Table 16-1. Summary of Chromium Concentrations in Soil, Site S-26, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (mg/kg)	Detection Limit (mg/kg)
Area 1					
GE0005	4/8/1998	1	SW6010A	103 J	0.374
GE0006	4/9/1998	0.5	SW6010A	34.8	0.36
GE0007	4/9/1998	0.5	SW6010A	54.8	0.364
GE0008	4/9/1998	0.5	SW6010A	38.1	0.366
GE0009	4/9/1998	0.5	SW6010A	37.5	0.357
Area 2					
SS0007	6/27/1996	0.33	SW7191	64	NA
SS0009	6/27/1996	0.25	SW7191	48	NA
CP0002	7/17/1996	9	SW7191	25 J	NA
CP0002	7/17/1996	14	SW7191	5	NA
CP0002	7/17/1996	19	SW7191	47	NA
GE0014	4/8/1998	1	SW6010A	40.4	0.367
GE0015	4/8/1998	1	SW6010A	38.9	0.365
GE0016	4/8/1998	1	SW6010A	28.3	0.365
GE0017	4/8/1998	1	SW6010A	102 J	0.372
GE0018	4/8/1998	1	SW6010A	31.8	0.37
GE0019	4/8/1998	1	SW6010A	79	0.365
GE0020	4/8/1998	1	SW6010A	91.5	0.365
GE0021	4/8/1998	1.5	SW6010A	49.3	0.393
GE0022	4/9/1998	0.5	SW6010A	19.9	0.365
GE0023	4/9/1998	0.5	SW6010A	69.7	0.367
GE0024	4/9/1998	0.75	SW6010A	50.3	0.361
GE0025	4/15/1998	0.5	SW6010A	104	0.367
GE0026	4/15/1998	0.5	SW6010A	166	0.373
GE0027	4/15/1998	0.5	SW6010A	60.1	0.369
GE0028	4/15/1998	0.5	SW6010A	79.8	0.38
GE0031	4/16/1998	0.5	SW6010A	98.3	0.358
Area 3					
SS0010	6/27/1996	0.33	SW7191	71	NA
GE0036	4/8/1998	1	SW6010A	16.2	0.358
GE0037	4/8/1998	1	SW6010A	25.8 J	0.403
GE0038	4/8/1998	1.5	SW6010A	44.1 J	0.398
GE0039	4/15/1998	0.5	SW6010A	102	0.367
GE0040	4/15/1998	0.5	SW6010A	103	0.358
GE0042	4/15/1998	0.5	SW6010A	115	0.359
GE0045	4/16/1998	0.75	SW6010A	42.5	0.366
GE0113	5/5/1998	0.5	SW6010A	83.3	0.376
Area 4					
GE0047	4/8/1998	1	SW6010A	188	0.361
GE0048	4/8/1998	1	SW6010A	7.94 J	0.363
GE0049	4/8/1998	1	SW6010A	148	NA
GE0050	4/8/1998	1	SW6010A	6.95	0.39
GE0051	4/8/1998	1	SW6010A	137	0.399
GE0052	4/8/1998	1	SW6010A	68.5	0.376
GE0053	4/8/1998	1	SW6010A	8.03	0.401
GE0054	4/8/1998	1	SW6010A	20	0.354
GE0055	4/8/1998	1	SW6010A	8.87	0.365
GE0056	4/8/1998	1	SW6010A	130 J	0.377

Table 16-1. (Continued)

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (mg/kg)	Detection Limit (mg/kg)
Area 4 (cont'd)					
GE0057	4/8/1998	1	SW6010A	7.93	0.352
GE0058	4/8/1998	1	SW6010A	20.7	0.358
GE0059	4/15/1998	0.5	SW6010A	55.8	0.366
GE0060	4/15/1998	0.5	SW6010A	138	0.36
GE0061	4/15/1998	0.5	SW6010A	190	0.363
GE0062	4/15/1998	0.5	SW6010A	147	0.357
GE0063	4/15/1998	0.5	SW6010A	77.7	0.353
GE0064	4/15/1998	0.5	SW6010A	84.6	0.367
GE0072	4/16/1998	0.5	SW6010A	163 J	0.367
GE0074	4/16/1998	0.5	SW6010A	31.3	0.354
GE0065	6/26/1998	0.75	SW6010A	22.5	0.34
GE0066	6/26/1998	0.75	SW6010A	18.9	0.34
Area 5					
SS0014	6/27/1996	0.33	SW7191	90	NA
SS0052	2/5/1997	2	SW7191	14	NA
GE0075	4/8/1998	1	SW6010A	33 J	0.353
GE0076	4/15/1998	0.5	SW6010A	132	0.357
GE0077	4/15/1998	0.5	SW6010A	60	0.359
GE0078	4/15/1998	0.5	SW6010A	79.8	0.357
GE0079	4/15/1998	0.5	SW6010A	81.8	0.35
Area 6					
AREA6HE-01	11/17/2006	0.9	SW6010B	26.7	0.0857
AREA6HE-02	11/17/2006	1.1	SW6010B	14.8	0.0963
AREA6HE-03	11/17/2006	1.4	SW6010B	24.7	0.0987
AREA6HE-04	11/17/2006	1.6	SW6010B	12.4	0.093
AREA6HE-05	11/17/2006	1.2	SW6010B	17.4	0.0945
AREA6HE-06	11/17/2006	1.9	SW6010B	10 J+	0.0929
AREA6HE-07	11/20/2006	1.1	SW6010B	46.8	0.0974
AREA6VE-01	11/17/2006	2.2	SW6010B	8.11	0.0965
AREA6VE-02	11/17/2006	2.2	SW6010B	7.72	0.0938
AREA6VE-03	1/19/2007	2	SW6010B	9.56	0.0987
Other					
SS0011	6/27/1996	0.5	SW7191	43	NA
SS0015	7/2/1996	0.25	SW7191	19	NA
SS0051	2/5/1997	2	SW7191	13	NA
SS0053	2/5/1997	2	SW7191	38	NA

Notes: Post-ROD/pre-excavation sample results (1996 and 1997) are presented in this table if the sample locations are outside of the excavated area (see Figure 16-1).

All excavation sample results (1998, 2006, and 2007) are presented in this table.

bgs = below ground surface
J = estimated concentration
J+ = estimated concentration, high biased
mg/kg = milligrams per kilogram
NA = not available
ROD = record of decision

Table 16-2. Summary of Lead Concentrations in Soil, Site S-26, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (mg/kg)	Detection Limit (mg/kg)
Area 1					
S21+10W	1/1/1992	0.5	XRF	456	NA
GE0005	4/8/1998	1	SW6010A	288	4.42
GE0006	4/9/1998	0.5	SW6010A	157	4.31
GE0007	4/9/1998	0.5	SW6010A	256	4.37
GE0008	4/9/1998	0.5	SW6010A	196	4.39
GE0009	4/9/1998	0.5	SW6010A	159	4.28
Area 2					
P18.5	1/1/1992	0.5	XRF	464	NA
P19.5	1/1/1992	0.5	XRF	787	NA
Q18	1/1/1992	0.5	XRF	508	NA
Q19	1/1/1992	0.5	XRF	710	NA
R16.5	1/1/1992	0.5	XRF	700	NA
R17.5	1/1/1992	0.5	XRF	528	NA
R19.5	1/1/1992	0.5	XRF	449	NA
S16	1/1/1992	0.5	XRF	664	NA
S17	1/1/1992	0.5	XRF	595	NA
S19	1/1/1992	0.5	XRF	447	NA
T14.5	1/1/1992	0.5	XRF	665	NA
T15.5	1/1/1992	0.5	XRF	772	NA
T19.5	1/1/1992	0.5	XRF	686	NA
U15	1/1/1992	0.5	XRF	790	NA
U16	1/1/1992	0.5	XRF	722	NA
U17	1/1/1992	0.5	XRF	550	NA
U18	1/1/1992	0.5	XRF	462	NA
SS0007	6/27/1996	0.33	SW7421	320	24
SS0009	6/27/1996	0.25	SW7421	190	6.1
CP0002	7/17/1996	9	SW7421	88 J	2.5
CP0002	7/17/1996	14	SW7421	1.1	0.13
CP0002	7/17/1996	19	SW7421	7.1	0.81
GE0014	4/8/1998	1	SW6010A	150	4.4
GE0015	4/8/1998	1	SW6010A	174	4.37
GE0016	4/8/1998	1	SW6010A	115	4.37
GE0017	4/8/1998	1	SW6010A	467 J	4.46
GE0018	4/8/1998	1	SW6010A	102	4.44
GE0019	4/8/1998	1	SW6010A	348	4.37
GE0020	4/8/1998	1	SW6010A	536	4.48
GE0021	4/8/1998	1.5	SW6010A	229	4.71
GE0022	4/9/1998	0.5	SW6010A	73.5	4.37
GE0023	4/9/1998	0.5	SW6010A	321	4.4
GE0024	4/9/1998	0.75	SW6010A	250	4.32
GE0025	4/15/1998	0.5	SW6010A	462	4.39
GE0026	4/15/1998	0.5	SW6010A	911	4.47
GE0027	4/15/1998	0.5	SW6010A	286	4.42
GE0028	4/15/1998	0.5	SW6010A	398	4.55
GE0031	4/16/1998	0.5	SW6010A	543	4.3
Area 3					
O15	1/1/1992	0.5	XRF	415	NA
P15.5	1/1/1992	0.5	XRF	614	NA

Table 16-2. (Continued)

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (mg/kg)	Detection Limit (mg/kg)
Area 3 (cont'd)					
P16.5	1/1/1992	0.5	XRF	729	NA
P17.5	1/1/1992	0.5	XRF	502	NA
SS0010	6/27/1996	0.33	SW7421	330	12
GE0036	4/8/1998	1	SW6010A	55	4.29
GE0037	4/8/1998	1	SW6010A	95.8 J	4.83
GE0038	4/8/1998	1.5	SW6010A	217	4.78
GE0039	4/15/1998	0.5	SW6010A	491	4.39
GE0040	4/15/1998	0.5	SW6010A	414	4.3
GE0042	4/15/1998	0.5	SW6010A	547	4.31
GE0045	4/16/1998	0.75	SW6010A	217	4.38
GE0113	5/5/1998	0.5	SW6010A	387	4.5
Area 4					
N4.5	1/1/1992	0.5	XRF	475	NA
P3.5	1/1/1992	0.5	XRF	480	NA
P6.5	1/1/1992	0.5	XRF	715	NA
Q2	1/1/1992	0.5	XRF	467	NA
Q3	1/1/1992	0.5	XRF	733	NA
Q6	1/1/1992	0.5	XRF	475	NA
S4	1/1/1992	0.5	XRF	870	NA
S5	1/1/1992	0.5	XRF	463	NA
T3.5	1/1/1992	0.5	XRF	880	NA
T4.5	1/1/1992	0.5	XRF	469	NA
GE0047	4/8/1998	1	SW6010A	762	4.33
GE0048	4/8/1998	1	SW6010A	ND	4.35
GE0049	4/8/1998	1	SW6010A	649	NA
GE0050	4/8/1998	1	SW6010A	ND	4.67
GE0051	4/8/1998	1	SW6010A	640	4.78
GE0052	4/8/1998	1	SW6010A	363	4.51
GE0053	4/8/1998	1	SW6010A	ND	4.81
GE0054	4/8/1998	1	SW6010A	ND	4.25
GE0055	4/8/1998	1	SW6010A	13.9	4.37
GE0056	4/8/1998	1	SW6010A	571 J	4.52
GE0057	4/8/1998	1	SW6010A	ND	4.22
GE0058	4/8/1998	1	SW6010A	ND	4.3
GE0059	4/15/1998	0.5	SW6010A	229	4.38
GE0060	4/15/1998	0.5	SW6010A	609	4.32
GE0061	4/15/1998	0.5	SW6010A	667	4.35
GE0062	4/15/1998	0.5	SW6010A	564	4.28
GE0063	4/15/1998	0.5	SW6010A	306	4.24
GE0064	4/15/1998	0.5	SW6010A	390	4.4
GE0072	4/16/1998	0.5	SW6010A	734 J	4.4
GE0074	4/16/1998	0.5	SW6010A	96.7	4.25
GE0065	6/26/1998	0.75	SW6010A	22.5	4.18
GE0066	6/26/1998	0.75	SW6010A	20.9	4.17
Area 5					
SS0014	6/27/1996	0.33	SW7421	460	24
SS0052	2/5/1997	2	SW7421	48	NA
GE0075	4/8/1998	1	SW6010A	107 J	4.23
GE0076	4/15/1998	0.5	SW6010A	516	4.28

Table 16-2. (Continued)

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (mg/kg)	Detection Limit (mg/kg)
Area 5 (cont'd)					
GE0077	4/15/1998	0.5	SW6010A	435	4.3
GE0078	4/15/1998	0.5	SW6010A	325	4.28
GE0079	4/15/1998	0.5	SW6010A	337	4.2
Area 6					
AREA6HE-01	11/17/2006	0.9	SW6010B	4.44	0.357
AREA6HE-02	11/17/2006	1.1	SW6010B	3.46 J	0.401
AREA6HE-03	11/17/2006	1.4	SW6010B	71.7 J	0.411
AREA6HE-04	11/17/2006	1.6	SW6010B	5.41	0.388
AREA6HE-05	11/17/2006	1.2	SW6010B	28.6	0.394
AREA6HE-06	11/17/2006	1.9	SW6010B	3.22 J	0.387
AREA6HE-07	11/20/2006	1.1	SW6010B	208	0.406
AREA6VE-01	11/17/2006	2.2	SW6010B	1.24 J	0.402
AREA6VE-02	11/17/2006	2.2	SW6010B	0.775 J	0.391
AREA6VE-03	1/19/2007	2	SW6010B	2.31 J	0.411
Other					
SS0011	6/27/1996	0.5	SW7421	170	6.1
SS0015	7/2/1996	0.25	SW7421	45	2.4
SS0051	2/5/1997	2	SW7421	20	NA
SS0053	2/5/1997	2	SW7421	210	NA

Notes: Pre-ROD sample results (1991) are presented in this table if the sample locations are outside of the excavated area and the concentrations are greater than the residential regional screening level for lead of 400 mg/kg, establishing the need for land use controls (see Figure 16-2).

Post-ROD/pre-excavation sample results (1996 and 1997) are presented in this table if the sample locations are outside of the excavated area (see Figure 16-2).

All excavation sample results (1998, 2006, and 2007) are presented in this table.

bgs = below ground surface
J = estimated result
mg/kg = milligrams per kilogram
NA = not available
ND = not detected
ROD = record of decision

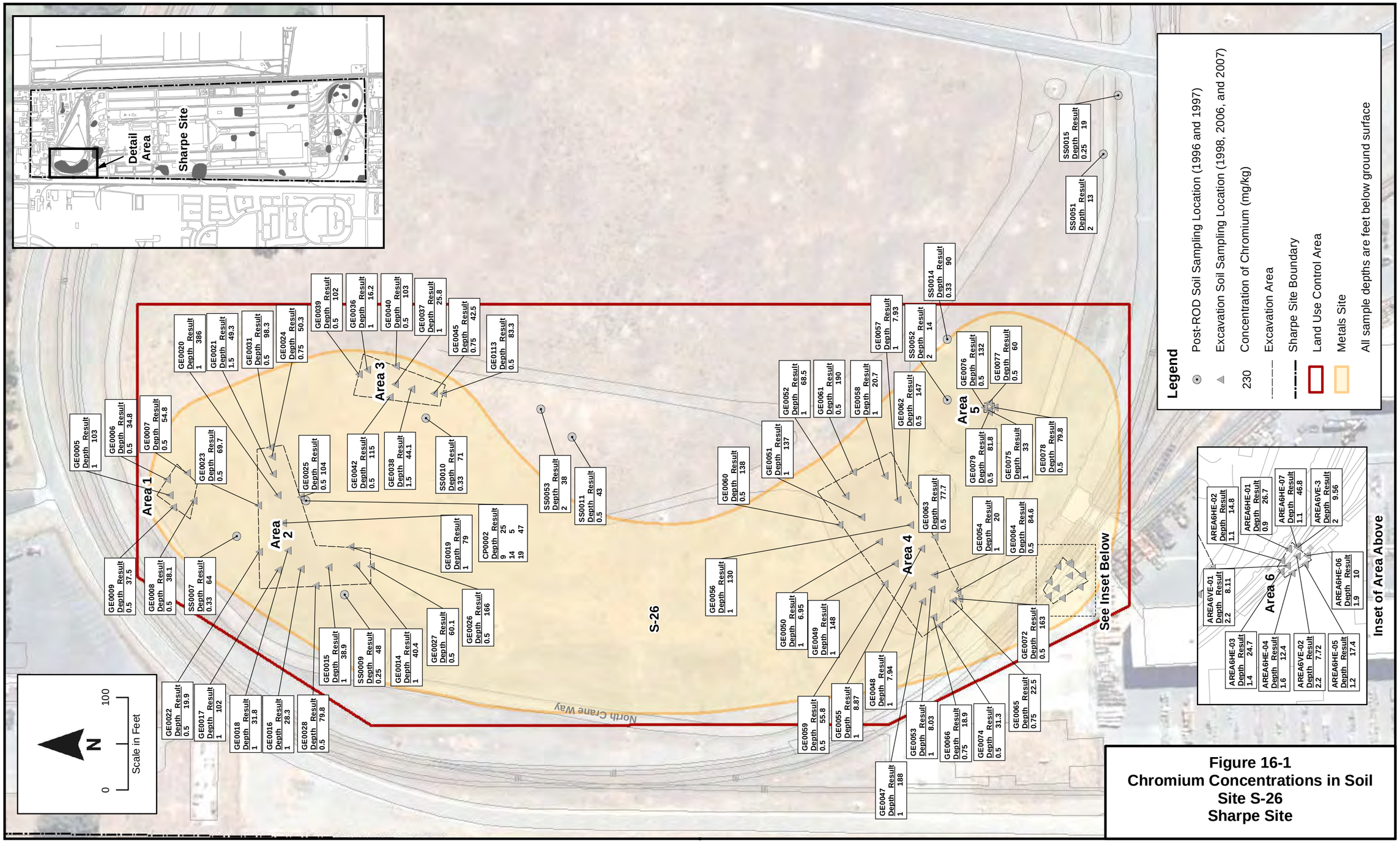


Figure 16-1
Chromium Concentrations in Soil
Site S-26
Sharpe Site

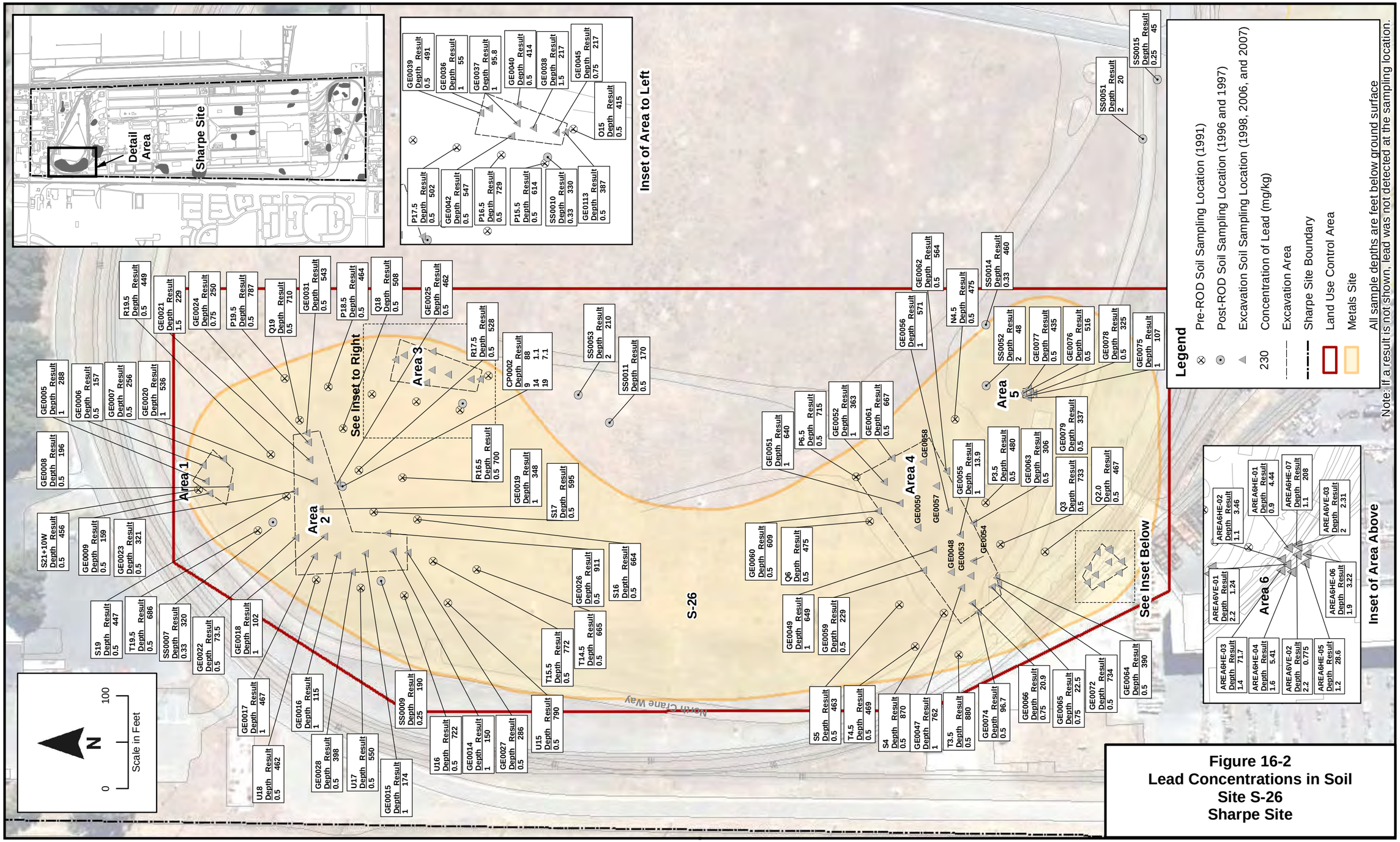


Figure 16-2
Lead Concentrations in Soil
Site S-26
Sharpe Site

L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\S26_PB_hist_results_portrait.mxd AVS 6/10/2011 SAC

SITE S-30

Conceptual Site Model

Site S-30 is in the southern portion of the South Balloon at the Sharpe Site (Figure 17-1). The surface of Site S-30 is compacted soil and gravel. No structures are present at Site S-30.

Potential Sources: Chromium and lead in surface soils at Site S-30 resulted from the disposal of solid waste from paint stripping operations. Waste (sludge) was routinely transported to the industrial wastewater treatment plant where the liquids were discharged into the oxidation ponds for treatment and the solids were spread on the ground in the South Balloon (Environmental Science and Engineering, Inc. [ESE], 1990). The waste was then mechanically turned into the surface soil and presumed to be thoroughly mixed. Historical information also indicates that metals contamination at Site S-30 resulted from wastes disposed in burial pits in the South Balloon (ESE, 1990). The vadose zone beneath the site is composed of clayey, sandy silt.

Groundwater: Depths to groundwater measured in the vicinity of Site S-30 ranged from approximately 11.5 to 17.5 feet below ground surface (bgs) during 2008 and the first half of 2009. Groundwater samples for total chromium and lead analysis were collected from monitoring and extraction wells at and downgradient from Site S-30 between 1996 and 2006 and between 1996 and 2000, respectively. The *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) required monitoring metals concentrations in groundwater relative to those that existed at the time the OU 2 ROD was signed (i.e., baseline conditions) to determine whether the concentration changes were statistically significant (ESE, 1996). For total chromium, concentrations exceeded the maximum contamination level (MCL) of 50 micrograms per liter (µg/L) in two samples collected in the fourth quarter of 1997 and the first quarter of 1998. The maximum total chromium concentration detected was 67.9 µg/L in the fourth quarter of 1997. No statistically significant increasing concentration trends were identified for total chromium concentrations over the period of sampling at Site S-30. Total lead was detected in one sample at a concentration of 5.35 µg/L in the second quarter of 1996, which is less than the MCL of 15 µg/L. For total lead, a trend analysis could not be performed because there were too few detections in wells at and downgradient from Site S-30. Aquifer cleanup levels were not established, and groundwater sampling for total chromium and lead analysis was discontinued in 2007 and 2001, respectively (URS, 2007c and 2001).

Land Use: Site S-30 is not currently being used. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Sampling: Thirty-five soil samples were field-analyzed using x-ray fluorescence at Site S-30 during the 1994 remedial investigation (ESE, 1994). The maximum concentrations of total chromium and lead detected were 171 milligrams per kilogram (mg/kg) and 27,500 mg/kg, respectively. The OU 2 ROD required excavation/off-site disposal of soil at Site S-30 with concentrations greater than the cleanup standards: 300 mg/kg for total chromium and 1,000 mg/kg for total lead in soil (0 to 2 feet bgs). The OU 2 ROD also established soluble action levels for total chromium (50 µg/L) and total lead (150 µg/L) in deionized water waste extraction test (DI-WET) extracts from the soil (ESE, 1996).

After the OU 2 ROD was signed in 1996, additional samples were collected at Site S-30 to delineate soils contaminated with total chromium and/or lead at concentrations exceeding the cleanup standards. In the 1996 post-ROD investigation, both surface and subsurface soil samples (2 to 12 feet bgs) were collected (Radian International, 1997a). All sample results were less than the cleanup standards; the maximum

concentrations of total chromium (130 mg/kg) and total lead (340 mg/kg) were detected in surface soil (0 to 2 feet bgs) at sample location SS0022 (Tables 17-1, 17-2, and Figures 17-1, 17-2). In addition, all DI-WET extraction results indicated that concentrations of lead and chromium did not exceed their soluble action levels. In 1999, an additional surface soil sample was collected to confirm the 1996 sampling results. The total chromium and lead results were less than the cleanup standards (Radian International, 2000a).

Soil Removal and Disposal Decision: Results of samples collected in 1996 and 1999 indicated that there was no threat to on-site adult workers or groundwater quality at Site S-30 because all chromium and lead concentrations were less than the cleanup standards and soluble action levels. Sample density was considered sufficient to reach the decision that soil removal and disposal would not be necessary at the site (Radian International, 2000a).

Potential Site Risk: Concentrations of total chromium and lead in soil at Site S-30 are less than the OU 2 ROD industrial-based cleanup standards (Tables 17-1, 17-2, and Figures 17-1, 17-2). However, those cleanup standards do not allow for unlimited use and unrestricted exposure (e.g., residential use).

The majority of post-ROD investigation samples were collected from 0 to 2 feet bgs based on the OU 2 ROD remedial excavation requirements for metals sites. A conservative evaluation of the need for land use controls at Site S-30 was based on the results of pre-ROD samples collected from depths below 2 feet bgs and all post-ROD sample results.

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

Land use controls to prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing are recommended for soil at Site S-30 to protect human health and the environment because chromium and lead have been left in place at concentrations that do not allow for unlimited use and unrestricted exposure.

Table 17-1. Summary of Chromium Concentrations in Soil, Site S-30, Sharpe

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (mg/kg)	Detection Limit (mg/kg)
SS0017	6/26/1996	0.25	SW7191	8.1	NA
SS0018	6/26/1996	0.25	SW7191	63	NA
SS0019	6/26/1996	0.08	SW7191	22	NA
SS0020	6/26/1996	0.08	SW7191	110	NA
SS0021	6/27/1996	0.17	SW7191	65	NA
SS0022	6/27/1996	0.25	SW7191	130	NA
SS0023	6/26/1996	0.25	SW7191	11	NA
SS0048	7/2/1996	0.33	SW7191	78	NA
SS0049	7/2/1996	0.33	SW7191	92	NA
SS0050	7/2/1996	0.25	SW7191	45	NA
CP0004	7/17/1996	5	SW7191	16	NA
CP0004	7/17/1996	8.5	SW7191	8.9	NA
CP0004	7/17/1996	12	SW7191	16	NA
SS0056	6/9/1999	0.5	SW7191	10.7	0.672

Note: All post-ROD sample results (1996 and 1999) are presented in this table.

bgs = below ground surface
mg/kg = milligrams per kilogram
NA = not available
ROD = record of decision

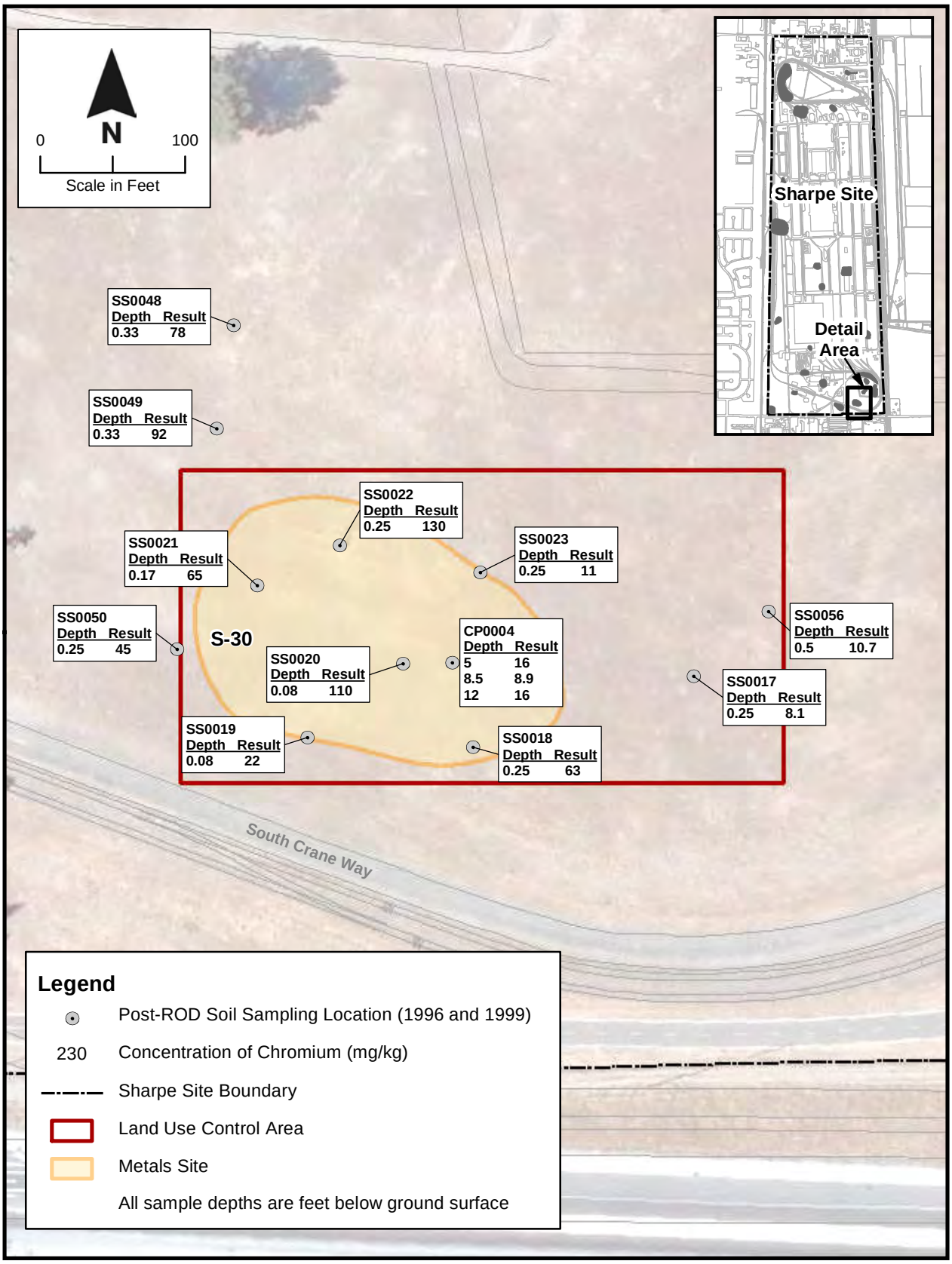
Table 17-2. Summary of Lead Concentrations in Soil, Site S-30, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (mg/kg)	Detection Limit (mg/kg)
9E	4/1/1994	3	CONF	27,500	NA
9G	4/1/1994	3	XRF	426	NA
SS0017	6/26/1996	0.25	SW7421	6.5	0.61
SS0018	6/26/1996	0.25	SW7421	130	6.1
SS0019	6/26/1996	0.08	SW7421	70	2.4
SS0020	6/26/1996	0.08	SW7421	230	12
SS0021	6/27/1996	0.17	SW7421	130	12
SS0022	6/27/1996	0.25	SW7421	240	12
SS0023	6/26/1996	0.25	SW7421	3.1	0.24
SS0048	7/2/1996	0.33	SW7421	340 J	NA
SS0049	7/2/1996	0.33	SW7421	180	12
SS0050	7/2/1996	0.25	SW7421	130	6.1
CP0004	7/17/1996	5	SW7421	4 J	0.14
CP0004	7/17/1996	8.5	SW7421	2.6	0.14
CP0004	7/17/1996	12	SW7421	7.5	0.75
SS0056	6/9/1999	0.5	SW7421	7.14	1.23

Notes: Pre-ROD sample results (1994) below the ROD-required excavation limit of 2 feet bgs are presented in this table if the sample concentrations are greater than the residential regional screening level for lead of 400 mg/kg, establishing the need for land use controls (see Figure 17-2).

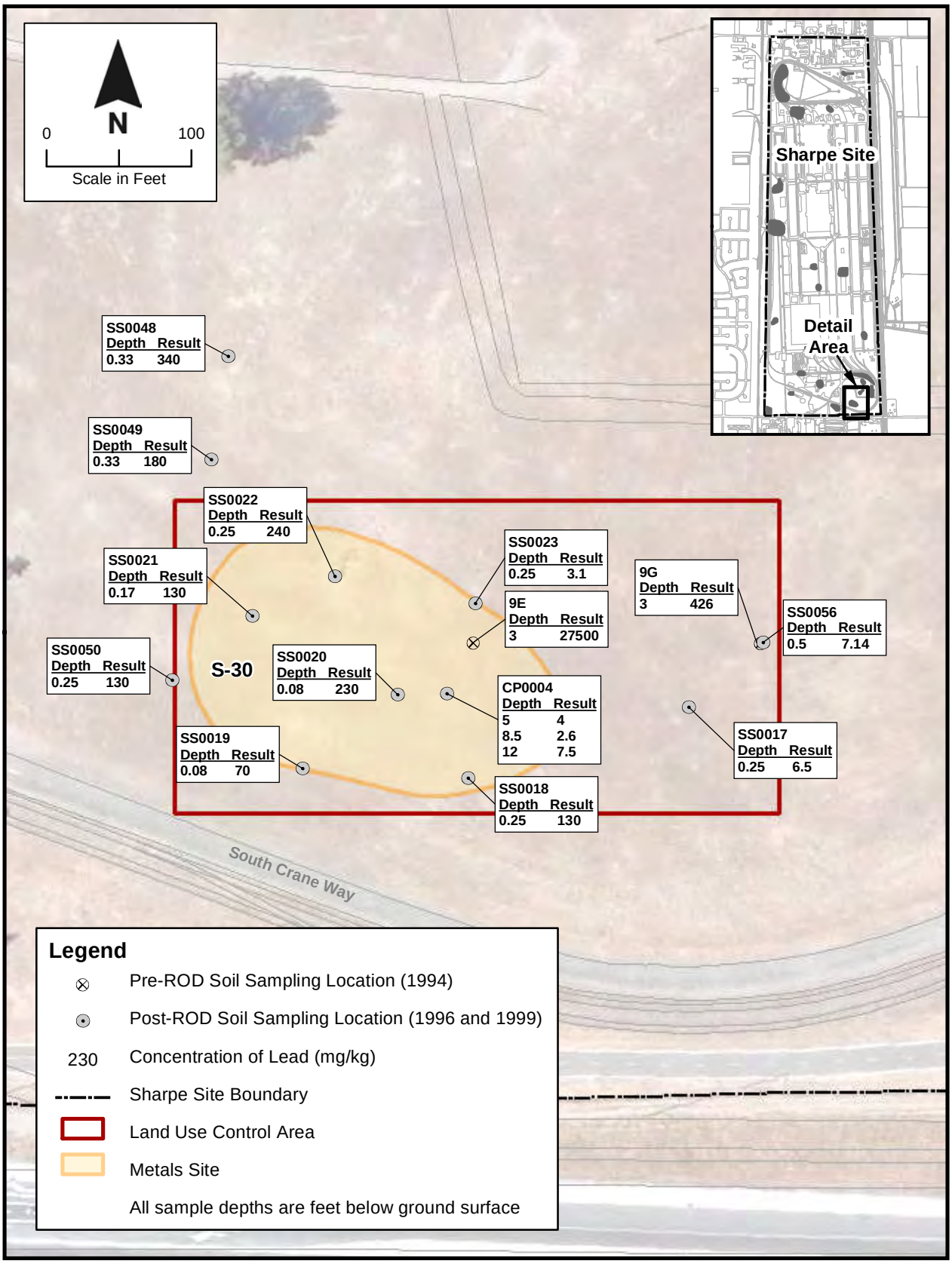
All post-ROD sample results (1996 and 1999) are presented in this table.

bgs = below ground surface
J = estimated result
mg/kg = milligrams per kilogram
NA = not available
ROD = record of decision



L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\S30_CR_hist_results.mxd AVS 6/10/2011 SAC

Figure 17-1. Chromium Concentrations in Soil, Site S-30, Sharpe Site



L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\S30_PB_hist_results.mxd AVS 6/10/2011 SAC

Figure 17-2. Lead Concentrations in Soil, Site S-30, Sharpe Site

SITE S-33/29

Conceptual Site Model

Site S-33/29 is in the southern portion of the South Balloon at the Sharpe Site (Figure 18-1). The surface of Site S-33/29 is sparsely vegetated soil. No structures are present at Site S-33/29.

Potential Sources: Chromium and lead in surface soils at Site S-33/29 resulted from the operation of open debris burn pits used to dispose of empty paint containers, wood, paper, hydraulic fluid, and other combustible material (Environmental Science and Engineering, Inc. [ESE], 1990). The vadose zone beneath the site is composed of clayey, sandy silt.

Groundwater: Depths to groundwater measured in the vicinity of Site S-33/29 ranged from approximately 14 to 18.5 feet below ground surface (bgs) during 2008 and the first half of 2009. Groundwater samples for total chromium and lead analysis were collected from monitoring and extraction wells at and downgradient from Site S-33/29 between 1996 and 2006 and between 1996 and 2000, respectively. The *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) required monitoring metals concentrations in groundwater relative to those that existed at the time the OU 2 ROD was signed (i.e., baseline conditions) to determine whether the concentration changes were statistically significant (ESE, 1996). For total chromium, eight samples collected between the second quarter of 1996 and the first quarter of 2000 had concentrations greater than the maximum contaminant level (MCL) of 50 micrograms per liter (µg/L). The maximum total chromium concentration detected was 61.6 µg/L in the fourth quarter of 1996. No statistically significant increasing concentration trends were identified for total chromium concentrations over the period of sampling. Total lead was detected in two samples at concentrations less than the MCL of 15 µg/L in the second quarter of 1997 and the first quarter of 1998. For total lead, a trend analysis could not be performed because there were too few detections in wells at and downgradient from Site S-33/29. Aquifer cleanup levels were not established, and groundwater sampling for total chromium and lead analysis was discontinued in 2007 and 2001, respectively (URS, 2007c and 2001).

Land Use: Site S-33/29 is not currently being used. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Sampling: Twenty-two soil samples were field-analyzed using x-ray fluorescence at Site S-33/29 during the 1994 remedial investigation (ESE, 1994). The maximum concentrations of total chromium and lead were 329 milligrams per kilogram (mg/kg) and 1,542 mg/kg, respectively. The OU 2 ROD required excavation/off-site disposal of soil at Site S-33/29 with concentrations that exceeded the cleanup standards: 300 mg/kg for total chromium and 1,000 mg/kg for total lead in soil (0 to 2 feet bgs). The OU 2 ROD also established soluble action levels for total chromium (50 µg/L) and total lead (150 µg/L) in deionized water waste extraction test (DI-WET) extracts from soil (ESE, 1996).

After the OU 2 ROD was signed in 1996, additional soil samples were collected at Site S-33/29 to delineate soils contaminated with total chromium and/or lead at concentrations exceeding the cleanup standards. In the 1996 post-ROD investigation, both surface and subsurface soil samples (2 to 12.5 feet bgs) were collected (Radian International, 1997a). The maximum concentrations of total chromium (32 mg/kg) and total lead (670 mg/kg) were less than the cleanup standards (Tables 18-1, 18-2, and Figures 18-1, 18-2). In addition, all DI-WET extraction results indicated that concentrations of lead and chromium did not exceed their soluble action levels.

In 1998, additional site characterization soil sampling was conducted at the request of the California Regional Water Quality Control Board–Central Valley Region. Maximum concentrations of total chromium (59.9 mg/kg from 4 feet bgs at CP0739) and total lead (509 mg/kg from 8 feet bgs at CP0735) were both less than the OU 2 ROD cleanup standards. Soluble chromium was detected in a groundwater sample collected from CP0735 at 50.8 µg/L, which slightly exceeded the action level of 50 µg/L (Radian International, 1999) but was the only exceedance at Site S-33/29. Soluble lead concentrations in DI-WET extracts were less than the 150 µg/L action level.

Soil Removal and Disposal Decision: Results of samples collected in 1996 and 1998 indicated that there was no threat to on-site adult workers or groundwater quality at Site S-33/29 because all chromium and lead concentrations were less than the cleanup standards and soluble action levels (except one soluble chromium concentration as noted above). Sample density was considered sufficient to reach the decision that soil removal and disposal would not be necessary at the site (Radian International, 2000a).

Potential Site Risk: Concentrations of total chromium and lead in soil at Site S-33/29 are less than the OU 2 ROD industrial-based cleanup standards (Tables 18-1, 18-2, and Figures 18-1, 18-2). However, those cleanup standards do not allow for unlimited use and unrestricted exposure (e.g., residential use).

The majority of post-ROD investigation samples were collected from 0 to 2 feet bgs based on the OU 2 ROD remedial excavation requirements for metals sites. A conservative evaluation of the need for land use controls at Site S-33/29 was based on the results of pre-ROD samples collected from depths below 2 feet bgs and all post-ROD sample results.

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

Land use controls to prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing are recommended for soil at Site S-33/29 to protect human health and the environment because chromium and lead have been left in place at concentrations that do not allow for unlimited use and unrestricted exposure.

Table 18-1. Summary of Chromium Concentrations in Soil, Site S-33/29, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (mg/kg)	Detection Limit (mg/kg)
SS0035	6/26/1996	0.5	SW7191	32	NA
SS0036	6/26/1996	0.25	SW7191	19	NA
SS0037	6/26/1996	0.17	SW7191	32	NA
SS0038	6/26/1996	0.25	SW7191	27	NA
SS0039	6/26/1996	0.25	SW7191	17	NA
CP0006	7/17/1996	5	SW7191	15	NA
CP0006	7/17/1996	9	SW7191	5.3	NA
CP0006	7/17/1996	12	SW7191	1.9	NA
SS0040	9/24/1996	0.25	SW7191	18	NA
SS0041	9/24/1996	0.25	SW7191	20	NA
CP0733	5/12/1998	5	SW7191	9.83	0.287
CP0733	5/12/1998	8.5	SW7191	12.9	0.266
CP0733	5/12/1998	12.5	SW7191	4.36	0.1
CP0734	5/12/1998	4.5	SW7191	17.6	0.618
CP0734	5/12/1998	8.5	SW7191	29.8	0.753
CP0734	5/12/1998	12.5	SW7191	4.58	0.1
CP0735	5/12/1998	4.5	SW7191	38.3	0.637
CP0735	5/12/1998	10	SW7191	27.9	0.692
CP0735	5/12/1998	12.5	SW7191	27.5	0.689
CP0736	5/12/1998	4.5	SW7191	17.9	0.788
CP0736	5/12/1998	8.5	SW7191	18.9	0.477
CP0736	5/12/1998	12.5	SW7191	29.3	0.542
CP0737	5/12/1998	4.5	SW7191	20.4	0.633
CP0737	5/12/1998	8.5	SW7191	9.1	0.269
CP0737	5/12/1998	12.5	SW7191	28	0.725
CP0738	5/12/1998	4.5	SW7191	20.3	0.54
CP0738	5/12/1998	8.5	SW7191	12.9	0.561
CP0738	5/12/1998	12.5	SW7191	22.4	0.498
CP0739	5/12/1998	4.5	SW7191	59.9	1.28
CP0739	5/12/1998	8.5	SW7191	8.15	0.267
CP0739	5/12/1998	12.5	SW7191	22.9	0.557
CP0768	12/23/1998	4	SW7191	21 J	0.46
CP0768	12/23/1998	8	SW7191	24	0.46
CP0768	12/23/1998	12	SW7191	14	0.46
CP0769	12/23/1998	4	SW7191	5.9	0.46
CP0769	12/23/1998	8	SW7191	6.3	0.46
CP0769	12/23/1998	12	SW7191	2.4	0.46
CP0770	12/23/1998	4	SW7191	16	0.46
CP0770	12/23/1998	8	SW7191	8.7	0.46
CP0770	12/23/1998	12	SW7191	11	0.46
CP0771	12/23/1998	4	SW7191	6.4	0.46
CP0771	12/23/1998	8	SW7191	6	0.46
CP0771	12/23/1998	12	SW7191	9.1	0.46

Note: All post-ROD sample results (1996 and 1998) are presented in this table.

bgs = below ground surface
J = estimated result
mg/kg = milligrams per kilogram
NA = not available
ROD = record of decision

Table 18-2. Summary of Lead Concentrations in Soil, Site S-33/29, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (mg/kg)	Detection Limit (mg/kg)
S29-B9	4/1/1994	2.5	XRF	1,542	NA
S29-B11	4/1/1994	3	XRF	412	NA
SS0035	6/26/1996	0.5	SW7421	570	31
SS0036	6/26/1996	0.25	SW7421	25	1.2
SS0037	6/26/1996	0.17	SW7421	210	30
SS0038	6/26/1996	0.25	SW7421	670	24
SS0039	6/26/1996	0.25	SW7421	79	6.1
CP0006	7/17/1996	5	SW7421	4.4	0.13
CP0006	7/17/1996	9	SW7421	1.4	0.13
CP0006	7/17/1996	12	SW7421	0.85	0.13
SS0040	9/24/1996	0.25	SW7421	130	6
SS0041	9/24/1996	0.25	SW7421	200	12
CP0733	5/12/1998	4.5	SW7421	2.06	0.0857
CP0733	5/12/1998	8.5	SW7421	2.02	0.0653
CP0733	5/12/1998	12.5	SW7421	0.987	0.0615
CP0734	5/12/1998	4.5	SW7421	2.02	0.0756
CP0734	5/12/1998	8.5	SW7421	2.45	0.0922
CP0734	5/12/1998	12.5	SW7421	0.971	0.0613
CP0735	5/12/1998	4.5	SW7421	480	7.81
CP0735	5/12/1998	10	SW7421	509	8.47
CP0735	5/12/1998	12.5	SW7421	9.9	0.337
CP0736	5/12/1998	4.5	SW7421	4.94 J	0.0966
CP0736	5/12/1998	8.5	SW7421	2.69 J	0.0584
CP0736	5/12/1998	12.5	SW7421	8.22 J	0.265
CP0737	5/12/1998	4.5	SW7421	2.2	0.0775
CP0737	5/12/1998	8.5	SW7421	1.64	0.0658
CP0737	5/12/1998	12.5	SW7421	7.23	0.178
CP0738	5/12/1998	4.5	SW7421	14.7 J	0.265
CP0738	5/12/1998	8.5	SW7421	1.65	0.0686
CP0738	5/12/1998	12.5	SW7421	5.38	0.122
CP0739	5/12/1998	4.5	SW7421	1.88	0.0781
CP0739	5/12/1998	8.5	SW7421	1.5	0.0653
CP0739	5/12/1998	12.5	SW7421	5.9	0.136
CP0768	12/23/1998	4	SW7421	7.5	0.101
CP0768	12/23/1998	8	SW7421	62	0.101
CP0768	12/23/1998	12	SW7421	7.5	0.101
CP0769	12/23/1998	4	SW7421	1.1	0.101
CP0769	12/23/1998	8	SW7421	0.88	0.101
CP0769	12/23/1998	12	SW7421	1.1	0.101
CP0770	12/23/1998	4	SW7421	70	0.101
CP0770	12/23/1998	8	SW7421	3	0.101
CP0770	12/23/1998	12	SW7421	5.4	0.101
CP0771	12/23/1998	4	SW7421	1.3	0.101
CP0771	12/23/1998	8	SW7421	1.1	0.101
CP0771	12/23/1998	12	SW7421	3.8	0.101

Notes: Pre-ROD sample results (1994) below the ROD-required excavation limit of 2 feet bgs are presented in this table if the sample concentrations are greater than the residential regional screening level for lead of 400 mg/kg, establishing the need for land use controls (see Figure 18-2).

All post-ROD sample results (1996 and 1998) are presented in this table.

bgs = below ground surface
J = estimated result
mg/kg = milligrams per kilogram
NA = not available
ROD = record of decision

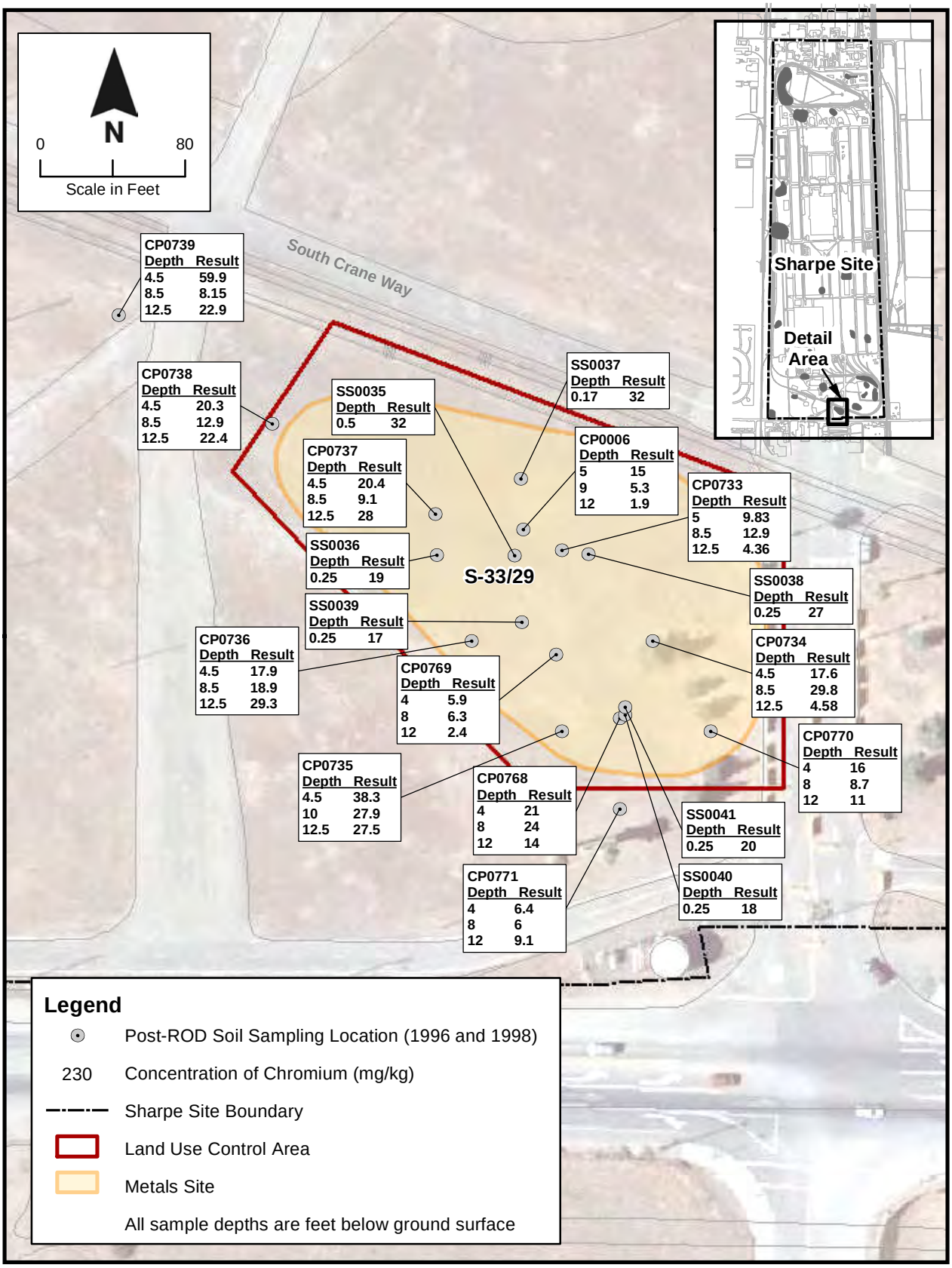
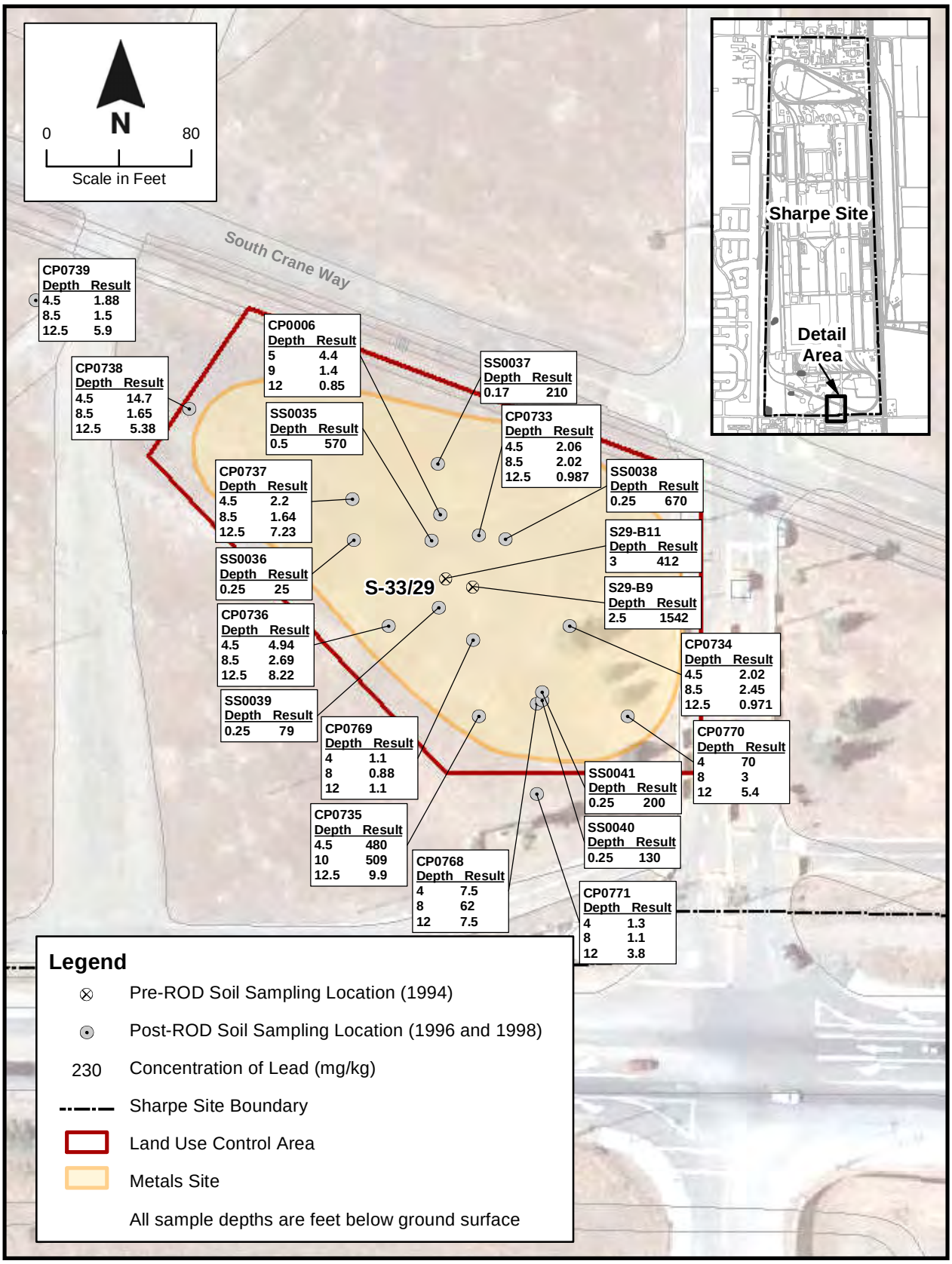


Figure 18-1. Chromium Concentrations in Soil, Site S-33/29, Sharpe Site



L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\S33_PB_hist_results.mxd AVS 6/10/2011 SAC

Figure 18-2. Lead Concentrations in Soil, Site S-33/29, Sharpe Site

SITE S-36

Conceptual Site Model

Site S-36 is in the northeastern portion of the South Balloon at the Sharpe Site (Figure 19-1). The surface of Site S-36 is open, unpaved soil with sparse groundcover. One structure (Building 605) is present at the site. Building 605 is currently used for the temporary storage of hazardous waste generated at the facility.

Potential Sources: Chromium and lead in surface soils at Site S-36 resulted from the disposal of solid waste from paint stripping operations. Waste (sludge) was routinely transported to the industrial wastewater treatment plant where the liquids were discharged into the oxidation ponds for treatment and the solids were spread on the ground in the South Balloon (Environmental Science and Engineering, Inc. [ESE], 1990). The waste was then mechanically turned into the surface soil and presumed to be thoroughly mixed. Historical information also indicates that metals contamination at Site S-36 resulted from wastes disposed in burial pits in the South Balloon (ESE, 1990). The vadose zone beneath the site is composed of clayey, sandy silt.

Groundwater: Depths to groundwater measured in the vicinity of Site S-36 ranged from approximately 11.5 to 16 feet below ground surface (bgs) during 2008 and the first half of 2009. Groundwater samples for total chromium and lead analysis were collected from monitoring and extraction wells at and downgradient from Site S-36 between 1996 and 2005 and between 1996 and 2000, respectively. The *Record of Decision Basewide Remedy for DDRW-Sharpe Site* (OU 2 ROD) required monitoring metals concentrations in groundwater relative to those that existed at the time the OU 2 ROD was signed (i.e., baseline conditions) to determine whether the concentration changes were statistically significant (ESE, 1996). For total chromium, seven samples collected between the fourth quarter of 1996 and the first quarter of 1999 had concentrations greater than the maximum contaminant level (MCL) of 50 micrograms per liter (µg/L). The maximum total chromium concentration detected was 75.3 µg/L in the first quarter of 1998. No statistically significant increasing concentration trends were identified for total chromium concentrations during the period of sampling. Total lead was detected in one sample at a concentration of 16.3 µg/L in the fourth quarter of 1996, which is slightly greater than the MCL of 15 µg/L. For total lead, a trend analysis could not be performed because there were too few detections in wells at and down-gradient from Site S-36. Aquifer cleanup levels were not established, and groundwater sampling for total chromium and lead analysis was discontinued in 2006 and 2001, respectively (URS, 2006 and 2001).

Land Use: Most of Site S-36 is not being used at this time. Building 605 is used for storage; one employee is in the building for approximately 4 hours per workday. Any future use of the site is expected to be industrial/storage.

CERCLA History

Soil Sampling: One hundred and thirty-six soil samples were field-analyzed using x-ray fluorescence at Site S-36 during the 1994 remedial investigation (ESE, 1994).The maximum concentrations of total chromium and lead were 722 milligrams per kilogram (mg/kg) and 3,990 mg/kg, respectively. The OU 2 ROD required excavation/off-site disposal of soil at Site S-36 with concentrations greater than the cleanup standards: 300 mg/kg for total chromium and 1,000 mg/kg for total lead in soil (0 to 2 feet bgs). The OU 2 ROD also established soluble action levels for total chromium in deionized water waste extraction test (DI-WET) extracts from soil (50 µg/L) and total lead (150 µg/L) (ESE, 1996).

After the OU 2 ROD was signed in 1996, additional soil samples were collected at Site S-36 to delineate soils contaminated with total chromium and/or lead at concentrations exceeding the cleanup standards. In the 1996 post-ROD investigation, both surface and subsurface soil samples (2 to 12 feet bgs) were

collected (Radian International, 1997a). The maximum concentrations of total chromium (110 mg/kg) and lead (370 mg/kg) were less than the cleanup standards (Tables 19-1, 19-2, and Figures 19-1, 19-2). The soluble chromium concentration (51 µg/L) in one sample (SS0025) was slightly greater than the action level but was the only exceedance at Site S-36.

At the request of the California Regional Water Quality Control Board–Central Valley Region, additional surface soil samples were collected in 1999 at Site S-36 to confirm the 1996 sampling results. All results were less than the cleanup standards (Radian International, 2000a). In addition, all DI-WET extraction results indicated that concentrations of lead and chromium did not exceed their soluble action levels.

Soil Removal and Disposal Decision: Results of samples collected in 1996 and 1999 indicated that there was no threat to on-site adult workers or groundwater quality at Site S-36 because all chromium and lead concentrations were less than the cleanup standards and soluble action levels (except one soluble chromium concentration as noted above). Sample density was considered sufficient to reach the decision that soil removal and disposal would not be necessary at the site (Radian International, 2000a).

Potential Site Risk: Concentrations of total chromium and lead in soil at Site S-36 are less than the OU 2 ROD industrial-based cleanup standards (Tables 19-1, 19-2, and Figures 19-1, 19-2). However, those cleanup standards do not allow for unlimited use and unrestricted exposure (e.g., residential use).

The majority of post-ROD investigation samples were collected from 0 to 2 feet bgs based on the OU 2 ROD remedial excavation requirements for metals sites. A conservative evaluation of the need for land use controls at Site S-36 was based on the results of pre-ROD samples collected from depths below 2 feet bgs and all post-ROD sample results.

Burrowing owls constitute a valued ecological resource that is present at the Sharpe Site. Available data do not indicate any discernable or measurable adverse effects to burrowing owl populations from either residual chemicals in soil or from other environmental or biological factors.

Recommendation

Land use controls to prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing are recommended for soil at Site S-36 to protect human health and the environment because chromium and lead have been left in place at concentrations that do not allow for unlimited use and unrestricted exposure.

Table 19-1. Summary of Chromium Concentrations in Soil, Site S-36, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (mg/kg)	Detection Limit (mg/kg)
50E OF 1F	4/1/1994	14.5	XRF	722	NA
50E OF 1H	4/1/1994	4	XRF	368	NA
SS0024	6/26/1996	0.25	SW7191	26	NA
SS0025	6/26/1996	0.25	SW7191	110	NA
SS0026	6/27/1996	0.25	SW7191	38	NA
SS0027	6/27/1996	0.33	SW7191	12	NA
SS0028	6/27/1996	0.33	SW7191	14	NA
SS0029	6/27/1996	0.33	SW7191	9.5	NA
SS0030	6/26/1996	0.25	SW7191	8.4	NA
SS0031	6/26/1996	0.25	SW7191	53	NA
SS0032	6/26/1996	0.17	SW7191	51	NA
SS0033	6/26/1996	0.25	SW7191	37	NA
SS0034	6/26/1996	0.25	SW7191	66	NA
CP0005	7/17/1996	5	SW7191	22	NA
CP0005	7/17/1996	8.5	SW7191	16	NA
CP0005	7/17/1996	12	SW7191	14	NA
SS0054	6/9/1999	0.5	SW7191	18.1	0.877
SS0055	6/9/1999	0.5	SW7191	29.1	0.749
SS0057	6/9/1999	0.5	SW7191	14.3	0.678

Notes: Pre-ROD sample results (1994) below the ROD-required excavation limit of 2 feet bgs are presented in this table if the sample concentrations are greater than the residential regional screening level for chromium of 280 mg/kg, establishing the need for land use controls (see Figure 19-1).

All post-ROD sample results (1996 and 1999) are presented in this table.

bgs = below ground surface
mg/kg = milligrams per kilogram
NA = not available
ROD = record of decision

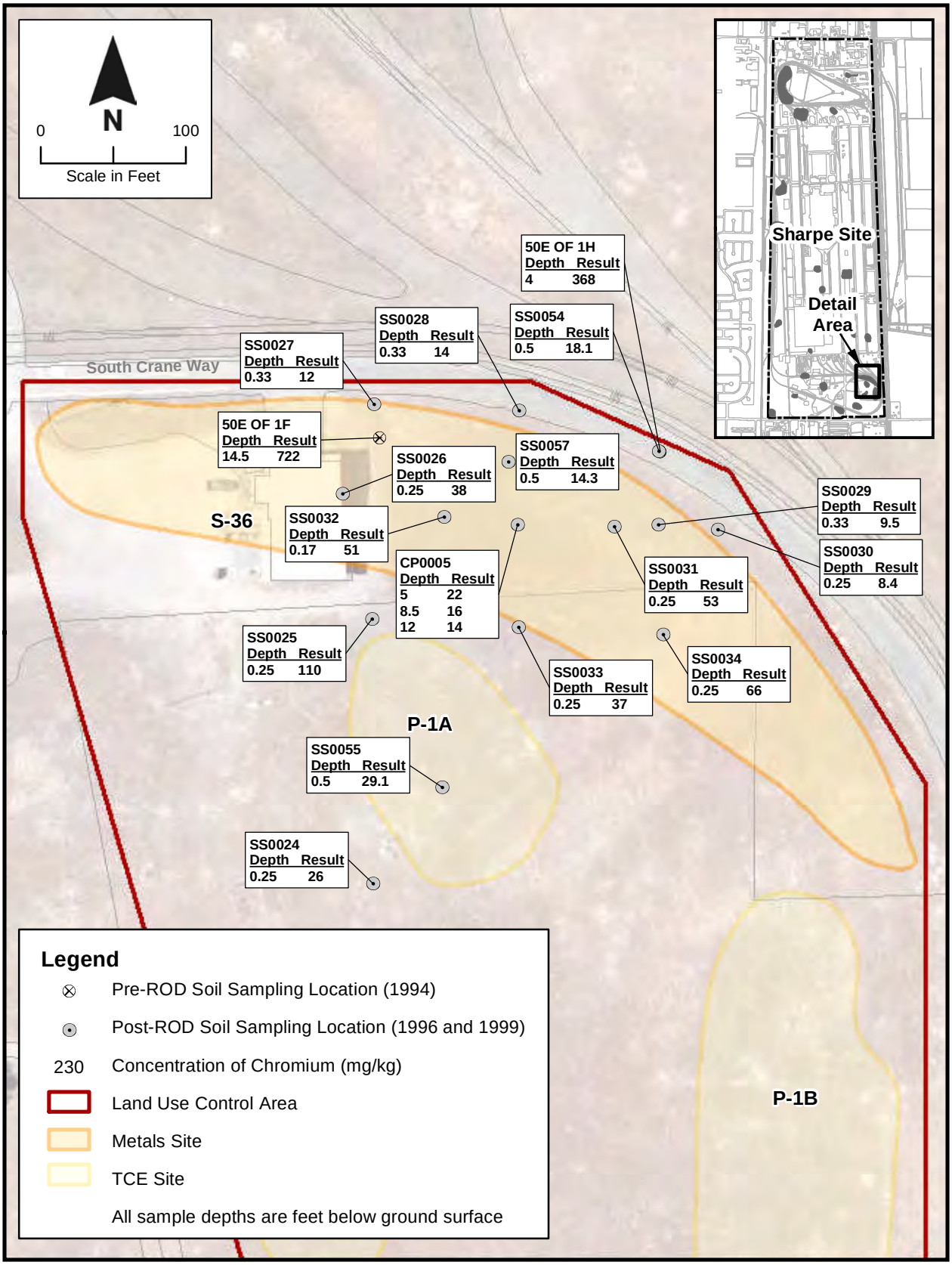
Table 19-2. Summary of Lead Concentrations in Soil, Site S-36, Sharpe Site

Location	Sample Date	Sample Depth (feet bgs)	Method	Result (mg/kg)	Detection Limit (mg/kg)
2H	4/1/1994	14	XRF	610	NA
48E OF 1F	4/1/1994	4	XRF	474	NA
50E OF 1G	4/1/1994	4	CONF	1,160	NA
50E OF 1H	4/1/1994	4	CONF	3,990	NA
50N 50E OF 1F	4/1/1994	3	XRF	452	NA
50S OF 2H	4/1/1994	10	XRF	575	NA
SS0024	6/26/1996	0.25	SW7421	81	2.5
SS0025	6/26/1996	0.25	SW7421	370	12
SS0026	6/27/1996	0.25	SW7421	160	6
SS0027	6/27/1996	0.33	SW7421	40	2.5
SS0028	6/27/1996	0.33	SW7421	55	2.4
SS0029	6/27/1996	0.33	SW7421	24	1.2
SS0030	6/26/1996	0.25	SW7421	7.9	0.61
SS0031	6/26/1996	0.25	SW7421	93	12
SS0032	6/26/1996	0.17	SW7421	78	12
SS0033	6/26/1996	0.25	SW7421	100	6.1
SS0034	6/26/1996	0.25	SW7421	270	12
CP0005	7/17/1996	5	SW7421	210	7.1
CP0005	7/17/1996	9	SW7421	3.7	0.15
CP0005	7/17/1996	12	SW7421	3.5	0.16
SS0054	6/9/1999	0.5	SW7421	40.6	1.61
SS0055	6/9/1999	0.5	SW7421	61.7	1.37
SS0057	6/9/1999	0.5	SW7421	147	6.21

Notes: Pre-ROD sample results (1994) below the ROD-required excavation limit of 2 feet bgs are presented in this table if the sample concentrations are greater than the residential regional screening level for lead of 400 mg/kg, establishing the need for land use controls (see Figure 19-2).

All post-ROD sample results (1996 and 1999) are presented in this table.

bgs = below ground surface
mg/kg = milligrams per kilogram
NA = not available
ROD = record of decision



L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\S36_CR_hist_results.mxd AVS 6/10/2011 SAC

Figure 19-1. Chromium Concentrations in Soil, Site S-36, Sharpe Site

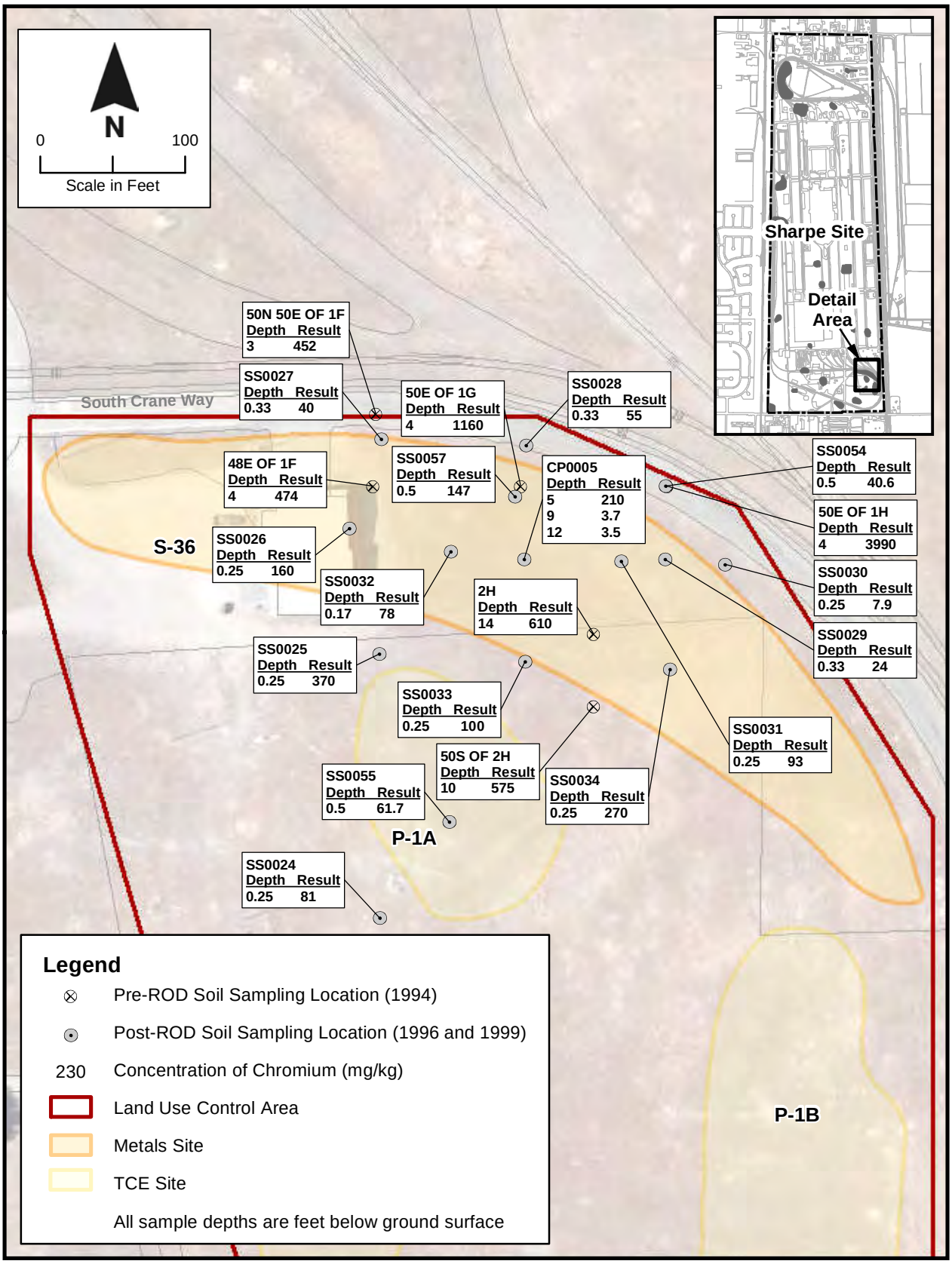


Figure 19-2. Lead Concentrations in Soil, Site S-36, Sharpe Site

REFERENCES

Albion Environmental, Inc. 1997. *Burrowing Owl Management Plan, Sharpe Depot*. November.

California Department of Toxic Substances Control and California Department of Fish and Game, 2010. *Ecological Risk Evaluation for Burrowing Owls at Site P-3A*. September.

Environmental Science and Engineering, Inc. (ESE), 1986. *Environmental Contamination Survey at Sharpe Army Depot, Final Report*. Prepared for US Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, MD.

ESE, 1990. *Remedial Investigation/Feasibility Study at DDRW-Sharpe Site, Remedial Investigation*. Draft Final. November.

ESE, 1994. *Remedial Investigation/Feasibility Study at Sharpe Site: Soils Feasibility Study Report*. Final. December.

ESE, 1996. *Record of Decision, Basewide Remedy for DDRW-Sharpe Site*. Final. February.

Gallegos, P., J. Lutz, J. Markwiese, R. Ryti, and R. Mirenda, 2007. Wildlife Ecological Screening Levels for Inhalation of Volatile Organic Chemicals. *Environ. Toxicol.Chem*. 26:1299–1303.

MWH, 2010. *Inhalation Toxicity Reference Value Updates for Use in Ecological Risk Assessments at Santa Susana Field Laboratory, Ventura County, California*.

Radian Corporation, 1996. *Operable Unit 2 Remedial Design Work Plan, DDRW-Sharpe*. Final. May.

Radian International, 1997a. *DDRW-Sharpe, Operable Unit 2 Pre-Design Technical Summary*. Final. January.

Radian International, 1997b. *DDRW-Sharpe, Addendum to the Operable Unit 2 Pre-Design Technical Summary*. Final. September.

Radian International, 1999. *DDJC-Sharpe Engineering Technical Memorandum Site S-33/29 Metals Investigation*. Final. August.

Radian International, 2000a. *Operable Unit 2, No Further Action, Remedial Action Report*. Final. December.

Radian International, 2000b. *DDJC-Sharpe Operable Unit 2, Metals Remedial Action Report, Sites S-3 and S-26.* Final. September.

United States Environmental Protection Agency (EPA), 2002. *Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*. Draft. EPA 530-D-02-004. Prepared by Office of Solid Waste and Emergency Response, United States Environmental Protection Agency, Washington, D.C. November.

EPA, 2009. *Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites. RSL Table Update December 10, 2009*. Online information: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm (last accessed February 2010).

URS Group, Inc. (URS), 2001. DDJC-*Sharpe FFA Annual Progress Report: October 1999 through September 2000*. Final. May.

URS, 2002. *Operable Unit 2 Soil Vapor Extraction Remedial Action Report, DDJC-Sharpe*. Final. May.

URS, 2005. Minutes for Remedial Project Managers Meeting, November 2005.

URS, 2006. DDJC-*Sharpe FFA Annual Progress Report: October 2004 through September 2005*. Final. May.

URS, 2007a. *DDJC-Sharpe Comprehensive Cone Penetrometer Investigation – Sites P-2A and P-5A Soil Vapor Sampling Results*. December.

URS, 2007b. *Site P-5A Groundwater and Soil Vapor Investigation Results, Technical Memorandum, DDJC-Sharpe*. Final. February.

URS, 2007c. *DDJC-Sharpe FFA Annual Progress Report: October 2005 through September 2006*. Final. May.

URS, 2008. *DDJC-Sharpe Operable Unit 2, Metals Remedial Action Report, Site S-26, Area 6*. Final. January.

URS, 2009. *DDJC-Sharpe Comprehensive Cone Penetrometer Testing Investigation Results Report*. Final. October.

URS, 2010a. *DDJC-Sharpe FFA Annual Progress Report: October 2008 through September 2009*. Final. May.

URS, 2010b. *DDJC-Sharpe Well Monitoring Program Quarterly Monitoring Report, First Quarter 2010 Sampling Round*. April.

URS, 2011. *Ecological Risk Evaluation of Burrowing Owls at the Metals Sites, Defense Distribution Depot San Joaquin – Sharpe Site*. Final. May.

APPENDIX B

Risk and Hazard Estimates for the Vapor Intrusion Pathway at the TCE Sites

TABLE OF CONTENTS

INTRODUCTION B-1

RATIONALE B-1

ORGANIZATION OF THIS APPENDIX B-1

METHODS B-2
- Data Evaluation B-2
- Fate and Transport Modeling for the Site-Specific Calculations B-2
- Cumulative Risk Assessment of the Vapor Intrusion Pathway B-3

RESULTS SUMMARY B-4

LIMITATIONS B-4

REFERENCES B-5

TABLES

Table B-1 Residential Risk and Hazard Estimates, Vapor Intrusion Pathwway at the TCE Soil Sites, Sharpe Site B-6

ATTACHMENTS

Attachment B1 Site P-1A
- Table B1-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1A
- Table B1-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1A
- Table B1-3 DATAENTER printout for Site P-1A
- Table B1-4 CHEMPROPS printout for Site P-1A
- Table B1-5 INTERCALCS printout for Site P-1A

Attachment B2 Site P-1B
- Table B2-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1B
- Table B2-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1B
- Table B2-3 DATAENTER printout for Site P-1B
- Table B2-4 CHEMPROPS printout for Site P-1B
- Table B2-5 INTERCALCS printout for Site P-1B

ATTACHMENTS (Continued)

Attachment B3 Site P-1C
Table B3-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1C
Table B3-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1C
Table B3-3 DATAENTER printout for Site P-1C
Table B3-4 CHEMPROPS printout for Site P-1C
Table B3-5 INTERCALCS printout for Site P-1C

Attachment B4 Site P-1D
Table B4-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1D
Table B4-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1D
Table B4-3 DATAENTER printout for Site P-1D
Table B4-4 CHEMPROPS printout for Site P-1D
Table B4-5 INTERCALCS printout for Site P-1D

Attachment B5 Site P-1E
Table B5-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1E
Table B5-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1E
Table B5-3 DATAENTER printout for Site P-1E
Table B5-4 CHEMPROPS printout for Site P-1E
Table B5-5 INTERCALCS printout for Site P-1E

Attachment B6 Site P-1F
Table B6-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1F
Table B6-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1F
Table B6-3 DATAENTER printout for Site P-1F
Table B6-4 CHEMPROPS printout for Site P-1F
Table B6-5 INTERCALCS printout for Site P-1F

Attachment B7 Site P-1G
Table B7-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1G
Table B7-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1G
Table B7-3 DATAENTER printout for Site P-1G
Table B7-4 CHEMPROPS printout for Site P-1G
Table B7-5 INTERCALCS printout for Site P-1G

ATTACHMENTS (Continued)

Attachment B8 Site P-2A
Table B1-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-2A
Table B8-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-2A
Table B8-3 DATAENTER printout for Site P-2A
Table B8-4 CHEMPROPS printout for Site P-2A
Table B8-5 INTERCALCS printout for Site P-2A

Attachment B9 Site P-2B
Table B9-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-2B
Table B9-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-2B
Table B9-3 DATAENTER printout for Site P-2B
Table B9-4 CHEMPROPS printout for Site P-2B
Table B9-5 INTERCALCS printout for Site P-2B

Attachment B10 Site P-3A
Table B10-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-3A
Table B10-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-3A
Table B10-3 DATAENTER printout for Site P-3A
Table B10-4 CHEMPROPS printout for Site P-3A
Table B10-5 INTERCALCS printout for Site P-3A

Attachment B11 Site P-4A
Table B11-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4A
Table B11-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4A
Table B11-3 DATAENTER printout for Site P-4A
Table B11-4 CHEMPROPS printout for Site P-4A
Table B11-5 INTERCALCS printout for Site P-4A

Attachment B12 Site P-4B
Table B12-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4B
Table B12-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4B
Table B12-3 DATAENTER printout for Site P-4B
Table B12-4 CHEMPROPS printout for Site P-4B
Table B12-5 INTERCALCS printout for Site P-4B

ATTACHMENTS (Continued)

Attachment B13 Site P-4C
Table B13-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4C
Table B13-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4C
Table B13-3 DATAENTER printout for Site P-4C
Table B13-4 CHEMPROPS printout for Site P-4C
Table B13-5 INTERCALCS printout for Site P-4C

Attachment B14 Site P-5A
Table B14-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-5A
Table B14-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-5A
Table B14-3 DATAENTER printout for Site P-5A
Table B14-4 CHEMPROPS printout for Site P-5A
Table B14-5 INTERCALCS printout for Site P-5A

Attachment B15 Site P-6A
Table B15-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-6A
Table B15-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-6A
Table B15-3 DATAENTER printout for Site P-6A
Table B15-4 CHEMPROPS printout for Site P-6A
Table B15-5 INTERCALCS printout for Site P-6A

Attachment B16 Site P-8A
Table B16-1 Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-8A
Table B16-2 Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-8A
Table B16-3 DATAENTER printout for Site P-8A
Table B16-4 CHEMPROPS printout for Site P-8A
Table B16-5 INTERCALCS printout for Site P-8A

Attachment B17 Analytical Data Used in Assessments
Table B17-1 Analytical Data Set, Detected Analytes, TCE Sites
Table B17-2 Analytical Data Set, Site-Specific Exposure Concentrations, TCE Sites

INTRODUCTION

The information presented in this appendix documents vapor intrusion pathway risk assessments completed in support of the *Amendment to the Record of Decision, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site* (*Operable Unit 2 – Soils*) (OU 2 ROD Amendment). These efforts address specific concerns expressed in review comments on the draft OU 2 ROD amendment by the United States Environmental Protection Agency, Region 9 (EPA) and the California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC).

RATIONALE

In their review comments, EPA requested figures, tables, and/or text to detail the site-specific residual trichloroethene (TCE) data and calculated human health risks that were used to support the no further action decisions documented in the draft OU 2 ROD amendment for the TCE sites. Appendix A of this OU 2 ROD amendment provides the information requested by EPA. During subsequent comment resolution meetings, EPA indicated that risk of exposure to residual volatile organic compounds (VOCs) via the vapor intrusion pathway was their concern at the TCE sites. DTSC raised additional concerns regarding the potential vapor intrusion threat from multiple VOCs that might be present in soil vapor.

In response to the regulators' requests and concerns, a series of risk assessment evaluations have been developed. As a final product, the EPA and DTSC screening-level cumulative results in conjunction with site-specific (i.e., not "screening-level") cumulative results are provided herein. These cumulative results provide a line of evidence to support risk management decisions regarding no further action determinations or the need for establishing land use controls for future management of the TCE sites.

ORGANIZATION OF THIS APPENDIX

This appendix describes the methods used and provides a summary of results (Table B-1) that presents the cumulative results for each site. Attachments are provided for each of the 16 TCE sites (e.g., "Attachment B1" for Site P-1A, "Attachment B2" for Site P-1B, through "Attachment B16" for Site P-8A). Each site-specific attachment contains:

- Result tables of cumulative risk and cumulative hazard estimates for a residential use scenario, providing the necessary data and computational processes. These tables are numbered as, for example, "Table B1-1" for cumulative risk at Site P-1A and "Table B1-2" for cumulative hazard at Site P-1A, "Table B2-1" for cumulative risk at Site P-1B and "Table B2-2" for cumulative hazard at Site P-1B, etc.

- Printouts of the DATENTER, CHEMPROPS, and INTERCALCS worksheets from the EPA (2004) adaptation of the Johnson and Ettinger (1991) vapor intrusion model (J&E model). The J&E model was used to derive chemical- and depth-specific values of the attenuation factor (α or "alpha") which was then used in the derivation of the site-specific risk and hazard estimates. These printouts are numbered as, for example, "Table B1-3" for Site P-1A DATAENTER, "Table B1-4" for Site P-1A CHEMPROPS, and "Table B1-5" for Site P-1A INTERCALCS, "Table B2-3" for Site P-1B DATAENTER, etc.

- Attachment B17 contains tables of the analytical data used in this assessment:

  — Table B17-1: data set of all detected results; and

— Table B17-2: compilation of the maximum, or maximum risk, concentrations used as the representative exposure concentrations at each site (see the Data Evaluation subsection below for further details).

METHODS

As summarized below, these evaluations used standardized and agency-specific risk assessment methods. Efforts included (1) data evaluation, (2) fate and transport modeling using the J&E model, and (3) derivation of risk and hazard estimates.

Data Evaluation

The most recent site-specific soil gas data (Attachment B17) were obtained from post-ROD sampling at sites that did not require remediation, or from post-shutdown confirmation sampling at sites remediated with soil vapor extraction (SVE). For example, at Site P-1A, the most recent sampling occurred in January 2002 following shutdown of the SVE system at that site. Some sites have more recent data, other sites have older data, but they are the only data available.

A limited amount of data processing was necessary: only detected analytes were evaluated (that is, no "ND" qualifiers or "U"-flagged data. The entire set of detected concentrations is listed in Table B17-1. Some unit conversions were necessary, and data were formatted for subsequent use.

For each site, the maximum concentration result was retained for each detected analyte, regardless of sampling location or depth (i.e., all maximums were retained from anywhere at a site and considered to be part of the representative cumulative exposure mixture), **except** in limited instances when the maximum detected concentration did not give rise to the maximum estimated risk because a lower concentration at a shallower depth resulted in a greater predicted indoor air concentration. The maximum, or maximum risk, sample data are listed in Table B17-2.

Fate and Transport Modeling for the Site-Specific Calculations

The SG-SCREEN ("soil-gas screening") version of the J&E model was used, as modified to include DTSC default values for:

- Default, hypothetical, 10m × 10m slab-on-grade building, with associated default building characteristics;
- User-defined vadose zone soil vapor permeability, k_v (cm^2): 1.0E-08;
- Average vapor flow rate into building, Q_{soil} (L/m): 5 L/m/100 m^2;
- Building ventilation rate, $Q_{building}$ (cm^2/s), based on DTSC-default of 0.5 air exchanges per hour; and
- Crack to total-area ratio, η (dimensionless): 0.005.

Each site was assigned a soil lithology based on site-specific information (i.e., boring logs):

- Soil Conservation Service (SCS) soil type "LS" (loamy sand): Sites P-1A, P-1B, P-1C, and P-1E;
- SCS soil type "SL" (sandy loam): Sites P-1D, P-1G, P-2B, P-3A, P-4A, and P-5A;

- SCS soil type "SIL" (silt loam): Sites P-1F, P-2A, and P-8A; and

- SCS soil type "L" (loam): Sites P-4B, P-4C, and P-6A.

The J&E model was used to estimate the "Infinite Source Indoor Attenuation Coefficient, α (dimensionless)," as derived on the INTERCALCS worksheet. The model was executed for each specific sampling depth at a site, retaining the alpha values for the analytes that were detected at that depth. The resulting dataset of alpha values constitutes the chemical- and depth-specific alphas for the detected analytes at a site; these alphas were subsequently used in the calculation of site-specific risk and hazard estimates.

Printouts of the J&E model's worksheets are provided within each site-specific attachment; for example, in "Attachment B1" for Site P-1A, "Table B1-3" is the DATAENTER printout for Site P-1A, "Table B1-4" is the CHEMPROPS printout, and "Table B1-5" is the INTERCALCS printout).

Cumulative Risk Assessment of the Vapor Intrusion Pathway

Only analytes with detected concentrations were included, and only maximum (or maximum risk) concentrations were used as the exposure-point concentrations for the site (see the discussion in the Data Evaluation section).

Volumetric soil gas results (i.e., part per billion by volume [ppbv] results) were first converted to mass-per-unit-volume units ($\mu g/m^3$), based on the Ideal Gas Law, the analyte's molecular weight, and assumptions of standard temperature (25°C) and pressure (1 atmosphere). These calculations are included within each site's result tables.

Toxicity data used were those most recently available at the time of preparation (Spring 2010). Health-protective toxicity values were obtained from EPA and Office of Environmental Health Hazard Assessment (OEHHA) sources, and are included and referenced within each site's result tables.

Concentrations of VOCs in indoor air were estimated using three attenuation-factor approaches:

- EPA Screening: based on the EPA (2002) screening attenuation factor for deeper (>5 feet below ground surface) soils: $\alpha = 0.01$;

- DTSC Screening: based on the DTSC (2005) screening attenuation factor for current-day slab-on-grade residential structures: $\alpha = 0.002$; and

- Site-specific: based on the site-, chemical-, and depth-specific attenuation factors described in the Fate-and-Transport section.

Cancer risk and noncancer hazard estimates were derived using:

- Maximum, or maximum risk, concentrations of each detected analyte;

- The method-specific α (attenuation factor) for a residential use scenario, as described above;

- Standardized EPA and Cal/EPA equations for risk and hazard estimation via the inhalation pathway (e.g., EPA 2009; equations are provided as footnotes to the results table); and

- Standardized EPA and Cal/EPA values for exposure variables such as exposure duration, exposure frequency, exposure time, and averaging time were used in conjunction with the toxicity values (values are provided in footnotes to the results table).

Estimates were derived for unrestricted ("residential") land use. Risk estimates are listed in "Table B[number]-1" and hazard estimates are listed in "Table B[number]-2" within each attachment of site-specific information (e.g., "Table B1-1" for risk at Site P-1A and "Table B1-2" for hazard at Site P-1A, "Table B2-1" for risk at Site P-1B and "Table B2-2 for hazard at Site P-1B, etc.).

RESULTS SUMMARY

Table B-1 is a compilation of the cumulative risk and hazard index estimates (including the TCE-specific contribution) for each site.

LIMITATIONS

As discussed previously, the quantitative risk estimates are based on EPA screening, DTSC screening, and site-specific evaluations. No one method is completely and specifically applicable to the TCE sites at the Sharpe Site, and consequently, these multiple methods provide a range of risk estimates, each with associated uncertainty:

- The attenuation factor in the EPA screening method is considered by EPA to be a reasonable upper bound value to reflect generally reasonable worst-case conditions for a first-pass screening of soil vapor data (EPA, 2002). EPA derived the value based on co-located (paired) data from sites where indoor air, soil gas, and groundwater samples were available, and from theoretical considerations. The specific site conditions that gave rise to the generic attenuation factor may or may not be representative of the TCE sites at the Sharpe Site, but as an upper-bound value, the factor is intended to be conservative (health-protective) and more likely to over-indicate risk (to ensure that risks are not overlooked).

- The attenuation factor in the DTSC screening method is based on the most protective value for slab-on-grade or crawlspace structures, which are the most likely and common types of construction in the region (as opposed to structures with basements). In addition, the factor is based on current *residences* (although none are present at any site); the attenuation factor for future residences is slightly less than half the value used for the TCE sites at the Sharpe Site, and the commercial factors are approximately half the residential value under current and future conditions. In consideration of the California-specific factors and health-protective assumptions, the DTSC screening method uses default attenuation factors that reflect reasonable worst-case conditions for California for the contamination of indoor air due to intrusion of vapors migrating from subsurface contamination (DTSC, 2005). Consequently, the factor is intended to be conservative (health-protective) and more likely to over-indicate risk (to ensure that risks are not overlooked).

- The site-specific method relied on limited site-specific input data to the J&E model (chemical-specific concentrations at specific subsurface depths and site-specific soil types). Although these inputs are more site-specific than the conditions embedded within the EPA and DTSC attenuation factors, the specific applicability of the J&E model itself is likely to be more uncertain than the empirical data of EPA and DTSC. The empirical data represent actual vapor-intrusion processes at real locations, whereas the J&E model simulates conditions at a hypothetical location based on assumed values for multiple computational variables. However, the screening-level input parameters to the J&E model are considered default parameters for a first tier assessment, which should in most cases provide a reasonably (but not overly) conservative estimate of the vapor intrusion attenuation

factor for a site (EPA, 2004). Consequently, the site-specific methods are also likely to be conservative and over-indicate risk with, perhaps, a closer approximation of potential on-site conditions.

Collectively, the various approaches provide three risk estimates for one line of evidence in determining whether a TCE site requires no further action or whether a TCE site requires LUCs to protect human health and the environment (see Appendix A). All three are mathematical predictions for hypothetical conditions, as there are (with two partial exceptions) no structures for human use that overlie the TCE sites at the Sharpe Site.

REFERENCES

California Department of Toxic Substances Control (DTSC), 2005. *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*. Interim Final. Prepared by Department of Toxic Substances Control, California Environmental Protection Agency, Sacramento, CA. February. Online information: http://www.dtsc.ca.gov/AssessingRisk/upload/HERD_POL_Eval_Subsurface_Vapor_Intrusion interim_final.pdf (last accessed May 2010).

Johnson, P.C. and R.A. Ettinger, 1991. Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapors into Buildings. *Environmental Science & Technology.* 25:1445–1452.

United States Environmental Protection Agency (EPA), 2002. *Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance).* Draft. EPA 530-D-02-004. Prepared by Office of Solid Waste and Emergency Response (OSWER), United States Environmental Protection Agency, Washington, D.C. November.

EPA, 2003. Human Health Toxicity Values in Superfund Risk Assessments. OSWER Directive 9285.7-53. December. Online information: http://www.epa.gov/oswer/riskassessment/pdf/hhmemo.pdf (last accessed February 2010)

EPA, 2004. *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings.* Prepared by Environmental Quality Management, Inc., Durham, NC. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C. February. Online information: http://www.epa.gov/oswer/riskassessment/airmodel/johnson_ettinger.htm (last accessed February 2010).

EPA, 2009. *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment).* Final. EPA-540-R-070-002, OSWER Directive 9285.7-82. Office of Superfund Remediation and Technology Innovation, Environmental Protection Agency, Washington, D.C. January.

Table B-1. Residential Risk and Hazard Estimates, Vapor Intrusion Pathway at the TCE Soil Sites, Sharpe Site

	Residential Cumulative Cancer Risk [a]				Percentage	Residential Noncancer Hazard Index [b]		
Site	EPA Screening	DTSC Screening	Site-Specific	Site-Specific TCE Risk [a]	Contribution by TCE	EPA Screening	DTSC Screening	Site-Specific Hazard Index
P-1A	**3.4E-05**	**6.7E-06**	**4.0E-06**	**3.5E-06**	89%	0.10	0.019	0.011
P-1B	**3.5E-05**	**7.1E-06**	**3.0E-06**	**3.0E-06**	100%	0.075	0.015	0.0066
P-1C	**3.5E-05**	**7.1E-06**	**4.3E-06**	**4.3E-06**	100%	0.082	0.016	0.0092
P-1D	**1.2E-05**	**2.3E-06**	**1.1E-06**	7.6E-07	68%	0.23	0.045	0.018
P-1E	**1.4E-05**	**2.8E-06**	**1.7E-06**	**1.7E-06**	100%	0.028	0.0056	0.0034
P-1F	**3.2E-06**	6.4E-07	1.8E-07	8.4E-09	5%	0.16	0.032	0.011
P-1G	**7.6E-05**	**1.5E-05**	**5.3E-06**	**4.8E-06**	91%	0.33	0.066	0.031
P-2A	**7.6E-05**	**1.5E-05**	**5.3E-06**	**5.3E-06**	99%	0.18	0.036	0.012
P-2B	**2.0E-04**	**4.0E-05**	**1.1E-05**	**1.4E-06**	13%	**15**	**3.0**	**1.7**
P-3A	**3.2E-05**	**6.4E-06**	**3.3E-06**	**3.2E-06**	96%	0.15	0.029	0.012
P-4A	**8.4E-06**	**1.7E-06**	6.4E-07	6.4E-07	99%	0.068	0.014	0.0067
P-4B	**1.6E-04**	**3.2E-05**	**9.4E-06**	**7.2E-06**	77%	**1.8**	0.37	0.099
P-4C	**2.8E-06**	5.5E-07	1.1E-07	1.1E-08	10%	0.064	0.013	0.0024
P-5A	**2.9E-04**	**5.8E-05**	**2.9E-05**	**2.9E-05**	100%	0.57	0.11	0.057
P-6A	**1.2E-05**	**2.5E-06**	9.3E-07	9.2E-07	99%	0.03	0.0068	0.0023
P-8A	**5.2E-05**	**1.0E-05**	**1.3E-06**	8.1E-07	60%	0.52	0.10	0.024

[a] From Table B[attachment number]-1 from each site-specific attachment, based on the highest-risk concentrations of detected VOCs.
[b] From Table B[attachment number]-2 from each site-specific attachment, based on the highest-hazard concentrations of detected VOCs.

A **bold** value indicates a risk estimate $>1\times10^{-6}$ or a hazard index >1.

DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
TCE = trichloroethene
VOC = volatile organic compound
> = greater than

Attachment B1

Site P-1A

Table B1-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0946GS001FD	1/7/2002	6	Acetone	58.08	--	--	17	4.04E+01	1.357E-03	--	--	--
CP1022GS002FD	1/9/2002	10.5	Benzene	78.11	7.80E-06	IRIS	2.1	6.71E+00	7.984E-04	2.15E-07	4.30E-08	1.72E-08
CP0942GS003FD	1/7/2002	13	2-Butanone	72.11	--	--	6.4	1.89E+01	6.421E-04	--	--	--
CP1022GS002FD	1/9/2002	10.5	Carbon Disulfide	76.13	--	--	1.4	4.36E+00	8.910E-04	--	--	--
CP1022GS002FD	1/9/2002	10.5	Chloroform	119.38	2.30E-05	IRIS	4.1	2.00E+01	8.910E-04	**1.89E-06**	3.78E-07	1.69E-07
VEW1A1GS001FD	1/7/2002	5	Tetrachloroethene	165.83	5.90E-06	OEHHA	14	9.49E+01	1.146E-03	**2.30E-06**	4.60E-07	2.64E-07
CP0944GS002FD	1/8/2002	10	Toluene	92.14	--	--	1300	4.90E+03	8.200E-04	--	--	--
VEW1A8GS001NS	1/8/2002	5	Trichloroethene	131.39	2.00E-06	OEHHA	660	3.55E+03	1.203E-03	**2.91E-05**	**5.83E-06**	**3.51E-06**
CP1022GS002FD	1/9/2002	10.5	Trichlorofluoromethane	137.37	--	--	3.3	1.85E+01	7.923E-04	--	--	--
CP0942GS003FD	1/7/2002	13	m- & p-Xylenes	106.17	--	--	3.3	1.43E+01	6.662E-04	--	--	--
									Cumulative Risk:	**3.4E-05**	**6.7E-06**	**4.0E-06**

"--" = toxicity data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B1-3 through B1-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B1-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B1-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0946GS001FD	1/7/2002	6	Acetone	58.08	3.1E+04	ATSDR	17	4.04E+01	1.357E-03	1.25E-05	2.50E-06	1.69E-06
CP1022GS002FD	1/9/2002	10.5	Benzene	78.11	3.0E+01	IRIS	2.1	6.71E+00	7.984E-04	2.14E-03	4.29E-04	1.71E-04
CP0942GS003FD	1/7/2002	13	2-Butanone	72.11	5.0E+03	IRIS	6.4	1.89E+01	6.421E-04	3.62E-05	7.24E-06	2.32E-06
CP1022GS002FD	1/9/2002	10.5	Carbon Disulfide	76.13	7.0E+02	IRIS	1.4	4.36E+00	8.910E-04	5.97E-05	1.19E-05	5.32E-06
CP1022GS002FD	1/9/2002	10.5	Chloroform	119.38	3.0E+02	OEHHA	4.1	2.00E+01	8.910E-04	6.40E-04	1.28E-04	5.70E-05
VEW1A1GS001FD	1/7/2002	5	Tetrachloroethene	165.83	3.5E+01	OEHHA	14	9.49E+01	1.146E-03	2.60E-02	5.20E-03	2.98E-03
CP0944GS002FD	1/8/2002	10	Toluene	92.14	5.0E+03	IRIS	1300	4.90E+03	8.200E-04	9.39E-03	1.88E-03	7.70E-04
VEW1A8GS001NS	1/8/2002	5	Trichloroethene	131.39	6.0E+02	OEHHA	660	3.55E+03	1.203E-03	5.67E-02	1.13E-02	6.82E-03
CP1022GS002FD	1/9/2002	10.5	Trichlorofluoromethane	137.37	7.0E+02	HEAST	3.3	1.85E+01	7.923E-04	2.54E-04	5.08E-05	2.01E-05
CP0942GS003FD	1/7/2002	13	m- & p-Xylenes	106.17	1.0E+02	IRIS	3.3	1.43E+01	6.662E-04	1.37E-03	2.75E-04	9.15E-05
									Hazard Index:	9.7E-02	1.9E-02	1.1E-02

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL) (http://www.atsdr.cdc.gov/mrls/)
HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B1-3 through B1-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B1-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	µg/m^3
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	µg/m^3
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	µg/m^3

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

µg/m^3 = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-1A

Table B1-3: Site P-1A DATAENTER

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	127184			0.014	Tetrachloroethylene	5
2	79016			0.66	Trichloroethylene	5
3	67641			0.017	Acetone	6
4	108883			1.3	Toluene	10
5	71432			0.0021	Benzene	10.5
6	75150			0.0014	Carbon disulfide	10.5
7	67663			0.0041	Chloroform	10.5
8	75694			0.0033	Trichlorofluoromethane	10.5
9	78933			0.0064	Methylethylketone (2-butanone)	13
10	1330207			0.0033	Xylenes	13

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	396.24	24			1.00E-08

5 ft bgs = 152.4; 6 ft bgs = 182.9; 10 ft bgs = 304.8; 10.5 ft bgs = 320.04; 13 ft bgs = 396.24

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
LS	1.62	0.39	0.076	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B1-4: Site P-1A CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	3.5E-02	165.83	Tetrachloroethylene
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
1.24E-01	1.14E-05	3.87E-05	25	6,955	329.20	508.10	0.0E+00	3.1E+01	58.08	Acetone
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	2.9E-05	3.0E-02	78.11	Benzene
1.04E-01	1.00E-05	3.02E-02	25	6,391	319.00	552.00	0.0E+00	7.0E-01	76.13	Carbon disulfide
1.04E-01	1.00E-05	3.66E-03	25	6,988	334.32	536.40	5.3E-06	3.0E-01	119.38	Chloroform
8.70E-02	9.70E-06	9.68E-02	25	5,999	296.70	471.00	0.0E+00	7.0E-01	137.36	Trichlorofluoromethane
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11	Methylethylketone (2-butanone)
8.50E-02	9.90E-06	5.18E-03	25	7,897	375.41	566.58	0.0E+00	7.0E-01	106.17	Xylenes

END

Table B1-5: Site P-1A INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^v (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	9.52E+01	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	3.56E+03	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	4.05E+01	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	4.91E+03	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	6.73E+00	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	4.37E+00	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	2.01E+01	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	1.86E+01	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	1.89E+01	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	1.44E+01	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	9,410	1.74E-02	7.14E-01	1.80E-04	1.00E-02	381.24
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	1.10E-02	381.24
1.00E+06	5.00E-03	15	7,384	3.71E-05	1.52E-03	1.80E-04	1.72E-02	381.24
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	1.21E-02	381.24
1.00E+06	5.00E-03	15	7,977	5.29E-03	2.17E-01	1.80E-04	1.22E-02	381.24
1.00E+06	5.00E-03	15	6,572	2.91E-02	1.19E+00	1.80E-04	1.44E-02	381.24
1.00E+06	5.00E-03	15	7,407	3.51E-03	1.44E-01	1.80E-04	1.44E-02	381.24
1.00E+06	5.00E-03	15	5,993	9.35E-02	3.84E+00	1.80E-04	1.21E-02	381.24
1.00E+06	5.00E-03	15	8,244	5.32E-05	2.18E-03	1.80E-04	1.12E-02	381.24
1.00E+06	5.00E-03	15	8,979	4.92E-03	2.02E-01	1.80E-04	1.18E-02	381.24

Chemical- and DATAENTER-Depth-Specific:

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	9.52E+01	1.25	8.33E+01	1.00E-02	5.00E+03	1.73E+07		
15	3.56E+03	1.25	8.33E+01	1.10E-02	5.00E+03	3.96E+06		
15	4.05E+01	1.25	8.33E+01	1.72E-02	5.00E+03	1.59E+04		
15	4.91E+03	1.25	8.33E+01	1.21E-02	5.00E+03	9.78E+05		
15	6.73E+00	1.25	8.33E+01	1.22E-02	5.00E+03	8.36E+05		
15	4.37E+00	1.25	8.33E+01	1.44E-02	5.00E+03	1.03E+05		
15	2.01E+01	1.25	8.33E+01	1.44E-02	5.00E+03	1.03E+05		
15	1.86E+01	1.25	8.33E+01	1.21E-02	5.00E+03	9.78E+05		
15	1.89E+01	1.25	8.33E+01	1.12E-02	5.00E+03	2.80E+06	6.421E-04	1.22E-02
15	1.44E+01	1.25	8.33E+01	1.18E-02	5.00E+03	1.35E+06	6.662E-04	9.57E-03

Alpha values pasted in, from iterations:

	(as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
Tetrachloroet	5	1.146E-03
Trichloroethy	5	1.203E-03
Acetone	6	1.357E-03
Toluene	10	8.200E-04
Benzene	10.5	7.984E-04
Carbon disulf	10.5	8.910E-04
Chloroform	10.5	8.910E-04
Trichlorofluor	10.5	7.923E-04
Methylethylke	13	6.421E-04
Xylenes	13	6.662E-04

Attachment B2

Site P-1B

Table B2-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1B, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c] (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c] $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g] EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g] DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g] Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0953GS001FD	1/8/2002	6	Toluene	92.14	--	--	820	3.09E+03	1.140E-03	--	--	--
VMW1B1GS002NS	1/9/2002	8.5	Trichloroethene	131.39	2.0E-06	OEHHA	800	4.30E+03	8.617E-04	**3.53E-05**	**7.07E-06**	**3.04E-06**
									Cumulative Risk:	**3.5E-05**	**7.1E-06**	**3.0E-06**

"--" = toxicity data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298\,°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B2-3 through B2-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B2-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1B, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): $\alpha = 0.01$

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: $\alpha = 0.002$

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B2-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1B, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0953GS001FD	1/8/2002	6	Toluene	92.14	5.0E+03	IRIS	820	3.09E+03	1.140E-03	5.93E-03	1.19E-03	6.76E-04
VMW1B1GS002NS	1/9/2002	8.5	Trichloroethene	131.39	6.0E+02	OEHHA	800	4.30E+03	8.617E-04	6.87E-02	1.37E-02	5.92E-03
									Hazard Index:	7.5E-02	1.5E-02	6.6E-03

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\,atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B2-3 through B2-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B2-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1B, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days/year \times 24\ hours/day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	µg/m^3
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	µg/m^3
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	µg/m^3

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

µg/m^3 = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-1B

Table B2-3: Site P-1B DATAENTER

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	108883			0.82	Toluene	6
2	79016			0.8	Trichloroethylene	8.5

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	259.08	24			1.00E-08

6 ft bgs = 182.9; 8.5 ft bgs = 259.08

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
LS	1.62	0.39	0.076	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B2-4: Site P-1B CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene

END

Table B2-5: Site P-1B INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
244.08	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	3.10E+03	3.39E+04
244.08	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	4.31E+03	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	1.21E-02	244.08
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	1.10E-02	244.08

Chemical- and DATAENTER-Depth-Specific:

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	3.10E+03	1.25	8.33E+01	1.21E-02	5.00E+03	9.78E+05		
15	4.31E+03	1.25	8.33E+01	1.10E-02	5.00E+03	3.96E+06	8.617E-04	3.71E+00

Alpha values pasted in, from iterations:

	(as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
Toluene	6	1.140E-03
Trichloroethy	8.5	8.617E-04

Attachment B3

Site P-1C

Table B3-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1C, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c] (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c] $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g] EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g] DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g] Site-Specific [j]
Volatile Organic Compounds (VOCs)												
VMW1C1GS003FD	1/9/2002	12.5	Acetone	58.08	--	--	3.1	7.36E+00	8.877E-04	--	--	--
VMW1C1GS003FD	1/9/2002	12.5	2-Butanone	72.11	--	--	0.87	2.57E+00	6.616E-04	--	--	--
VMW1C1GS003FD	1/9/2002	12.5	Carbon Disulfide	76.13	--	--	1	3.11E+00	7.903E-04	--	--	--
CP0960GS003FD	1/8/2002	13	Toluene	92.14	--	--	1900	7.16E+03	6.776E-04	--	--	--
VEW1C2GS001NS	1/7/2002	5	Trichloroethene	131.39	2.0E-06	OEHHA	800	4.30E+03	1.203E-03	**3.53E-05**	**7.07E-06**	**4.25E-06**
									Cumulative Risk:	**3.5E-05**	**7.1E-06**	**4.3E-06**

"--" = toxicity data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298\,°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B3-3 through B3-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B3-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1C, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): $\alpha = 0.01$

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: $\alpha = 0.002$

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B3-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1C, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
VMW1C1GS003FD	1/9/2002	12.5	Acetone	58.08	3.1E+04	ATSDR	3.1	7.36E+00	8.877E-04	2.28E-06	4.56E-07	2.02E-07
VMW1C1GS003FD	1/9/2002	12.5	2-Butanone	72.11	5.0E+03	IRIS	0.87	2.57E+00	6.616E-04	4.92E-06	9.84E-07	3.26E-07
VMW1C1GS003FD	1/9/2002	12.5	Carbon Disulfide	76.13	7.0E+02	IRIS	1	3.11E+00	7.903E-04	4.26E-05	8.53E-06	3.37E-06
CP0960GS003FD	1/8/2002	13	Toluene	92.14	5.0E+03	IRIS	1900	7.16E+03	6.776E-04	1.37E-02	2.75E-03	9.30E-04
VEW1C2GS001NS	1/7/2002	5	Trichloroethene	131.39	6.0E+02	OEHHA	800	4.30E+03	1.203E-03	6.87E-02	1.37E-02	8.26E-03
									Hazard Index:	8.2E-02	1.6E-02	9.2E-03

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL) (http://www.atsdr.cdc.gov/mrls/)

IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\,atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B3-3 through B3-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B3-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1C, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days/year \times 24\ hours/day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	µg/m^3
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	µg/m^3
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	µg/m^3

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

µg/m^3 = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-1C

Table B3-3: Site P-1C DATAENTER

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	79016			0.8	Trichloroethylene	5
2	78933			0.00087	Methylethylketone (2-butanone)	12.5
3	67641			0.0031	Acetone	12.5
4	75150			0.001	Carbon disulfide	12.5
5	108883			1.9	Toluene	13

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	396.24	24			1.00E-08

5 ft bgs = 152.4; 12.5 ft bgs = 381; 13 ft bgs = 396.24

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
LS	1.62	0.39	0.076	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B3-4: Site P-1C CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11	Methylethylketone (2-butanone)
1.24E-01	1.14E-05	3.87E-05	25	6,955	329.20	508.10	0.0E+00	3.1E+01	58.08	Acetone
1.04E-01	1.00E-05	3.02E-02	25	6,391	319.00	552.00	0.0E+00	7.0E-01	76.13	Carbon disulfide
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene

END

Table B3-5: Site P-1C INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	4.31E+03	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	2.57E+00	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	7.38E+00	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	3.12E+00	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	7.18E+03	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	1.10E-02	381.24
1.00E+06	5.00E-03	15	8,244	5.32E-05	2.18E-03	1.80E-04	1.12E-02	381.24
1.00E+06	5.00E-03	15	7,384	3.71E-05	1.52E-03	1.80E-04	1.72E-02	381.24
1.00E+06	5.00E-03	15	6,572	2.91E-02	1.19E+00	1.80E-04	1.44E-02	381.24
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	1.21E-02	381.24

Chemical- and DATAENTER-Depth-Specific:

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	4.31E+03	1.25	8.33E+01	1.10E-02	5.00E+03	3.96E+06		
15	2.57E+00	1.25	8.33E+01	1.12E-02	5.00E+03	2.80E+06		
15	7.38E+00	1.25	8.33E+01	1.72E-02	5.00E+03	1.59E+04		
15	3.12E+00	1.25	8.33E+01	1.44E-02	5.00E+03	1.03E+05		
15	7.18E+03	1.25	8.33E+01	1.21E-02	5.00E+03	9.78E+05	6.776E-04	4.87E+00

Alpha values pasted in, from iterations:

	(as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
Trichloroethy	5	1.203E-03
Methylethylk	12.5	6.616E-04
Acetone	12.5	8.877E-04
Carbon disul	12.5	7.903E-04
Toluene	13	6.776E-04

Attachment B4

Site P-1D

Table B4-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1D, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0086GS001NS	7/11/1996	6	Acetone	58.08	--	--	200	4.75E+02	1.162E-03	--	--	--
CP0086GS001NS	7/11/1996	6	Benzene	78.11	7.8E-06	IRIS	5.7	1.82E+01	9.550E-04	5.84E-07	1.17E-07	5.57E-08
CP0086GS001NS	7/11/1996	6	2-Butanone	72.11	--	--	16	4.72E+01	9.067E-04	--	--	--
CP0779GS002NS	6/9/1999	10.1	Chloromethane	50.49	1.8E-06	HEAST	2.4	4.96E+00	8.426E-04	3.67E-08	7.33E-09	3.09E-09
CP0089GS002NS	7/10/1996	11	Cyclohexane	84.16	--	--	7	2.41E+01	--	--	--	--
CP0086GS001NS	7/11/1996	6	1,3-Dichlorobenzene	147	--	--	9.4	5.65E+01	8.190E-04	--	--	--
CP0086GS001NS	7/11/1996	6	1,4-Dichlorobenzene	147	1.1E-05	OEHHA	8.8	5.29E+01	8.174E-04	**2.39E-06**	4.78E-07	1.95E-07
CP0086GS001NS	7/11/1996	6	1,4-Dioxane	88.11	7.7E-06	OEHHA	6.4	2.31E+01	9.617E-04	7.30E-07	1.46E-07	7.02E-08
CP0086GS001NS	7/11/1996	6	Ethyl Alcohol	46.07	--	--	32	6.03E+01	--	--	--	--
CP0779GS002NS	6/9/1999	10.1	Ethylbenzene	106.17	2.5E-06	OEHHA	7.7	3.34E+01	5.823E-04	3.43E-07	6.87E-08	2.00E-08
CP0086GS001NS	7/11/1996	6	4-Ethyltoluene	120.2	--	--	5	2.46E+01	--	--	--	--
CP0779GS002NS	6/9/1999	10.1	n-Heptane	100.21	--	--	9.1	3.73E+01	--	--	--	--
CP0779GS002NS	6/9/1999	10.1	Hexane	86.18	--	--	710	2.50E+03	1.114E-03	--	--	--
CP0779GS002NS	6/9/1999	10.1	Methyl Bromide	94.94	--	--	2.7	1.05E+01	5.692E-04	--	--	--
CP0779GS002NS	6/9/1999	10.1	Methylene Chloride	84.93	4.7E-07	IRIS	3.2	1.11E+01	7.247E-04	2.15E-08	4.29E-09	1.56E-09
CP0089GS002NS	7/10/1996	11	Propylene	42.08	--	--	15	2.58E+01	--	--	--	--
CP0086GS001NS	7/11/1996	6	Styrene	104.15	--	--	1.1	4.69E+00	8.330E-04	--	--	--
CP0779GS002NS	6/9/1999	10.1	Tetrachloroethene	165.83	5.9E-06	OEHHA	2.2	1.49E+01	5.644E-04	3.62E-07	7.23E-08	2.04E-08
CP0779GS002NS	6/9/1999	10.1	Toluene	92.14	--	--	93	3.50E+02	6.508E-04	--	--	--
CP0543GS001NS	3/13/1997	4.5	Trichloroethene	131.39	2.0E-06	OEHHA	160	8.60E+02	1.080E-03	**7.07E-06**	**1.41E-06**	7.63E-07
CP0086GS001NS	7/11/1996	6	1,2,4-Trimethylbenzene	120.2	--	--	15	7.37E+01	7.481E-04	--	--	--
CP0086GS001NS	7/11/1996	6	1,3,5-Trimethylbenzene	120.2	--	--	3.8	1.87E+01	7.447E-04	--	--	--
CP0779GS002NS	6/9/1999	10.1	o-Xylene	106.17	--	--	6	2.61E+01	6.508E-04	--	--	--
CP0779GS002NS	6/9/1999	10.1	m- & p-Xylenes	106.17	--	--	31	1.35E+02	6.397E-04	--	--	--
									Cumulative Risk:	**1.2E-05**	**2.3E-06**	**1.1E-06**

"--" = data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)

IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\,atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B4-3 through B4-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B4-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1D, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B4-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1D, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0086GS001NS	7/11/1996	6	Acetone	58.08	3.1E+04	ATSDR	200	4.75E+02	1.162E-03	1.47E-04	2.94E-05	1.71E-05
CP0086GS001NS	7/11/1996	6	Benzene	78.11	3.0E+01	IRIS	5.7	1.82E+01	9.550E-04	5.82E-03	1.16E-03	5.56E-04
CP0086GS001NS	7/11/1996	6	2-Butanone	72.11	5.0E+03	IRIS	16	4.72E+01	9.067E-04	9.05E-05	1.81E-05	8.20E-06
CP0779GS002NS	6/9/1999	10.1	Chloromethane	50.49	9.0E+01	IRIS	2.4	4.96E+00	8.426E-04	5.28E-04	1.06E-04	4.45E-05
CP0089GS002NS	7/10/1996	11	Cyclohexane	84.16	6.0E+03	IRIS	7	2.41E+01	--	3.85E-05	7.70E-06	--
CP0086GS001NS	7/11/1996	6	1,3-Dichlorobenzene	147	--	--	9.4	5.65E+01	8.190E-04	--	--	--
CP0086GS001NS	7/11/1996	6	1,4-Dichlorobenzene	147	8.0E+02	IRIS	8.8	5.29E+01	8.174E-04	6.34E-04	1.27E-04	5.18E-05
CP0086GS001NS	7/11/1996	6	1,4-Dioxane	88.11	3.0E+03	OEHHA	6.4	2.31E+01	9.617E-04	7.37E-05	1.47E-05	7.09E-06
CP0086GS001NS	7/11/1996	6	Ethyl Alcohol	46.07	--	--	32	6.03E+01	--	--	--	--
CP0779GS002NS	6/9/1999	10.1	Ethylbenzene	106.17	1.0E+03	IRIS	7.7	3.34E+01	5.823E-04	3.21E-04	6.41E-05	1.87E-05
CP0086GS001NS	7/11/1996	6	4-Ethyltoluene	120.2	--	--	5	2.46E+01	--	--	--	--
CP0779GS002NS	6/9/1999	10.1	n-Heptane	100.21	--	--	9.1	3.73E+01	--	--	--	--
CP0779GS002NS	6/9/1999	10.1	Hexane	86.18	7.0E+02	IRIS	710	2.50E+03	1.114E-03	3.43E-02	6.86E-03	3.82E-03
CP0779GS002NS	6/9/1999	10.1	Methyl Bromide	94.94	5.0E+00	IRIS	2.7	1.05E+01	5.692E-04	2.01E-02	4.02E-03	1.14E-03
CP0779GS002NS	6/9/1999	10.1	Methylene Chloride	84.93	4.0E+02	OEHHA	3.2	1.11E+01	7.247E-04	2.66E-04	5.33E-05	1.93E-05
CP0089GS002NS	7/10/1996	11	Propylene	42.08	3.0E+03	OEHHA	15	2.58E+01	--	8.25E-05	1.65E-05	--
CP0086GS001NS	7/11/1996	6	Styrene	104.15	1.0E+03	IRIS	1.1	4.69E+00	8.330E-04	4.49E-05	8.99E-06	3.74E-06
CP0779GS002NS	6/9/1999	10.1	Tetrachloroethene	165.83	3.5E+01	OEHHA	2.2	1.49E+01	5.644E-04	4.09E-03	8.18E-04	2.31E-04
CP0779GS002NS	6/9/1999	10.1	Toluene	92.14	5.0E+03	IRIS	93	3.50E+02	6.508E-04	6.72E-04	1.34E-04	4.37E-05
CP0543GS001NS	3/13/1997	4.5	Trichloroethene	131.39	6.0E+02	OEHHA	160	8.60E+02	1.080E-03	1.37E-02	2.75E-03	1.48E-03
CP0086GS001NS	7/11/1996	6	1,2,4-Trimethylbenzene	120.2	7.0E+00	PPRTV	15	7.37E+01	7.481E-04	1.01E-01	2.02E-02	7.56E-03
CP0086GS001NS	7/11/1996	6	1,3,5-Trimethylbenzene	120.2	6.0E+00	PPRTV	3.8	1.87E+01	7.447E-04	2.99E-02	5.97E-03	2.22E-03
CP0779GS002NS	6/9/1999	10.1	o-Xylene	106.17	1.0E+02	IRIS	6	2.61E+01	6.508E-04	2.50E-03	5.00E-04	1.63E-04
CP0779GS002NS	6/9/1999	10.1	m- & p-Xylenes	106.17	1.0E+02	IRIS	31	1.35E+02	6.397E-04	1.29E-02	2.58E-03	8.26E-04
									Hazard Index:	2.3E-01	4.5E-02	1.8E-02

"--" = data are not available

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL) (http://www.atsdr.cdc.gov/mrls/)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)
PPRTV = Provisional Peer-Reviewed Reference Toxicity Value, as cited in EPA's Regional Screening Level (RSL) tables (http://www.epa.gov/region09/superfund/prg/)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B4-3 through B4-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B4-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1D, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days/year \times 24\ hours/day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	µg/m^3
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	µg/m^3
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	µg/m^3

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

µg/m^3 = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-1D

Table B4-3: Site P-1D DATAENTER

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	79016			0.16	Trichloroethylene	4.5
2	95636			0.015	1,2,4-Trimethylbenzene	6
3	108678			0.0038	1,3,5-Trimethylbenzene	6
4	541731			0.0094	1,3-Dichlorobenzene	6
5	106467			0.0088	1,4-Dichlorobenzene	6
6	123911			0.0064	1,4-Dioxane	6
7	622968			0.005	CAS No. not found	6
8	78933			0.016	Methylethylketone (2-butanone)	6
9	67641			0.2	Acetone	6
10	71432			0.0057	Benzene	6
11	64175			0.032	CAS No. not found	6
12	100425			0.0011	Styrene	6
13	74839			0.0027	Methyl bromide	10.1
14	74873			0.0024	Methyl chloride (chloromethane)	10.1
15	100414			0.0077	Ethylbenzene	10.1
16	142825			0.0091	CAS No. not found	10.1
17	110543			0.71	Hexane	10.1
18	1330207			0.031	Xylenes	10.1
19	75092			0.0032	Methylene chloride	10.1
20	95476			0.006	o-Xylene	10.1
21	127184			0.0022	Tetrachloroethylene	10.1
22	108883			0.093	Toluene	10.1
23	110827			0.007	CAS No. not found	11
24	115071			0.015	CAS No. not found	11

Table B4-3: Site P-1D DATAENTER

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	307.848	24			1.00E-08

4.5 ft bgs = 137.16; 6 ft bgs = 182.9; 10.1 ft bgs = 307.848; 11 ft bgs = 335.28

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.62	0.387	0.103	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B4-4: Site P-1D CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
6.06E-02	7.92E-06	6.14E-03	25	9,369	442.30	649.17	0.0E+00	7.0E-03	120.20	1,2,4-Trimethylbenzene
6.02E-02	8.67E-06	5.87E-03	25	9,321	437.89	637.25	0.0E+00	6.0E-03	120.20	1,3,5-Trimethylbenzene
6.92E-02	7.86E-06	3.09E-03	25	9,230	446.00	684.00	0.0E+00	1.1E-01	147.00	1,3-Dichlorobenzene
6.90E-02	7.90E-06	2.39E-03	25	9,271	447.21	684.75	1.1E-05	8.0E-01	147.00	1,4-Dichlorobenzene
8.70E-02	1.10E-05	4.80E-06	25	8,164	374.30	587.20	7.7E-06	3.0E+03	88.11	1,4-Dioxane
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11	Methylethylketone (2-butanone)
1.24E-01	1.14E-05	3.87E-05	25	6,955	329.20	508.10	0.0E+00	3.1E+01	58.08	Acetone
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	2.9E-05	3.0E-02	78.11	Benzene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
7.10E-02	8.00E-06	2.74E-03	25	8,737	418.31	636.00	0.0E+00	9.0E-01	104.15	Styrene
7.28E-02	1.21E-05	6.22E-03	25	5,714	276.71	467.00	0.0E+00	5.0E-03	94.94	Methyl bromide
1.26E-01	6.50E-06	8.80E-03	25	5,115	249.00	416.25	1.8E-06	9.0E-02	50.49	Methyl chloride (chloromethane)
7.50E-02	7.80E-06	7.86E-03	25	8,501	409.34	617.20	2.5E-06	1.0E+00	106.17	Ethylbenzene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
2.00E-01	7.77E-06	1.66E+00	25	6,895	341.70	508.00	0.0E+00	7.0E-01	86.18	Hexane
8.50E-02	9.90E-06	5.18E-03	25	7,897	375.41	566.58	0.0E+00	7.0E-01	106.17	Xylenes
1.01E-01	1.17E-05	2.18E-03	25	6,706	313.00	510.00	1.0E-06	4.0E-01	84.93	Methylene chloride
8.70E-02	1.00E-05	5.18E-03	25	8,661	417.60	630.30	0.0E+00	1.0E-01	106.17	o-Xylene
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	3.5E-02	165.83	Tetrachloroethylene
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found

END

Table B4-5: Site P-1D INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	8.62E+02	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	7.40E+01	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.87E+01	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	5.67E+01	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	5.31E+01	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	2.31E+01	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	4.73E+01	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	4.76E+02	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.83E+01	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	4.70E+00	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.05E+01	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	4.97E+00	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	3.35E+01	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	2.51E+03	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.35E+02	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.11E+01	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	2.61E+01	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.50E+01	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	3.51E+02	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
292.848	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	7.98E-03	292.848
1.00E+06	5.00E-03	15	11,516	5.76E-03	2.36E-01	1.80E-04	6.12E-03	292.848
1.00E+06	5.00E-03	15	11,495	5.50E-03	2.25E-01	1.80E-04	6.08E-03	292.848
1.00E+06	5.00E-03	15	11,029	2.90E-03	1.19E-01	1.80E-04	6.99E-03	292.848
1.00E+06	5.00E-03	15	11,098	2.25E-03	9.22E-02	1.80E-04	6.97E-03	292.848
1.00E+06	5.00E-03	15	9,113	4.56E-06	1.87E-04	1.80E-04	8.99E-03	292.848
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	292.848
1.00E+06	5.00E-03	15	8,244	5.32E-05	2.18E-03	1.80E-04	8.17E-03	292.848
1.00E+06	5.00E-03	15	7,384	3.71E-05	1.52E-03	1.80E-04	1.25E-02	292.848
1.00E+06	5.00E-03	15	7,977	5.29E-03	2.17E-01	1.80E-04	8.88E-03	292.848
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	292.848
1.00E+06	5.00E-03	15	10,294	2.59E-03	1.06E-01	1.80E-04	7.17E-03	292.848
1.00E+06	5.00E-03	15	5,508	6.03E-03	2.47E-01	1.80E-04	7.35E-03	292.848
1.00E+06	5.00E-03	15	4,578	8.57E-03	3.52E-01	1.80E-04	1.27E-02	292.848
1.00E+06	5.00E-03	15	9,994	7.43E-03	3.05E-01	1.80E-04	7.57E-03	292.848
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	292.848
1.00E+06	5.00E-03	15	7,549	1.59E+00	6.53E+01	1.80E-04	2.02E-02	292.848
1.00E+06	5.00E-03	15	8,979	4.92E-03	2.02E-01	1.80E-04	8.58E-03	292.848
1.00E+06	5.00E-03	15	6,884	2.10E-03	8.62E-02	1.80E-04	1.02E-02	292.848
1.00E+06	5.00E-03	15	10,245	4.88E-03	2.00E-01	1.80E-04	8.78E-03	292.848
1.00E+06	5.00E-03	15	9,410	1.74E-02	7.14E-01	1.80E-04	7.27E-03	292.848
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	8.78E-03	292.848
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	292.848
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	292.848

Table B4-5: Site P-1D INTERCALCS

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Chemical- and DATAENTER-Depth-Specific: Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)		Alpha values pasted in, from iterations: (as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
15	8.62E+02	1.25	8.33E+01	7.98E-03	5.00E+03	1.19E+09			Trichloroethy	4.5	1.080E-03
15	7.40E+01	1.25	8.33E+01	6.12E-03	5.00E+03	6.78E+11			1,2,4-Trimeth	6	7.481E-04
15	1.87E+01	1.25	8.33E+01	6.08E-03	5.00E+03	8.12E+11			1,3,5-Trimeth	6	7.447E-04
15	5.67E+01	1.25	8.33E+01	6.99E-03	5.00E+03	2.29E+10			1,3-Dichlorob	6	8.190E-04
15	5.31E+01	1.25	8.33E+01	6.97E-03	5.00E+03	2.46E+10			1,4-Dichlorob	6	8.174E-04
15	2.31E+01	1.25	8.33E+01	8.99E-03	5.00E+03	1.14E+08			1,4-Dioxane	6	9.617E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	6	#N/A
15	4.73E+01	1.25	8.33E+01	8.17E-03	5.00E+03	7.19E+08			Methylethylke	6	9.067E-04
15	4.76E+02	1.25	8.33E+01	1.25E-02	5.00E+03	5.89E+05			Acetone	6	1.162E-03
15	1.83E+01	1.25	8.33E+01	8.88E-03	5.00E+03	1.40E+08			Benzene	6	9.550E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	6	#N/A
15	4.70E+00	1.25	8.33E+01	7.17E-03	5.00E+03	1.25E+10			Styrene	6	8.330E-04
15	1.05E+01	1.25	8.33E+01	7.35E-03	5.00E+03	7.05E+09	5.692E-04	5.98E-03	Methyl bromi	10.1	5.692E-04
15	4.97E+00	1.25	8.33E+01	1.27E-02	5.00E+03	4.90E+05	8.426E-04	4.19E-03	Methyl chlori	10.1	8.426E-04
15	3.35E+01	1.25	8.33E+01	7.57E-03	5.00E+03	3.63E+09	5.823E-04	1.95E-02	Ethylbenzene	10.1	5.823E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A	#N/A	#N/A	CAS No. not	10.1	#N/A
15	2.51E+03	1.25	8.33E+01	2.02E-02	5.00E+03	3.84E+03	1.114E-03	2.79E+00	Hexane	10.1	1.114E-03
15	1.35E+02	1.25	8.33E+01	8.58E-03	5.00E+03	2.72E+08	6.397E-04	8.64E-02	Xylenes	10.1	6.397E-04
15	1.11E+01	1.25	8.33E+01	1.02E-02	5.00E+03	1.25E+07	7.247E-04	8.08E-03	Methylene ch	10.1	7.247E-04
15	2.61E+01	1.25	8.33E+01	8.78E-03	5.00E+03	1.74E+08	6.508E-04	1.70E-02	o-Xylene	10.1	6.508E-04
15	1.50E+01	1.25	8.33E+01	7.27E-03	5.00E+03	9.08E+09	5.644E-04	8.44E-03	Tetrachloroet	10.1	5.644E-04
15	3.51E+02	1.25	8.33E+01	8.78E-03	5.00E+03	1.74E+08	6.508E-04	2.29E-01	Toluene	10.1	6.508E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	11	#N/A
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	11	#N/A

Attachment B5

Site P-1E

Table B5-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1E, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0921GS001DS	12/18/2000	13	Acetone	58.08	--	--	6.2	1.47E+01	8.647E-04	--	--	--
CP0921GS001DS	12/18/2000	13	Benzene	78.11	7.8E-06	IRIS	0.24	7.67E-01	6.832E-04	2.46E-08	4.91E-09	1.68E-09
CP0921GS001DS	12/18/2000	13	2-Butanone	72.11	--	--	5.2	1.53E+01	6.421E-04	--	--	--
CP0921GS001DS	12/18/2000	13	Carbon Disulfide	76.13	--	--	0.86	2.68E+00	7.686E-04	--	--	--
CP0921GS001DS	12/18/2000	13	Chloromethane	50.49	1.8E-06	HEAST	0.42	8.67E-01	8.734E-04	6.41E-09	1.28E-09	5.60E-10
CP0921GS001DS	12/18/2000	13	Methyl tert-Butyl Ether	88.15	2.6E-07	OEHHA	0.27	9.73E-01	7.604E-04	1.04E-09	2.08E-10	7.91E-11
CP0921GS001DS	12/18/2000	13	Ethylbenzene	106.17	2.5E-06	OEHHA	0.14	6.08E-01	6.072E-04	6.25E-09	1.25E-09	3.79E-10
CP0921GS001DS	12/18/2000	13	Toluene	92.14	--	--	2.1	7.91E+00	6.776E-04	--	--	--
VEW1E1GS001NS	12/20/2000	5	Trichloroethene	131.39	2.0E-06	OEHHA	320	1.72E+03	1.203E-03	**1.41E-05**	**2.83E-06**	**1.70E-06**
CP0921GS001DS	12/18/2000	13	Trichlorofluoromethane	137.37	--	--	0.2	1.12E+00	6.776E-04	--	--	--
CP0921GS001DS	12/18/2000	13	o-Xylene	106.17	--	--	0.14	6.08E-01	6.776E-04	--	--	--
CP0921GS001DS	12/18/2000	13	m- & p-Xylenes	106.17	--	--	0.38	1.65E+00	6.662E-04	--	--	--
									Cumulative Risk:	**1.4E-05**	**2.8E-06**	**1.7E-06**

"--" = toxicity data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298\,°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B5-3 through B5+A76-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B5-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1E, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ \ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ \ air} = C_{soil\ \ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): $\alpha = 0.01$

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: $\alpha = 0.002$

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B5-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1E, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors RfC (µg/m^3)	Noncancer Toxicity Factors Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c] (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c] (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g] EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g] DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g] Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0921GS001DS	12/18/2000	13	Acetone	58.08	3.1E+04	ATSDR	6.2	1.47E+01	8.647E-04	4.56E-06	9.11E-07	3.94E-07
CP0921GS001DS	12/18/2000	13	Benzene	78.11	3.0E+01	IRIS	0.24	7.67E-01	6.832E-04	2.45E-04	4.90E-05	1.67E-05
CP0921GS001DS	12/18/2000	13	2-Butanone	72.11	5.0E+03	IRIS	5.2	1.53E+01	6.421E-04	2.94E-05	5.88E-06	1.89E-06
CP0921GS001DS	12/18/2000	13	Carbon Disulfide	76.13	7.0E+02	IRIS	0.86	2.68E+00	7.686E-04	3.67E-05	7.34E-06	2.82E-06
CP0921GS001DS	12/18/2000	13	Chloromethane	50.49	9.0E+01	IRIS	0.42	8.67E-01	8.734E-04	9.24E-05	1.85E-05	8.07E-06
CP0921GS001DS	12/18/2000	13	Methyl tert-Butyl Ether	88.15	3.0E+03	IRIS	0.27	9.73E-01	7.604E-04	3.11E-06	6.22E-07	2.37E-07
CP0921GS001DS	12/18/2000	13	Ethylbenzene	106.17	1.0E+03	IRIS	0.14	6.08E-01	6.072E-04	5.83E-06	1.17E-06	3.54E-07
CP0921GS001DS	12/18/2000	13	Toluene	92.14	5.0E+03	IRIS	2.1	7.91E+00	6.776E-04	1.52E-05	3.04E-06	1.03E-06
VEW1E1GS001NS	12/20/2000	5	Trichloroethene	131.39	6.0E+02	OEHHA	320	1.72E+03	1.203E-03	2.75E-02	5.50E-03	3.31E-03
CP0921GS001DS	12/18/2000	13	Trichlorofluoromethane	137.37	7.0E+02	HEAST	0.2	1.12E+00	6.776E-04	1.54E-05	3.08E-06	1.04E-06
CP0921GS001DS	12/18/2000	13	o-Xylene	106.17	1.0E+02	IRIS	0.14	6.08E-01	6.776E-04	5.83E-05	1.17E-05	3.95E-06
CP0921GS001DS	12/18/2000	13	m- & p-Xylenes	106.17	1.0E+02	IRIS	0.38	1.65E+00	6.662E-04	1.58E-04	3.16E-05	1.05E-05
									Hazard Index:	2.8E-02	5.6E-03	3.4E-03

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL) (http://www.atsdr.cdc.gov/mrls/)
HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298\,°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B5-3 through B5-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B5-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1E, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	µg/m^3
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	µg/m^3
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	µg/m^3

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

µg/m^3 = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-1E

Table B5-3: Site P-1E DATAENTER

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	79016			0.32	Trichloroethylene	5
2	78933			0.0052	Methylethylketone (2-butanone)	13
3	67641			0.0062	Acetone	13
4	71432			0.00024	Benzene	13
5	75150			0.00086	Carbon disulfide	13
6	74873			0.00042	Methyl chloride (chloromethane)	13
7	100414			0.00014	Ethylbenzene	13
8	1330207			0.00038	Xylenes	13
9	95476			0.00014	o-Xylene	13
10	1634044			0.00027	MTBE	13
11	108883			0.0021	Toluene	13
12	75694			0.0002	Trichlorofluoromethane	13

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	396.24	24			1.00E-08
	5 ft bgs = 152.4; 13 ft bgs = 396.24				

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
LS	1.62	0.39	0.076	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B5-4: Site P-1E CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11	Methylethylketone (2-butanone)
1.24E-01	1.14E-05	3.87E-05	25	6,955	329.20	508.10	0.0E+00	3.1E+01	58.08	Acetone
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	2.9E-05	3.0E-02	78.11	Benzene
1.04E-01	1.00E-05	3.02E-02	25	6,391	319.00	552.00	0.0E+00	7.0E-01	76.13	Carbon disulfide
1.26E-01	6.50E-06	8.80E-03	25	5,115	249.00	416.25	1.8E-06	9.0E-02	50.49	Methyl chloride (chloromethane)
7.50E-02	7.80E-06	7.86E-03	25	8,501	409.34	617.20	2.5E-06	1.0E+00	106.17	Ethylbenzene
8.50E-02	9.90E-06	5.18E-03	25	7,897	375.41	566.58	0.0E+00	7.0E-01	106.17	Xylenes
8.70E-02	1.00E-05	5.18E-03	25	8,661	417.60	630.30	0.0E+00	1.0E-01	106.17	o-Xylene
1.02E-01	1.05E-05	6.23E-04	25	6,678	328.30	497.10	2.6E-07	3.0E+00	88.15	MTBE
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene
8.70E-02	9.70E-06	9.68E-02	25	5,999	296.70	471.00	0.0E+00	7.0E-01	137.36	Trichlorofluoromethane

END

Table B5-5: Site P-1E INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	1.72E+03	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	1.54E+01	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	1.48E+01	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	7.69E-01	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	2.69E+00	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	8.70E-01	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	6.10E-01	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	1.65E+00	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	6.10E-01	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	9.76E-01	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	7.94E+00	3.39E+04
381.24	0.314	#N/A	#N/A	#N/A	1.00E-08	4,000	1.13E+00	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	1.10E-02	381.24
1.00E+06	5.00E-03	15	8,244	5.32E-05	2.18E-03	1.80E-04	1.12E-02	381.24
1.00E+06	5.00E-03	15	7,384	3.71E-05	1.52E-03	1.80E-04	1.72E-02	381.24
1.00E+06	5.00E-03	15	7,977	5.29E-03	2.17E-01	1.80E-04	1.22E-02	381.24
1.00E+06	5.00E-03	15	6,572	2.91E-02	1.19E+00	1.80E-04	1.44E-02	381.24
1.00E+06	5.00E-03	15	4,578	8.57E-03	3.52E-01	1.80E-04	1.75E-02	381.24
1.00E+06	5.00E-03	15	9,994	7.43E-03	3.05E-01	1.80E-04	1.04E-02	381.24
1.00E+06	5.00E-03	15	8,979	4.92E-03	2.02E-01	1.80E-04	1.18E-02	381.24
1.00E+06	5.00E-03	15	10,245	4.88E-03	2.00E-01	1.80E-04	1.21E-02	381.24
1.00E+06	5.00E-03	15	7,113	5.99E-04	2.46E-02	1.80E-04	1.42E-02	381.24
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	1.21E-02	381.24
1.00E+06	5.00E-03	15	5,993	9.35E-02	3.84E+00	1.80E-04	1.21E-02	381.24

Chemical- and DATAENTER-Depth-Specific:

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	1.72E+03	1.25	8.33E+01	1.10E-02	5.00E+03	3.96E+06		
15	1.54E+01	1.25	8.33E+01	1.12E-02	5.00E+03	2.80E+06	6.421E-04	9.88E-03
15	1.48E+01	1.25	8.33E+01	1.72E-02	5.00E+03	1.59E+04	8.647E-04	1.28E-02
15	7.69E-01	1.25	8.33E+01	1.22E-02	5.00E+03	8.36E+05	6.832E-04	5.25E-04
15	2.69E+00	1.25	8.33E+01	1.44E-02	5.00E+03	1.03E+05	7.686E-04	2.06E-03
15	8.70E-01	1.25	8.33E+01	1.75E-02	5.00E+03	1.37E+04	8.734E-04	7.60E-04
15	6.10E-01	1.25	8.33E+01	1.04E-02	5.00E+03	8.89E+06	6.072E-04	3.70E-04
15	1.65E+00	1.25	8.33E+01	1.18E-02	5.00E+03	1.35E+06	6.662E-04	1.10E-03
15	6.10E-01	1.25	8.33E+01	1.21E-02	5.00E+03	9.78E+05	6.776E-04	4.13E-04
15	9.76E-01	1.25	8.33E+01	1.42E-02	5.00E+03	1.23E+05	7.604E-04	7.42E-04
15	7.94E+00	1.25	8.33E+01	1.21E-02	5.00E+03	9.78E+05	6.776E-04	5.38E-03
15	1.13E+00	1.25	8.33E+01	1.21E-02	5.00E+03	9.78E+05	6.776E-04	7.63E-04

Alpha values pasted in, from iterations:

	(as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
Trichloroethy	5	1.203E-03
Methylethylke	13	6.421E-04
Acetone	13	8.647E-04
Benzene	13	6.832E-04
Carbon disulf	13	7.686E-04
Methyl chlorid	13	8.734E-04
Ethylbenzene	13	6.072E-04
Xylenes	13	6.662E-04
o-Xylene	13	6.776E-04
MTBE	13	7.604E-04
Toluene	13	6.776E-04
Trichlorofluor	13	6.776E-04

Attachment B6

Site P-1F

Table B6-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1F, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0782GS001NS	6/9/1999	5.8	Acetone	58.08	--	--	170	4.04E+02	8.628E-04	--	--	--
CP0782GS001NS	6/9/1999	5.8	Benzene	78.11	7.8E-06	IRIS	6.2	1.98E+01	6.730E-04	6.35E-07	1.27E-07	4.27E-08
CP0782GS001NS	6/9/1999	5.8	2-Butanone	72.11	--	--	27	7.96E+01	6.398E-04	--	--	--
CP0545GS001NS	3/13/1997	5	Carbon Disulfide	76.13	--	--	11	3.42E+01	8.459E-04	--	--	--
CP0163GS001NS	7/10/1996	7	Cyclohexane	84.16	--	--	6.8	2.34E+01	--	--	--	--
CP0161GS001NS	7/10/1996	9	1,4-Dichlorobenzene	147	1.1E-05	OEHHA	4.2	2.52E+01	3.828E-04	**1.14E-06**	2.28E-07	4.37E-08
CP0163GS001NS	7/10/1996	7	Ethyl Alcohol	46.07	--	--	42	7.91E+01	--	--	--	--
CP0545GS001NS	3/13/1997	5	Ethylbenzene	106.17	2.5E-06	OEHHA	28	1.22E+02	6.747E-04	**1.25E-06**	2.50E-07	8.43E-08
CP0782GS001NS	6/9/1999	5.8	n-Heptane	100.21	--	--	7.9	3.24E+01	--	--	--	--
CP0782GS001NS	6/9/1999	5.8	Hexane	86.18	--	--	390	1.37E+03	1.134E-03	--	--	--
CP0782GS001NS	6/9/1999	5.8	Methylene Chloride	84.93	4.7E-07	IRIS	4.7	1.63E+01	7.426E-04	3.15E-08	6.31E-09	2.34E-09
CP0163GS001NS	7/10/1996	7	2-Propanol	60.1	--	--	13	3.20E+01	--	--	--	--
CP0782GS001NS	6/9/1999	5.8	Styrene	104.15	--	--	1.8	7.67E+00	5.734E-04	--	--	--
CP0782GS001NS	6/9/1999	5.8	Toluene	92.14	--	--	39	1.47E+02	6.675E-04	--	--	--
CP0545GS001NS	3/13/1997	5	Trichloroethene	131.39	2.0E-06	OEHHA	2.7	1.45E+01	7.005E-04	1.19E-07	2.38E-08	8.35E-09
CP0163GS001NS	7/10/1996	7	1,2,4-Trimethylbenzene	120.2	--	--	4.4	2.16E+01	4.296E-04	--	--	--
CP0161GS001NS	7/10/1996	9	1,3,5-Trimethylbenzene	120.2	--	--	0.95	4.67E+00	3.407E-04	--	--	--
CP0545GS001NS	3/13/1997	5	o-Xylene	106.17	--	--	83	3.60E+02	7.498E-04	--	--	--
CP0545GS001NS	3/13/1997	5	m- & p-Xylenes	106.17	--	--	140	6.08E+02	7.378E-04	--	--	--
									Cumulative Risk:	**3.2E-06**	6.4E-07	1.8E-07

"--" = data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298\,°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B6-3 through B6-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B6-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1F, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c] (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c] $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g] EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g] DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g] Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): $\alpha = 0.01$

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: $\alpha = 0.002$

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B6-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1F, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0782GS001NS	6/9/1999	5.8	Acetone	58.08	3.1E+04	ATSDR	170	4.04E+02	8.628E-04	1.25E-04	2.50E-05	1.08E-05
CP0782GS001NS	6/9/1999	5.8	Benzene	78.11	3.0E+01	IRIS	6.2	1.98E+01	6.730E-04	6.33E-03	1.27E-03	4.26E-04
CP0782GS001NS	6/9/1999	5.8	2-Butanone	72.11	5.0E+03	IRIS	27	7.96E+01	6.398E-04	1.53E-04	3.05E-05	9.77E-06
CP0545GS001NS	3/13/1997	5	Carbon Disulfide	76.13	7.0E+02	IRIS	11	3.42E+01	8.459E-04	4.69E-04	9.38E-05	3.97E-05
CP0163GS001NS	7/10/1996	7	Cyclohexane	84.16	6.0E+03	IRIS	6.8	2.34E+01	--	3.74E-05	7.48E-06	--
CP0161GS001NS	7/10/1996	9	1,4-Dichlorobenzene	147	8.0E+02	IRIS	4.2	2.52E+01	3.828E-04	3.03E-04	6.05E-05	1.16E-05
CP0163GS001NS	7/10/1996	7	Ethyl Alcohol	46.07	--	--	42	7.91E+01	--	--	--	--
CP0545GS001NS	3/13/1997	5	Ethylbenzene	106.17	1.0E+03	IRIS	28	1.22E+02	6.747E-04	1.17E-03	2.33E-04	7.87E-05
CP0782GS001NS	6/9/1999	5.8	n-Heptane	100.21	--	--	7.9	3.24E+01	--	--	--	--
CP0782GS001NS	6/9/1999	5.8	Hexane	86.18	7.0E+02	IRIS	390	1.37E+03	1.134E-03	1.88E-02	3.77E-03	2.14E-03
CP0782GS001NS	6/9/1999	5.8	Methylene Chloride	84.93	4.0E+02	OEHHA	4.7	1.63E+01	7.426E-04	3.91E-04	7.83E-05	2.91E-05
CP0163GS001NS	7/10/1996	7	2-Propanol	60.1	7.0E+03	OEHHA	13	3.20E+01	--	4.38E-05	8.75E-06	--
CP0782GS001NS	6/9/1999	5.8	Styrene	104.15	1.0E+03	IRIS	1.8	7.67E+00	5.734E-04	7.35E-05	1.47E-05	4.22E-06
CP0782GS001NS	6/9/1999	5.8	Toluene	92.14	5.0E+03	IRIS	39	1.47E+02	6.675E-04	2.82E-04	5.64E-05	1.88E-05
CP0545GS001NS	3/13/1997	5	Trichloroethene	131.39	6.0E+02	OEHHA	2.7	1.45E+01	7.005E-04	2.32E-04	4.64E-05	1.62E-05
CP0163GS001NS	7/10/1996	7	1,2,4-Trimethylbenzene	120.2	7.0E+00	PPRTV	4.4	2.16E+01	4.296E-04	2.96E-02	5.93E-03	1.27E-03
CP0161GS001NS	7/10/1996	9	1,3,5-Trimethylbenzene	120.2	6.0E+00	PPRTV	0.95	4.67E+00	3.407E-04	7.46E-03	1.49E-03	2.54E-04
CP0545GS001NS	3/13/1997	5	o-Xylene	106.17	1.0E+02	IRIS	83	3.60E+02	7.498E-04	3.46E-02	6.91E-03	2.59E-03
CP0545GS001NS	3/13/1997	5	m- & p-Xylenes	106.17	1.0E+02	IRIS	140	6.08E+02	7.378E-04	5.83E-02	1.17E-02	4.30E-03
									Hazard Index:	1.6E-01	3.2E-02	1.1E-02

"--" = data are not available

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL) (http://www.atsdr.cdc.gov/mrls/)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)
PPRTV = Provisional Peer-Reviewed Reference Toxicity Value, as cited in EPA's Regional Screening Level (RSL) tables (http://www.epa.gov/region09/superfund/prg/)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B6-3 through B6-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B6-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1F, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days/year \times 24\ hours/day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	µg/m^3
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	µg/m^3
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	µg/m^3

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

µg/m^3 = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-1F

Table B6-3: Site P-1F DATAENTER

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	75150			0.011	Carbon disulfide	5
2	100414			0.028	Ethylbenzene	5
3	1330207			0.14	Xylenes	5
4	95476			0.083	o-Xylene	5
5	79016			0.0027	Trichloroethylene	5
6	78933			0.027	Methylethylketone (2-butanone)	5.8
7	67641			0.17	Acetone	5.8
8	71432			0.0062	Benzene	5.8
9	142825			0.0079	CAS No. not found	5.8
10	110543			0.39	Hexane	5.8
11	75092			0.0047	Methylene chloride	5.8
12	100425			0.0018	Styrene	5.8
13	108883			0.039	Toluene	5.8
14	95636			0.0044	1,2,4-Trimethylbenzene	7
15	67630			0.013	CAS No. not found	7
16	110827			0.0068	CAS No. not found	7
17	64175			0.042	CAS No. not found	7
18	108678			0.00095	1,3,5-Trimethylbenzene	9
19	106467			0.0042	1,4-Dichlorobenzene	9

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	274.32	24			1.00E-08

5 ft bgs = 152.4; 5.8 ft bgs = 176.784; 7 ft bgs = 213.36; 9 ft bgs = 274.32

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SIL	1.49	0.439	0.18	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B6-4: Site P-1F CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
1.04E-01	1.00E-05	3.02E-02	25	6,391	319.00	552.00	0.0E+00	7.0E-01	76.13	Carbon disulfide
7.50E-02	7.80E-06	7.86E-03	25	8,501	409.34	617.20	2.5E-06	1.0E+00	106.17	Ethylbenzene
8.50E-02	9.90E-06	5.18E-03	25	7,897	375.41	566.58	0.0E+00	7.0E-01	106.17	Xylenes
8.70E-02	1.00E-05	5.18E-03	25	8,661	417.60	630.30	0.0E+00	1.0E-01	106.17	o-Xylene
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11	Methylethylketone (2-butanone)
1.24E-01	1.14E-05	3.87E-05	25	6,955	329.20	508.10	0.0E+00	3.1E+01	58.08	Acetone
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	2.9E-05	3.0E-02	78.11	Benzene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
2.00E-01	7.77E-06	1.66E+00	25	6,895	341.70	508.00	0.0E+00	7.0E-01	86.18	Hexane
1.01E-01	1.17E-05	2.18E-03	25	6,706	313.00	510.00	1.0E-06	4.0E-01	84.93	Methylene chloride
7.10E-02	8.00E-06	2.74E-03	25	8,737	418.31	636.00	0.0E+00	9.0E-01	104.15	Styrene
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene
6.06E-02	7.92E-06	6.14E-03	25	9,369	442.30	649.17	0.0E+00	7.0E-03	120.20	1,2,4-Trimethylbenzene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
6.02E-02	8.67E-06	5.87E-03	25	9,321	437.89	637.25	0.0E+00	6.0E-03	120.20	1,3,5-Trimethylbenzene
6.90E-02	7.90E-06	2.39E-03	25	9,271	447.21	684.75	1.1E-05	8.0E-01	147.00	1,4-Dichlorobenzene

END

Table B6-5: Site P-1F INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	3.43E+01	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.22E+02	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	6.10E+02	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	3.61E+02	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.46E+01	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	7.99E+01	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	4.05E+02	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.99E+01	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.38E+03	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.64E+01	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	7.69E+00	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.47E+02	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	2.17E+01	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	4.68E+00	3.39E+04
259.32	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	2.53E+01	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	6,572	2.91E-02	1.19E+00	1.80E-04	6.00E-03	259.32
1.00E+06	5.00E-03	15	9,994	7.43E-03	3.05E-01	1.80E-04	4.33E-03	259.32
1.00E+06	5.00E-03	15	8,979	4.92E-03	2.02E-01	1.80E-04	4.91E-03	259.32
1.00E+06	5.00E-03	15	10,245	4.88E-03	2.00E-01	1.80E-04	5.02E-03	259.32
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	4.56E-03	259.32
1.00E+06	5.00E-03	15	8,244	5.32E-05	2.18E-03	1.80E-04	4.74E-03	259.32
1.00E+06	5.00E-03	15	7,384	3.71E-05	1.52E-03	1.80E-04	7.29E-03	259.32
1.00E+06	5.00E-03	15	7,977	5.29E-03	2.17E-01	1.80E-04	5.08E-03	259.32
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	259.32
1.00E+06	5.00E-03	15	7,549	1.59E+00	6.53E+01	1.80E-04	1.15E-02	259.32
1.00E+06	5.00E-03	15	6,884	2.10E-03	8.62E-02	1.80E-04	5.83E-03	259.32
1.00E+06	5.00E-03	15	10,294	2.59E-03	1.06E-01	1.80E-04	4.10E-03	259.32
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	5.02E-03	259.32
1.00E+06	5.00E-03	15	11,516	5.76E-03	2.36E-01	1.80E-04	3.50E-03	259.32
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	259.32
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	259.32
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	259.32
1.00E+06	5.00E-03	15	11,495	5.50E-03	2.25E-01	1.80E-04	3.48E-03	259.32
1.00E+06	5.00E-03	15	11,098	2.25E-03	9.22E-02	1.80E-04	3.98E-03	259.32

Table B6-5: Site P-1F INTERCALCS

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)		(as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
					Chemical- and DATAENTER-Depth-Specific:						**Alpha values pasted in, from iterations:**
15	3.43E+01	1.25	8.33E+01	6.00E-03	5.00E+03	1.14E+12			Carbon disulf	5	8.459E-04
15	1.22E+02	1.25	8.33E+01	4.33E-03	5.00E+03	5.22E+16			Ethylbenzene	5	6.747E-04
15	6.10E+02	1.25	8.33E+01	4.91E-03	5.00E+03	5.62E+14			Xylenes	5	7.378E-04
15	3.61E+02	1.25	8.33E+01	5.02E-03	5.00E+03	2.57E+14			o-Xylene	5	7.498E-04
15	1.46E+01	1.25	8.33E+01	4.56E-03	5.00E+03	7.43E+15			Trichloroethy	5	7.005E-04
15	7.99E+01	1.25	8.33E+01	4.74E-03	5.00E+03	1.85E+15			Methylethylke	5.8	6.398E-04
15	4.05E+02	1.25	8.33E+01	7.29E-03	5.00E+03	8.58E+09			Acetone	5.8	8.628E-04
15	1.99E+01	1.25	8.33E+01	5.08E-03	5.00E+03	1.77E+14			Benzene	5.8	6.730E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	5.8	#N/A
15	1.38E+03	1.25	8.33E+01	1.15E-02	5.00E+03	1.86E+06			Hexane	5.8	1.134E-03
15	1.64E+01	1.25	8.33E+01	5.83E-03	5.00E+03	2.57E+12			Methylene ch	5.8	7.426E-04
15	7.69E+00	1.25	8.33E+01	4.10E-03	5.00E+03	4.52E+17			Styrene	5.8	5.734E-04
15	1.47E+02	1.25	8.33E+01	5.02E-03	5.00E+03	2.58E+14			Toluene	5.8	6.675E-04
15	2.17E+01	1.25	8.33E+01	3.50E-03	5.00E+03	4.88E+20			1,2,4-Trimeth	7	4.296E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	7	#N/A
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	7	#N/A
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	7	#N/A
15	4.68E+00	1.25	8.33E+01	3.48E-03	5.00E+03	6.69E+20	3.407E-04	1.60E-03	1,3,5-Trimeth	9	3.407E-04
15	2.53E+01	1.25	8.33E+01	3.98E-03	5.00E+03	1.47E+18	3.828E-04	9.69E-03	1,4-Dichlorob	9	3.828E-04

Attachment B7

Site P-1G

Table B7-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1G, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0190GS002NS	7/16/1996	10	Acetone	58.08	--	--	79	1.88E+02	8.407E-04	--	--	--
CP0190GS002NS	7/16/1996	10	Benzene	78.11	7.8E-06	IRIS	8.4	2.68E+01	6.613E-04	8.60E-07	1.72E-07	5.69E-08
CP0572GS001NS	4/5/1997	4.5	1,3-Butadiene	54.09	3.0E-05	IRIS	3.9	8.63E+00	1.752E-03	**1.06E-06**	2.13E-07	1.86E-07
CP0572GS001NS	4/5/1997	4.5	2-Butanone	72.11	--	--	9.6	2.83E+01	1.095E-03	--	--	--
CP0190GS002NS	7/16/1996	10	Cyclohexane	84.16	--	--	130	4.47E+02	--	--	--	--
CP0190GS002NS	7/16/1996	10	1,4-Dioxane	88.11	7.7E-06	OEHHA	22	7.93E+01	6.669E-04	**2.51E-06**	5.02E-07	1.67E-07
CP0572GS001NS	4/5/1997	4.5	Ethyl Alcohol	46.07	--	--	64	1.21E+02	--	--	--	--
CP0574GS001NS	6/27/1997	7	Ethylbenzene	106.17	2.5E-06	OEHHA	17	7.38E+01	7.725E-04	7.58E-07	1.52E-07	5.86E-08
CP0574GS001NS	6/27/1997	7	n-Heptane	100.21	--	--	24	9.84E+01	--	--	--	--
CP0785GS003NS	6/9/1999	11.5	Hexane	86.18	--	--	2000	7.05E+03	1.031E-03	--	--	--
CP0574GS001NS	6/27/1997	7	Propylene	42.08	--	--	150	2.58E+02	--	--	--	--
CP0572GS001NS	4/5/1997	4.5	Toluene	92.14	--	--	8.4	3.17E+01	1.139E-03	--	--	--
CP0577GS002NS	6/3/1997	8.75	Trichloroethene	131.39	2.0E-06	OEHHA	1600	8.60E+03	6.774E-04	**7.07E-05**	**1.41E-05**	**4.79E-06**
CP0572GS001NS	4/5/1997	4.5	1,2,4-Trimethylbenzene	120.2	--	--	1.5	7.37E+00	9.231E-04	--	--	--
CP0574GS001NS	6/27/1997	7	o-Xylene	106.17	--	--	22	9.55E+01	8.533E-04	--	--	--
CP0574GS001NS	6/27/1997	7	m- & p-Xylenes	106.17	--	--	54	2.34E+02	8.403E-04	--	--	--
									Cumulative Risk:	**7.6E-05**	**1.5E-05**	**5.3E-06**

"--" = data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298\,°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B7-3 through B7-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B7-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1G, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B7-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1G, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors RfC (µg/m^3)	Noncancer Toxicity Factors Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c] (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c] (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g] EPA Screening [h]	DTSC Screening [i]	Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0190GS002NS	7/16/1996	10	Acetone	58.08	3.1E+04	ATSDR	79	1.88E+02	8.407E-04	5.80E-05	1.16E-05	4.88E-06
CP0190GS002NS	7/16/1996	10	Benzene	78.11	3.0E+01	IRIS	8.4	2.68E+01	6.613E-04	8.58E-03	1.72E-03	5.67E-04
CP0572GS001NS	4/5/1997	4.5	1,3-Butadiene	54.09	2.0E+00	IRIS	3.9	8.63E+00	1.752E-03	4.14E-02	8.27E-03	7.25E-03
CP0572GS001NS	4/5/1997	4.5	2-Butanone	72.11	5.0E+03	IRIS	9.6	2.83E+01	1.095E-03	5.43E-05	1.09E-05	5.94E-06
CP0190GS002NS	7/16/1996	10	Cyclohexane	84.16	6.0E+03	IRIS	130	4.47E+02	--	7.15E-04	1.43E-04	--
CP0190GS002NS	7/16/1996	10	1,4-Dioxane	88.11	3.0E+03	OEHHA	22	7.93E+01	6.669E-04	2.53E-04	5.07E-05	1.69E-05
CP0572GS001NS	4/5/1997	4.5	Ethyl Alcohol	46.07	--	--	64	1.21E+02	--	--	--	--
CP0574GS001NS	6/27/1997	7	Ethylbenzene	106.17	1.0E+03	IRIS	17	7.38E+01	7.725E-04	7.08E-04	1.42E-04	5.47E-05
CP0574GS001NS	6/27/1997	7	n-Heptane	100.21	--	--	24	9.84E+01	--	--	--	--
CP0785GS003NS	6/9/1999	11.5	Hexane	86.18	7.0E+02	IRIS	2000	7.05E+03	1.031E-03	9.66E-02	1.93E-02	9.95E-03
CP0574GS001NS	6/27/1997	7	Propylene	42.08	3.0E+03	OEHHA	150	2.58E+02	--	8.25E-04	1.65E-04	--
CP0572GS001NS	4/5/1997	4.5	Toluene	92.14	5.0E+03	IRIS	8.4	3.17E+01	1.139E-03	6.07E-05	1.21E-05	6.91E-06
CP0577GS002NS	6/3/1997	8.75	Trichloroethene	131.39	6.0E+02	OEHHA	1600	8.60E+03	6.774E-04	1.37E-01	2.75E-02	9.31E-03
CP0572GS001NS	4/5/1997	4.5	1,2,4-Trimethylbenzene	120.2	7.0E+00	PPRTV	1.5	7.37E+00	9.231E-04	1.01E-02	2.02E-03	9.32E-04
CP0574GS001NS	6/27/1997	7	o-Xylene	106.17	1.0E+02	IRIS	22	9.55E+01	8.533E-04	9.16E-03	1.83E-03	7.82E-04
CP0574GS001NS	6/27/1997	7	m- & p-Xylenes	106.17	1.0E+02	IRIS	54	2.34E+02	8.403E-04	2.25E-02	4.50E-03	1.89E-03
									Hazard Index:	3.3E-01	6.6E-02	3.1E-02

"--" = data are not available

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL) (http://www.atsdr.cdc.gov/mrls/)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)
PPRTV = Provisional Peer-Reviewed Reference Toxicity Value, as cited in EPA's Regional Screening Level (RSL) tables (http://www.epa.gov/region09/superfund/prg/)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B7-3 through B7-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B7-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-1G, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days/year \times 24\ hours/day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	µg/m^3
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	µg/m^3
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	µg/m^3

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

µg/m^3 = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-1G

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	95636			0.0015	1,2,4-Trimethylbenzene	4.5
2	106990			0.0039	1,3-Butadiene	4.5
3	78933			0.0096	Methylethylketone (2-butanone)	4.5
4	64175			0.064	CAS No. not found	4.5
5	108883			0.0084	Toluene	4.5
6	100414			0.017	Ethylbenzene	7
7	142825			0.024	CAS No. not found	7
8	1330207			0.054	Xylenes	7
9	95476			0.022	o-Xylene	7
10	115071			0.15	CAS No. not found	7
11	79016			1.6	Trichloroethylene	8.75
12	123911			0.022	1,4-Dioxane	10
13	67641			0.079	Acetone	10
14	71432			0.0084	Benzene	10
15	110827			0.13	CAS No. not found	10
16	110543			2	Hexane	11.5

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	350.52	24			1.00E-08

4.5 ft bgs = 137.16; 7 ft bgs = 213.36; 8.75 ft bgs = 266.7; 10 ft bgs = 304.8; 11.5 ft bgs = 350.52

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.62	0.387	0.103	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B7-4: Site P-1G CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
6.06E-02	7.92E-06	6.14E-03	25	9,369	442.30	649.17	0.0E+00	7.0E-03	120.20	1,2,4-Trimethylbenzene
2.49E-01	1.08E-05	7.34E-02	25	5,370	268.60	425.00	1.7E-04	2.0E-03	54.09	1,3-Butadiene
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11	Methylethylketone (2-butanone)
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene
7.50E-02	7.80E-06	7.86E-03	25	8,501	409.34	617.20	2.5E-06	1.0E+00	106.17	Ethylbenzene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
8.50E-02	9.90E-06	5.18E-03	25	7,897	375.41	566.58	0.0E+00	7.0E-01	106.17	Xylenes
8.70E-02	1.00E-05	5.18E-03	25	8,661	417.60	630.30	0.0E+00	1.0E-01	106.17	o-Xylene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
8.70E-02	1.10E-05	4.80E-06	25	8,164	374.30	587.20	7.7E-06	3.0E+03	88.11	1,4-Dioxane
1.24E-01	1.14E-05	3.87E-05	25	6,955	329.20	508.10	0.0E+00	3.1E+01	58.08	Acetone
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	2.9E-05	3.0E-02	78.11	Benzene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
2.00E-01	7.77E-06	1.66E+00	25	6,895	341.70	508.00	0.0E+00	7.0E-01	86.18	Hexane

END

Table B7-5: Site P-1G INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	7.40E+00	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	8.65E+00	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	2.84E+01	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	3.17E+01	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	7.40E+01	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	2.35E+02	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	9.58E+01	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	8.62E+03	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	7.95E+01	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.88E+02	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	2.69E+01	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
335.52	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	7.07E+03	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	11,516	5.76E-03	2.36E-01	1.80E-04	6.12E-03	335.52
1.00E+06	5.00E-03	15	5,003	7.14E-02	2.93E+00	1.80E-04	2.51E-02	335.52
1.00E+06	5.00E-03	15	8,244	5.32E-05	2.18E-03	1.80E-04	8.17E-03	335.52
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	335.52
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	8.78E-03	335.52
1.00E+06	5.00E-03	15	9,994	7.43E-03	3.05E-01	1.80E-04	7.57E-03	335.52
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	335.52
1.00E+06	5.00E-03	15	8,979	4.92E-03	2.02E-01	1.80E-04	8.58E-03	335.52
1.00E+06	5.00E-03	15	10,245	4.88E-03	2.00E-01	1.80E-04	8.78E-03	335.52
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	335.52
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	7.98E-03	335.52
1.00E+06	5.00E-03	15	9,113	4.56E-06	1.87E-04	1.80E-04	8.99E-03	335.52
1.00E+06	5.00E-03	15	7,384	3.71E-05	1.52E-03	1.80E-04	1.25E-02	335.52
1.00E+06	5.00E-03	15	7,977	5.29E-03	2.17E-01	1.80E-04	8.88E-03	335.52
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	335.52
1.00E+06	5.00E-03	15	7,549	1.59E+00	6.53E+01	1.80E-04	2.02E-02	335.52

Table B7-5: Site P-1G INTERCALCS

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Chemical- and DATAENTER-Depth-Specific: Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)		Alpha values pasted in, from iterations: (as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
15	7.40E+00	1.25	8.33E+01	6.12E-03	5.00E+03	6.78E+11			1,2,4-Trimeth	4.5	9.231E-04
15	8.65E+00	1.25	8.33E+01	2.51E-02	5.00E+03	7.58E+02			1,3-Butadiene	4.5	1.752E-03
15	2.84E+01	1.25	8.33E+01	8.17E-03	5.00E+03	7.19E+08			Methylethylke	4.5	1.095E-03
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	4.5	#N/A
15	3.17E+01	1.25	8.33E+01	8.78E-03	5.00E+03	1.74E+08			Toluene	4.5	1.139E-03
15	7.40E+01	1.25	8.33E+01	7.57E-03	5.00E+03	3.63E+09			Ethylbenzene	7	7.725E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	7	#N/A
15	2.35E+02	1.25	8.33E+01	8.58E-03	5.00E+03	2.72E+08			Xylenes	7	8.403E-04
15	9.58E+01	1.25	8.33E+01	8.78E-03	5.00E+03	1.74E+08			o-Xylene	7	8.533E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	7	#N/A
15	8.62E+03	1.25	8.33E+01	7.98E-03	5.00E+03	1.19E+09			Trichloroethyl	8.75	6.774E-04
15	7.95E+01	1.25	8.33E+01	8.99E-03	5.00E+03	1.14E+08			1,4-Dioxane	10	6.669E-04
15	1.88E+02	1.25	8.33E+01	1.25E-02	5.00E+03	5.89E+05			Acetone	10	8.407E-04
15	2.69E+01	1.25	8.33E+01	8.88E-03	5.00E+03	1.40E+08			Benzene	10	6.613E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	10	#N/A
15	7.07E+03	1.25	8.33E+01	2.02E-02	5.00E+03	3.84E+03	1.031E-03	7.29E+00	Hexane	11.5	1.031E-03

Attachment B8

Site P-2A

Table B8-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-2A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c] (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c] $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g] EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g] DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g] Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0243GS001NS	8/1/1996	5.8	Acetone	58.08	--	--	260	6.18E+02	8.628E-04	--	--	--
CP0243GS001NS	8/1/1996	5.8	Benzene	78.11	7.8E-06	IRIS	2	6.39E+00	6.731E-04	2.05E-07	4.10E-08	1.38E-08
CP0243GS001NS	8/1/1996	5.8	2-Butanone	72.11	--	--	53	1.56E+02	6.398E-04	--	--	--
CP0239GS002NS	7/12/1996	7.5	Carbon Disulfide	76.13	--	--	47	1.46E+02	6.202E-04	--	--	--
CP0243GS001NS	8/1/1996	5.8	Chloromethane	50.49	1.8E-06	HEAST	3.2	6.61E+00	8.618E-04	4.89E-08	9.78E-09	4.21E-09
CP0243GS001NS	8/1/1996	5.8	Cyclohexane	84.16	--	--	180	6.20E+02	--	--	--	--
CP0243GS001NS	8/1/1996	5.8	Dichlorodifluoromethane	120.91	--	--	2.4	1.19E+01	5.450E-04	--	--	--
CP0236GS001NS	7/12/1996	4	Ethyl Alcohol	46.07	--	--	150	2.83E+02	--	--	--	--
CP0243GS001NS	8/1/1996	5.8	n-Heptane	100.21	--	--	4	1.64E+01	--	--	--	--
CP0243GS001NS	8/1/1996	5.8	2-Propanol	60.1	--	--	9.6	2.36E+01	--	--	--	--
CP0239GS002NS	7/12/1996	7.5	Propylene	42.08	--	--	19	3.27E+01	--	--	--	--
CP0243GS001NS	8/1/1996	5.8	Tetrachloroethene	165.83	5.9E-06	OEHHA	4	2.71E+01	5.795E-04	6.58E-07	1.32E-07	3.81E-08
CP0243GS001NS	8/1/1996	5.8	Toluene	92.14	--	--	9.9	3.73E+01	6.675E-04	--	--	--
CP0236GS001NS	7/12/1996	4	1,1,1-Trichloroethane	133.41	--	--	2	1.09E+01	8.255E-04	--	--	--
CP0240GS001NS	7/15/1996	5	Trichloroethene	131.39	2.0E-06	OEHHA	1700	9.13E+03	7.005E-04	**7.51E-05**	**1.50E-05**	**5.26E-06**
CP0243GS001NS	8/1/1996	5.8	1,2,4-Trimethylbenzene	120.2	--	--	2.6	1.28E+01	5.067E-04	--	--	--
CP0236GS001NS	7/12/1996	4	o-Xylene	106.17	--	--	1.8	7.82E+00	8.865E-04	--	--	--
CP0236GS001NS	7/12/1996	4	m- & p-Xylenes	106.17	--	--	3.5	1.52E+01	8.734E-04	--	--	--
									Cumulative Risk:	**7.6E-05**	**1.5E-05**	**5.3E-06**

"--" = data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)

IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 ($\mu L/nL$)•($L/\mu L$)•($\mu g/g$)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B8-3 through B8-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B8-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-2A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c] (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c] $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g] EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g] DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g] Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): $\alpha = 0.01$

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: $\alpha = 0.002$

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B8-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-2A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0243GS001NS	8/1/1996	5.8	Acetone	58.08	3.1E+04	ATSDR	260	6.18E+02	8.628E-04	1.91E-04	3.82E-05	1.65E-05
CP0243GS001NS	8/1/1996	5.8	Benzene	78.11	3.0E+01	IRIS	2	6.39E+00	6.731E-04	2.04E-03	4.08E-04	1.37E-04
CP0243GS001NS	8/1/1996	5.8	2-Butanone	72.11	5.0E+03	IRIS	53	1.56E+02	6.398E-04	3.00E-04	5.99E-05	1.92E-05
CP0239GS002NS	7/12/1996	7.5	Carbon Disulfide	76.13	7.0E+02	IRIS	47	1.46E+02	6.202E-04	2.00E-03	4.01E-04	1.24E-04
CP0243GS001NS	8/1/1996	5.8	Chloromethane	50.49	9.0E+01	IRIS	3.2	6.61E+00	8.618E-04	7.04E-04	1.41E-04	6.07E-05
CP0243GS001NS	8/1/1996	5.8	Cyclohexane	84.16	6.0E+03	IRIS	180	6.20E+02	--	9.90E-04	1.98E-04	--
CP0243GS001NS	8/1/1996	5.8	Dichlorodifluoromethan	120.91	2.0E+02	HEAST	2.4	1.19E+01	5.450E-04	5.69E-04	1.14E-04	3.10E-05
CP0236GS001NS	7/12/1996	4	Ethyl Alcohol	46.07	--	--	150	2.83E+02	--	--	--	--
CP0243GS001NS	8/1/1996	5.8	n-Heptane	100.21	--	--	4	1.64E+01	--	--	--	--
CP0243GS001NS	8/1/1996	5.8	2-Propanol	60.1	7.0E+03	OEHHA	9.6	2.36E+01	--	3.23E-05	6.46E-06	--
CP0239GS002NS	7/12/1996	7.5	Propylene	42.08	3.0E+03	OEHHA	19	3.27E+01	--	1.05E-04	2.09E-05	--
CP0243GS001NS	8/1/1996	5.8	Tetrachloroethene	165.83	3.5E+01	OEHHA	4	2.71E+01	5.795E-04	7.43E-03	1.49E-03	4.31E-04
CP0243GS001NS	8/1/1996	5.8	Toluene	92.14	5.0E+03	IRIS	9.9	3.73E+01	6.675E-04	7.15E-05	1.43E-05	4.78E-06
CP0236GS001NS	7/12/1996	4	1,1,1-Trichloroethane	133.41	5.0E+03	IRIS	2	1.09E+01	8.255E-04	2.09E-05	4.19E-06	1.73E-06
CP0240GS001NS	7/15/1996	5	Trichloroethene	131.39	6.0E+02	OEHHA	1700	9.13E+03	7.005E-04	1.46E-01	2.92E-02	1.02E-02
CP0243GS001NS	8/1/1996	5.8	1,2,4-Trimethylbenzene	120.2	7.0E+00	PPRTV	2.6	1.28E+01	5.067E-04	1.75E-02	3.50E-03	8.87E-04
CP0236GS001NS	7/12/1996	4	o-Xylene	106.17	1.0E+02	IRIS	1.8	7.82E+00	8.865E-04	7.49E-04	1.50E-04	6.64E-05
CP0236GS001NS	7/12/1996	4	m- & p-Xylenes	106.17	1.0E+02	IRIS	3.5	1.52E+01	8.734E-04	1.46E-03	2.91E-04	1.27E-04
									Hazard Index:	1.8E-01	3.6E-02	1.2E-02

"--" = data are not available

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL) (http://www.atsdr.cdc.gov/mrls/)
HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)
PPRTV = Provisional Peer-Reviewed Reference Toxicity Value, as cited in EPA's Regional Screening Level (RSL) tables (http://www.epa.gov/region09/superfund/prg/)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\,atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B8-3 through B8-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B8-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-2A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days/year \times 24\ hours/day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	µg/m^3
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	µg/m^3
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	µg/m^3

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

µg/m^3 = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-2A

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	71556			0.002	1,1,1-Trichloroethane	4
2	64175			0.15	CAS No. not found	4
3	1330207			0.0035	Xylenes	4
4	95476			0.0018	o-Xylene	4
5	79016			1.7	Trichloroethylene	5
6	95636			0.0026	1,2,4-Trimethylbenzene	5.8
7	78933			0.053	Methylethylketone (2-butanone)	5.8
8	67630			0.0096	CAS No. not found	5.8
9	67641			0.26	Acetone	5.8
10	71432			0.002	Benzene	5.8
11	74873			0.0032	Methyl chloride (chloromethane)	5.8
12	110827			0.18	CAS No. not found	5.8
13	75718			0.0024	Dichlorodifluoromethane	5.8
14	142825			0.004	CAS No. not found	5.8
15	127184			0.004	Tetrachloroethylene	5.8
16	108883			0.0099	Toluene	5.8
17	75150			0.047	Carbon disulfide	7.5
18	115071			0.019	CAS No. not found	7.5

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	228.6	24			1.00E-08

4 ft bgs = 121.92; 5 ft bgs = 152.4; 5.8 ft bgs = 176.78; 7.5 ft bgs = 228.6

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{Soil} (L/m)
SIL	1.49	0.439	0.18	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B8-4: Site P-2A CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
7.80E-02	8.80E-06	1.72E-02	25	7,136	347.24	545.00	0.0E+00	5.0E+00	133.40	1,1,1-Trichloroethane
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
8.50E-02	9.90E-06	5.18E-03	25	7,897	375.41	566.58	0.0E+00	7.0E-01	106.17	Xylenes
8.70E-02	1.00E-05	5.18E-03	25	8,661	417.60	630.30	0.0E+00	1.0E-01	106.17	o-Xylene
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
6.06E-02	7.92E-06	6.14E-03	25	9,369	442.30	649.17	0.0E+00	7.0E-03	120.20	1,2,4-Trimethylbenzene
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11	Methylethylketone (2-butanone)
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
1.24E-01	1.14E-05	3.87E-05	25	6,955	329.20	508.10	0.0E+00	3.1E+01	58.08	Acetone
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	2.9E-05	3.0E-02	78.11	Benzene
1.26E-01	6.50E-06	8.80E-03	25	5,115	249.00	416.25	1.8E-06	9.0E-02	50.49	Methyl chloride (chloromethane)
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
6.65E-02	9.92E-06	3.42E-01	25	9,421	243.20	384.95	0.0E+00	2.0E-01	120.92	Dichlorodifluoromethane
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	3.5E-02	165.83	Tetrachloroethylene
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene
1.04E-01	1.00E-05	3.02E-02	25	6,391	319.00	552.00	0.0E+00	7.0E-01	76.13	Carbon disulfide
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found

END

Table B8-5: Site P-2A INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.09E+01	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.52E+01	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	7.84E+00	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	9.16E+03	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.28E+01	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.57E+02	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	6.19E+02	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	6.41E+00	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	6.63E+00	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.19E+01	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	2.72E+01	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	3.74E+01	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.47E+02	3.39E+04
213.6	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	7,732	1.64E-02	6.73E-01	1.80E-04	4.50E-03	213.6
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	213.6
1.00E+06	5.00E-03	15	8,979	4.92E-03	2.02E-01	1.80E-04	4.91E-03	213.6
1.00E+06	5.00E-03	15	10,245	4.88E-03	2.00E-01	1.80E-04	5.02E-03	213.6
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	4.56E-03	213.6
1.00E+06	5.00E-03	15	11,516	5.76E-03	2.36E-01	1.80E-04	3.50E-03	213.6
1.00E+06	5.00E-03	15	8,244	5.32E-05	2.18E-03	1.80E-04	4.74E-03	213.6
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	213.6
1.00E+06	5.00E-03	15	7,384	3.71E-05	1.52E-03	1.80E-04	7.29E-03	213.6
1.00E+06	5.00E-03	15	7,977	5.29E-03	2.17E-01	1.80E-04	5.08E-03	213.6
1.00E+06	5.00E-03	15	4,578	8.57E-03	3.52E-01	1.80E-04	7.27E-03	213.6
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	213.6
1.00E+06	5.00E-03	15	7,961	3.27E-01	1.34E+01	1.80E-04	3.84E-03	213.6
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	213.6
1.00E+06	5.00E-03	15	9,410	1.74E-02	7.14E-01	1.80E-04	4.16E-03	213.6
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	5.02E-03	213.6
1.00E+06	5.00E-03	15	6,572	2.91E-02	1.19E+00	1.80E-04	6.00E-03	213.6
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	213.6

Table B8-5: Site P-2A INTERCALCS

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Chemical- and DATAENTER-Depth-Specific: Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)		Alpha values pasted in, from iterations: (as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
15	1.09E+01	1.25	8.33E+01	4.50E-03	5.00E+03	1.19E+16			1,1,1-Trichlor	4	8.255E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not f	4	#N/A
15	1.52E+01	1.25	8.33E+01	4.91E-03	5.00E+03	5.62E+14			Xylenes	4	8.734E-04
15	7.84E+00	1.25	8.33E+01	5.02E-03	5.00E+03	2.57E+14			o-Xylene	4	8.865E-04
15	9.16E+03	1.25	8.33E+01	4.56E-03	5.00E+03	7.43E+15			Trichloroethyl	5	7.005E-04
15	1.28E+01	1.25	8.33E+01	3.50E-03	5.00E+03	4.88E+20			1,2,4-Trimeth	5.8	5.067E-04
15	1.57E+02	1.25	8.33E+01	4.74E-03	5.00E+03	1.85E+15			Methylethylke	5.8	6.398E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not f	5.8	#N/A
15	6.19E+02	1.25	8.33E+01	7.29E-03	5.00E+03	8.58E+09			Acetone	5.8	8.628E-04
15	6.41E+00	1.25	8.33E+01	5.08E-03	5.00E+03	1.77E+14			Benzene	5.8	6.731E-04
15	6.63E+00	1.25	8.33E+01	7.27E-03	5.00E+03	8.94E+09			Methyl chloric	5.8	8.618E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not f	5.8	#N/A
15	1.19E+01	1.25	8.33E+01	3.84E-03	5.00E+03	7.18E+18			Dichlorodifluo	5.8	5.450E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not f	5.8	#N/A
15	2.72E+01	1.25	8.33E+01	4.16E-03	5.00E+03	2.60E+17			Tetrachloroet	5.8	5.795E-04
15	3.74E+01	1.25	8.33E+01	5.02E-03	5.00E+03	2.58E+14			Toluene	5.8	6.675E-04
15	1.47E+02	1.25	8.33E+01	6.00E-03	5.00E+03	1.14E+12	6.202E-04	9.10E-02	Carbon disulf	7.5	6.202E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A	#N/A	#N/A	CAS No. not f	7.5	#N/A

Attachment B9

Site P-2B

Table B9-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-2B, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0265GS002NS	7/16/1996	10	Acetone	58.08	--	--	83	1.97E+02	8.407E-04	--	--	--
CP0267GS001NS	8/1/1996	6	Benzene	78.11	7.8E-06	IRIS	1.4	4.47E+00	9.550E-04	1.43E-07	2.87E-08	1.37E-08
CP0265GS002NS	7/16/1996	10	2-Butanone	72.11	--	--	19	5.60E+01	6.218E-04	--	--	--
CP0272GS002NS	8/13/1996	12.5	Carbon tetrachloride	153.82	1.5E-05	IRIS	430	2.70E+03	5.046E-04	**1.67E-04**	**3.33E-05**	**8.41E-06**
CP0267GS001NS	8/1/1996	6	Chloromethane	50.49	1.8E-06	HEAST	1.1	2.27E+00	1.171E-03	1.68E-08	3.36E-09	1.97E-09
CP0265GS002NS	7/16/1996	10	Cyclohexane	84.16	--	--	340	1.17E+03	--	--	--	--
CP0265GS002NS	7/16/1996	10	1,4-Dichlorobenzene	147	1.1E-05	OEHHA	1.8	1.08E+01	5.505E-04	4.89E-07	9.78E-08	2.69E-08
CP0267GS001NS	8/1/1996	6	1,4-Dioxane	88.11	7.7E-06	OEHHA	16	5.77E+01	9.617E-04	**1.82E-06**	3.65E-07	1.75E-07
CP0267GS001NS	8/1/1996	6	Ethyl Alcohol	46.07	--	--	24	4.52E+01	--	--	--	--
CP0789GS002NS	6/7/1999	9	Hexane	86.18	--	--	290000	1.02E+06	1.188E-03	--	--	--
CP0265GS002NS	7/16/1996	10	2-Propanol	60.1	--	--	7.2	1.77E+01	--	--	--	--
CP0267GS001NS	8/1/1996	6	Tetrachloroethene	165.83	5.9E-06	OEHHA	51	3.46E+02	8.407E-04	**8.39E-06**	**1.68E-06**	7.05E-07
CP0265GS002NS	7/16/1996	10	Toluene	92.14	--	--	4.7	1.77E+01	6.558E-04	--	--	--
CP0265GS002NS	7/16/1996	10	1,2,4-Trichlorobenzene	181.45	--	--	2.2	1.63E+01	2.741E-04	--	--	--
CP0263GS001NS	7/8/1996	10.25	Trichloroethene	131.39	2.0E-06	OEHHA	520	2.79E+03	5.987E-04	**2.30E-05**	**4.59E-06**	**1.37E-06**
CP0267GS001NS	8/1/1996	6	1,2,4-Trimethylbenzene	120.2	--	--	1.8	8.85E+00	7.481E-04	--	--	--
CP0267GS001NS	8/1/1996	6	m- & p-Xylenes	106.17	--	--	1.2	5.21E+00	9.348E-04	--	--	--
									Cumulative Risk:	**2.0E-04**	**4.0E-05**	**1.1E-05**

"--" = data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:
HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298\,°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 (μL/nL)•(L/μL)•(μg/g)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B9-3 through B9-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B9-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-2B, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR ($(\mu g/m^3)^{-1}$)	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: ($\mu g/m^3$) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ \ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ \ air} = C_{soil\ \ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): $\alpha = 0.01$

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: $\alpha = 0.002$

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B9-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-2B, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0265GS002NS	7/16/1996	10	Acetone	58.08	3.1E+04	ATSDR	83	1.97E+02	8.407E-04	6.10E-05	1.22E-05	5.13E-06
CP0267GS001NS	8/1/1996	6	Benzene	78.11	3.0E+01	IRIS	1.4	4.47E+00	9.550E-04	1.43E-03	2.86E-04	1.37E-04
CP0265GS002NS	7/16/1996	10	2-Butanone	72.11	5.0E+03	IRIS	19	5.60E+01	6.218E-04	1.07E-04	2.15E-05	6.68E-06
CP0272GS002NS	8/13/1996	12.5	Carbon tetrachloride	153.82	4.0E+01	OEHHA	430	2.70E+03	5.046E-04	6.48E-01	1.30E-01	3.27E-02
CP0267GS001NS	8/1/1996	6	Chloromethane	50.49	9.0E+01	IRIS	1.1	2.27E+00	1.171E-03	2.42E-04	4.84E-05	2.83E-05
CP0265GS002NS	7/16/1996	10	Cyclohexane	84.16	6.0E+03	IRIS	340	1.17E+03	--	1.87E-03	3.74E-04	--
CP0265GS002NS	7/16/1996	10	1,4-Dichlorobenzene	147	8.0E+02	IRIS	1.8	1.08E+01	5.505E-04	1.30E-04	2.59E-05	7.14E-06
CP0267GS001NS	8/1/1996	6	1,4-Dioxane	88.11	3.0E+03	OEHHA	16	5.77E+01	9.617E-04	1.84E-04	3.69E-05	1.77E-05
CP0267GS001NS	8/1/1996	6	Ethyl Alcohol	46.07	--	--	24	4.52E+01	--	--	--	--
CP0789GS002NS	6/7/1999	9	Hexane	86.18	7.0E+02	IRIS	290000	1.02E+06	1.188E-03	**1.40E+01**	**2.80E+00**	**1.66E+00**
CP0265GS002NS	7/16/1996	10	2-Propanol	60.1	7.0E+03	OEHHA	7.2	1.77E+01	--	2.42E-05	4.85E-06	--
CP0267GS001NS	8/1/1996	6	Tetrachloroethene	165.83	3.5E+01	OEHHA	51	3.46E+02	8.407E-04	9.48E-02	1.90E-02	7.97E-03
CP0265GS002NS	7/16/1996	10	Toluene	92.14	5.0E+03	IRIS	4.7	1.77E+01	6.558E-04	3.40E-05	6.79E-06	2.23E-06
CP0265GS002NS	7/16/1996	10	1,2,4-Trichlorobenzene	181.45	2.0E+00	PPRTV	2.2	1.63E+01	2.741E-04	7.83E-02	1.57E-02	2.15E-03
CP0263GS001NS	7/8/1996	10.25	Trichloroethene	131.39	6.0E+02	OEHHA	520	2.79E+03	5.987E-04	4.47E-02	8.93E-03	2.67E-03
CP0267GS001NS	8/1/1996	6	1,2,4-Trimethylbenzene	120.2	7.0E+00	PPRTV	1.8	8.85E+00	7.481E-04	1.21E-02	2.42E-03	9.07E-04
CP0267GS001NS	8/1/1996	6	m- & p-Xylenes	106.17	1.0E+02	IRIS	1.2	5.21E+00	9.348E-04	5.00E-04	9.99E-05	4.67E-05
									Hazard Index:	**1.5E+01**	**3.0E+00**	**1.7E+00**

"--" = data are not available

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL) (http://www.atsdr.cdc.gov/mrls/)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)
PPRTV = Provisional Peer-Reviewed Reference Toxicity Value, as cited in EPA's Regional Screening Level (RSL) tables (http://www.epa.gov/region09/superfund/prg/)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\,atm}{R \times 298\,°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B9-3 through B9-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B9-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-2B, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC ($\mu g/m^3$)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: ($\mu g/m^3$) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days/year \times 24\ hours/day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	$\mu g/m^3$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): $\alpha = 0.01$

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: $\alpha = 0.002$

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-2B

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	95636			0.0018	1,2,4-Trimethylbenzene	6
2	123911			0.016	1,4-Dioxane	6
3	71432			0.0014	Benzene	6
4	74873			0.0011	Methyl chloride (chloromethane)	6
5	64175			0.024	CAS No. not found	6
6	1330207			0.0012	Xylenes	6
7	127184			0.051	Tetrachloroethylene	6
8	110543			290	Hexane	9
9	120821			0.0022	1,2,4-Trichlorobenzene	10
10	106467			0.0018	1,4-Dichlorobenzene	10
11	78933			0.019	Methylethylketone (2-butanone)	10
12	67630			0.0072	CAS No. not found	10
13	67641			0.083	Acetone	10
14	110827			0.34	CAS No. not found	10
15	108883			0.0047	Toluene	10
16	79016			0.52	Trichloroethylene	10.25
17	56235			0.43	Carbon tetrachloride	12.5

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	381	24			1.00E-08

6 ft bgs = 182.9; 9 ft bgs = 274.32; 10 ft bgs = 304.8; 10.25 ft bgs = 312.42; 12.5 ft bgs = 381

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.62	0.387	0.103	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B9-4: Site P-2B CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
6.06E-02	7.92E-06	6.14E-03	25	9,369	442.30	649.17	0.0E+00	7.0E-03	120.20	1,2,4-Trimethylbenzene
8.70E-02	1.10E-05	4.80E-06	25	8,164	374.30	587.20	7.7E-06	3.0E+03	88.11	1,4-Dioxane
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	2.9E-05	3.0E-02	78.11	Benzene
1.26E-01	6.50E-06	8.80E-03	25	5,115	249.00	416.25	1.8E-06	9.0E-02	50.49	Methyl chloride (chloromethane)
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
8.50E-02	9.90E-06	5.18E-03	25	7,897	375.41	566.58	0.0E+00	7.0E-01	106.17	Xylenes
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	3.5E-02	165.83	Tetrachloroethylene
2.00E-01	7.77E-06	1.66E+00	25	6,895	341.70	508.00	0.0E+00	7.0E-01	86.18	Hexane
3.00E-02	8.23E-06	1.42E-03	25	10,471	486.15	725.00	0.0E+00	4.0E-03	181.45	1,2,4-Trichlorobenzene
6.90E-02	7.90E-06	2.39E-03	25	9,271	447.21	684.75	1.1E-05	8.0E-01	147.00	1,4-Dichlorobenzene
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11	Methylethylketone (2-butanone)
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
1.24E-01	1.14E-05	3.87E-05	25	6,955	329.20	508.10	0.0E+00	3.1E+01	58.08	Acetone
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
7.80E-02	8.80E-06	3.03E-02	25	7,127	349.90	556.60	4.2E-05	4.0E-02	153.82	Carbon tetrachloride

END

Table B9-5: Site P-2B INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	8.87E+00	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	5.78E+01	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	4.49E+00	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	2.28E+00	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	5.23E+00	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	3.47E+02	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.03E+06	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.64E+01	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.09E+01	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	5.62E+01	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.98E+02	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.78E+01	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	2.80E+03	3.39E+04
366	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	2.71E+03	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	11,516	5.76E-03	2.36E-01	1.80E-04	6.12E-03	366
1.00E+06	5.00E-03	15	9,113	4.56E-06	1.87E-04	1.80E-04	8.99E-03	366
1.00E+06	5.00E-03	15	7,977	5.29E-03	2.17E-01	1.80E-04	8.88E-03	366
1.00E+06	5.00E-03	15	4,578	8.57E-03	3.52E-01	1.80E-04	1.27E-02	366
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	366
1.00E+06	5.00E-03	15	8,979	4.92E-03	2.02E-01	1.80E-04	8.58E-03	366
1.00E+06	5.00E-03	15	9,410	1.74E-02	7.14E-01	1.80E-04	7.27E-03	366
1.00E+06	5.00E-03	15	7,549	1.59E+00	6.53E+01	1.80E-04	2.02E-02	366
1.00E+06	5.00E-03	15	13,069	1.32E-03	5.39E-02	1.80E-04	3.03E-03	366
1.00E+06	5.00E-03	15	11,098	2.25E-03	9.22E-02	1.80E-04	6.97E-03	366
1.00E+06	5.00E-03	15	8,244	5.32E-05	2.18E-03	1.80E-04	8.17E-03	366
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	366
1.00E+06	5.00E-03	15	7,384	3.71E-05	1.52E-03	1.80E-04	1.25E-02	366
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	366
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	8.78E-03	366
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	7.98E-03	366
1.00E+06	5.00E-03	15	7,716	2.90E-02	1.19E+00	1.80E-04	7.87E-03	366

Table B9-5: Site P-2B INTERCALCS

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Chemical- and DATAENTER-Depth-Specific: Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)		Alpha values pasted in, from iterations: (as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
15	8.87E+00	1.25	8.33E+01	6.12E-03	5.00E+03	6.78E+11			1,2,4-Trimeth	6	7.481E-04
15	5.78E+01	1.25	8.33E+01	8.99E-03	5.00E+03	1.14E+08			1,4-Dioxane	6	9.617E-04
15	4.49E+00	1.25	8.33E+01	8.88E-03	5.00E+03	1.40E+08			Benzene	6	9.550E-04
15	2.28E+00	1.25	8.33E+01	1.27E-02	5.00E+03	4.90E+05			Methyl chloric	6	1.171E-03
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	6	#N/A
15	5.23E+00	1.25	8.33E+01	8.58E-03	5.00E+03	2.72E+08			Xylenes	6	9.348E-04
15	3.47E+02	1.25	8.33E+01	7.27E-03	5.00E+03	9.08E+09			Tetrachloroet	6	8.407E-04
15	1.03E+06	1.25	8.33E+01	2.02E-02	5.00E+03	3.84E+03			Hexane	9	1.188E-03
15	1.64E+01	1.25	8.33E+01	3.03E-03	5.00E+03	7.85E+23			1,2,4-Trichlor	10	2.741E-04
15	1.09E+01	1.25	8.33E+01	6.97E-03	5.00E+03	2.46E+10			1,4-Dichlorob	10	5.505E-04
15	5.62E+01	1.25	8.33E+01	8.17E-03	5.00E+03	7.19E+08			Methylethylke	10	6.218E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	10	#N/A
15	1.98E+02	1.25	8.33E+01	1.25E-02	5.00E+03	5.89E+05			Acetone	10	8.407E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	10	#N/A
15	1.78E+01	1.25	8.33E+01	8.78E-03	5.00E+03	1.74E+08			Toluene	10	6.558E-04
15	2.80E+03	1.25	8.33E+01	7.98E-03	5.00E+03	1.19E+09			Trichloroethyl	10.25	5.987E-04
15	2.71E+03	1.25	8.33E+01	7.87E-03	5.00E+03	1.56E+09	5.046E-04	1.37E+00	Carbon tetrac	12.5	5.046E-04

Attachment B10

Site P-3A

Table B10-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-3A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0296GS002NS	8/8/1996	11.3	Acetone	58.08	--	--	130	3.09E+02	7.711E-04	--	--	--
CP0298GS001NS	8/12/1996	6.8	Benzene	78.11	7.8E-06	IRIS	6.3	2.01E+01	8.772E-04	6.45E-07	1.29E-07	5.66E-08
CP0293GS002NS	8/1/1996	13	2-Butanone	72.11	--	--	31	9.14E+01	5.032E-04	--	--	--
CP0288GS002NS	7/11/1996	9.5	Carbon Disulfide	76.13	--	--	78	2.43E+02	7.735E-04	--	--	--
CP0293GS002NS	8/1/1996	13	Chloromethane	50.49	1.8E-06	HEAST	1.1	2.27E+00	7.031E-04	1.68E-08	3.36E-09	1.18E-09
CP0298GS001NS	8/12/1996	6.8	Cyclohexane	84.16	--	--	120	4.13E+02	--	--	--	--
CP0298GS001NS	8/12/1996	6.8	Dichlorodifluoromethane	120.91	--	--	8.7	4.30E+01	7.261E-04	--	--	--
CP0551GS001NS	3/13/1997	5.5	cis-1,2-Dichloroethene	96.94	--	--	3.9	1.55E+01	9.068E-04	--	--	--
CP0296GS002NS	8/8/1996	11.3	Ethyl Alcohol	46.07	--	--	290	5.46E+02	--	--	--	--
CP0296GS002NS	8/8/1996	11.3	Ethylbenzene	106.17	2.5E-06	OEHHA	12	5.21E+01	5.315E-04	5.35E-07	1.07E-07	2.85E-08
CP0293GS002NS	8/1/1996	13	4-Methyl-2-pentanone	100.16	--	--	3.8	1.56E+01	4.735E-04	--	--	--
CP0293GS002NS	8/1/1996	13	2-Propanol	60.1	--	--	8.9	2.19E+01	--	--	--	--
CP0296GS002NS	8/8/1996	11.3	Tetrachloroethene	165.83	5.9E-06	OEHHA	6.3	4.27E+01	5.147E-04	**1.04E-06**	2.07E-07	5.33E-08
CP0288GS002NS	7/11/1996	9.5	Toluene	92.14	--	--	11	4.14E+01	6.821E-04	--	--	--
CP0289GS001NS	7/11/1996	4.5	Trichloroethene	131.39	2.0E-06	OEHHA	670	3.60E+03	1.080E-03	**2.96E-05**	**5.92E-06**	**3.20E-06**
CP0298GS001NS	8/12/1996	6.8	1,2,4-Trimethylbenzene	120.2	--	--	2.7	1.33E+01	6.795E-04	--	--	--
CP0296GS002NS	8/8/1996	11.3	1,3,5-Trimethylbenzene	120.2	--	--	1.3	6.39E+00	4.456E-04	--	--	--
CP0296GS002NS	8/8/1996	11.3	o-Xylene	106.17	--	--	31	1.35E+02	5.959E-04	--	--	--
CP0296GS002NS	8/8/1996	11.3	m- & p-Xylenes	106.17	--	--	50	2.17E+02	5.855E-04	--	--	--
									Cumulative Risk:	**3.2E-05**	**6.4E-06**	**3.3E-06**

"--" = data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:
HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298\,°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B10-3 through B10-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B10-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-3A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B10-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-3A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0296GS002NS	8/8/1996	11.3	Acetone	58.08	3.1E+04	ATSDR	130	3.09E+02	7.711E-04	9.55E-05	1.91E-05	7.36E-06
CP0298GS001NS	8/12/1996	6.8	Benzene	78.11	3.0E+01	IRIS	6.3	2.01E+01	8.772E-04	6.43E-03	1.29E-03	5.64E-04
CP0293GS002NS	8/1/1996	13	2-Butanone	72.11	5.0E+03	IRIS	31	9.14E+01	5.032E-04	1.75E-04	3.51E-05	8.82E-06
CP0288GS002NS	7/11/1996	9.5	Carbon Disulfide	76.13	7.0E+02	IRIS	78	2.43E+02	7.735E-04	3.33E-03	6.65E-04	2.57E-04
CP0293GS002NS	8/1/1996	13	Chloromethane	50.49	9.0E+01	IRIS	1.1	2.27E+00	7.031E-04	2.42E-04	4.84E-05	1.70E-05
CP0298GS001NS	8/12/1996	6.8	Cyclohexane	84.16	6.0E+03	IRIS	120	4.13E+02	--	6.60E-04	1.32E-04	0.00E+00
CP0298GS001NS	8/12/1996	6.8	Dichlorodifluoromethan	120.91	2.0E+02	HEAST	8.7	4.30E+01	7.261E-04	2.06E-03	4.12E-04	1.50E-04
CP0551GS001NS	3/13/1997	5.5	cis-1,2-Dichloroethene	96.94	--	--	3.9	1.55E+01	9.068E-04	--	--	--
CP0296GS002NS	8/8/1996	11.3	Ethyl Alcohol	46.07	--	--	290	5.46E+02	--	--	--	--
CP0296GS002NS	8/8/1996	11.3	Ethylbenzene	106.17	1.0E+03	IRIS	12	5.21E+01	5.315E-04	5.00E-04	9.99E-05	2.66E-05
CP0293GS002NS	8/1/1996	13	4-Methyl-2-pentanone	100.16	3.0E+03	IRIS	3.8	1.56E+01	4.735E-04	4.98E-05	9.95E-06	2.36E-06
CP0293GS002NS	8/1/1996	13	2-Propanol	60.1	7.0E+03	OEHHA	8.9	2.19E+01	--	3.00E-05	5.99E-06	0.00E+00
CP0296GS002NS	8/8/1996	11.3	Tetrachloroethene	165.83	3.5E+01	OEHHA	6.3	4.27E+01	5.147E-04	1.17E-02	2.34E-03	6.02E-04
CP0288GS002NS	7/11/1996	9.5	Toluene	92.14	5.0E+03	IRIS	11	4.14E+01	6.821E-04	7.95E-05	1.59E-05	5.42E-06
CP0289GS001NS	7/11/1996	4.5	Trichloroethene	131.39	6.0E+02	OEHHA	670	3.60E+03	1.080E-03	5.75E-02	1.15E-02	6.21E-03
CP0298GS001NS	8/12/1996	6.8	1,2,4-Trimethylbenzene	120.2	7.0E+00	PPRTV	2.7	1.33E+01	6.795E-04	1.82E-02	3.64E-03	1.24E-03
CP0296GS002NS	8/8/1996	11.3	1,3,5-Trimethylbenzene	120.2	6.0E+00	PPRTV	1.3	6.39E+00	4.456E-04	1.02E-02	2.04E-03	4.55E-04
CP0296GS002NS	8/8/1996	11.3	o-Xylene	106.17	1.0E+02	IRIS	31	1.35E+02	5.959E-04	1.29E-02	2.58E-03	7.69E-04
CP0296GS002NS	8/8/1996	11.3	m- & p-Xylenes	106.17	1.0E+02	IRIS	50	2.17E+02	5.855E-04	2.08E-02	4.16E-03	1.22E-03
									Hazard Index:	1.5E-01	2.9E-02	1.2E-02

"--" = data are not available

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL) (http://www.atsdr.cdc.gov/mrls/)
HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)
PPRTV = Provisional Peer-Reviewed Reference Toxicity Value, as cited in EPA's Regional Screening Level (RSL) tables (http://www.epa.gov/region09/superfund/prg/)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B10-3 through B10-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B10-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-3A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC ($\mu g/m^3$)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: ($\mu g/m^3$) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days/year \times 24\ hours/day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	$\mu g/m^3$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): $\alpha = 0.01$

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: $\alpha = 0.002$

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-3A

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	79016			0.67	Trichloroethylene	4.5
2	156592			0.0039	cis-1,2-Dichloroethylene	5.5
3	95636			0.0027	1,2,4-Trimethylbenzene	6.8
4	71432			0.0063	Benzene	6.8
5	110827			0.12	CAS No. not found	6.8
6	75718			0.0087	Dichlorodifluoromethane	6.8
7	75150			0.078	Carbon disulfide	9.5
8	108883			0.011	Toluene	9.5
9	108678			0.0013	1,3,5-Trimethylbenzene	11.3
10	67641			0.13	Acetone	11.3
11	64175			0.29	CAS No. not found	11.3
12	100414			0.012	Ethylbenzene	11.3
13	1330207			0.05	Xylenes	11.3
14	95476			0.031	o-Xylene	11.3
15	127184			0.0063	Tetrachloroethylene	11.3
16	78933			0.031	Methylethylketone (2-butanone)	13
17	67630			0.0089	CAS No. not found	13
18	108101			0.0038	Methylisobutylketone (4-methyl-2-pentanone)	13
19	74873			0.0011	Methyl chloride (chloromethane)	13

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	396.24	24			1.00E-08

4.5 ft bgs = 137.16; 5.5 ft bgs = 167.64; 6.8 ft bgs = 207.26; 9.5 ft bgs = 289.56; 11.3 ft bgs = 344.54; 13 ft bgs = 396.24

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.62	0.387	0.103	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B10-4: Site P-3A CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
7.36E-02	1.13E-05	4.07E-03	25	7,192	333.65	544.00	0.0E+00	3.5E-02	96.94	cis-1,2-Dichloroethylene
6.06E-02	7.92E-06	6.14E-03	25	9,369	442.30	649.17	0.0E+00	7.0E-03	120.20	1,2,4-Trimethylbenzene
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	2.9E-05	3.0E-02	78.11	Benzene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
6.65E-02	9.92E-06	3.42E-01	25	9,421	243.20	384.95	0.0E+00	2.0E-01	120.92	Dichlorodifluoromethane
1.04E-01	1.00E-05	3.02E-02	25	6,391	319.00	552.00	0.0E+00	7.0E-01	76.13	Carbon disulfide
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene
6.02E-02	8.67E-06	5.87E-03	25	9,321	437.89	637.25	0.0E+00	6.0E-03	120.20	1,3,5-Trimethylbenzene
1.24E-01	1.14E-05	3.87E-05	25	6,955	329.20	508.10	0.0E+00	3.1E+01	58.08	Acetone
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
7.50E-02	7.80E-06	7.86E-03	25	8,501	409.34	617.20	2.5E-06	1.0E+00	106.17	Ethylbenzene
8.50E-02	9.90E-06	5.18E-03	25	7,897	375.41	566.58	0.0E+00	7.0E-01	106.17	Xylenes
8.70E-02	1.00E-05	5.18E-03	25	8,661	417.60	630.30	0.0E+00	1.0E-01	106.17	o-Xylene
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	3.5E-02	165.83	Tetrachloroethylene
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11	Methylethylketone (2-butanone)
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
7.50E-02	7.80E-06	1.38E-04	25	8,243	389.50	571.00	0.0E+00	3.0E+00	100.16	Methylisobutylketone (4-methyl-2-
1.26E-01	6.50E-06	8.80E-03	25	5,115	249.00	416.25	1.8E-06	9.0E-02	50.49	Methyl chloride (chloromethane)

END

Table B10-5: Site P-3A INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	3.61E+03	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.55E+01	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.33E+01	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	2.02E+01	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	4.31E+01	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	2.44E+02	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	4.16E+01	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	6.41E+00	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	3.10E+02	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	5.23E+01	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	2.18E+02	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.35E+02	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	4.28E+01	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	9.17E+01	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.56E+01	3.39E+04
381.24	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	2.28E+00	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	7.98E-03	381.24
1.00E+06	5.00E-03	15	7,592	3.90E-03	1.60E-01	1.80E-04	7.43E-03	381.24
1.00E+06	5.00E-03	15	11,516	5.76E-03	2.36E-01	1.80E-04	6.12E-03	381.24
1.00E+06	5.00E-03	15	7,977	5.29E-03	2.17E-01	1.80E-04	8.88E-03	381.24
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	381.24
1.00E+06	5.00E-03	15	7,961	3.27E-01	1.34E+01	1.80E-04	6.71E-03	381.24
1.00E+06	5.00E-03	15	6,572	2.91E-02	1.19E+00	1.80E-04	1.05E-02	381.24
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	8.78E-03	381.24
1.00E+06	5.00E-03	15	11,495	5.50E-03	2.25E-01	1.80E-04	6.08E-03	381.24
1.00E+06	5.00E-03	15	7,384	3.71E-05	1.52E-03	1.80E-04	1.25E-02	381.24
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	381.24
1.00E+06	5.00E-03	15	9,994	7.43E-03	3.05E-01	1.80E-04	7.57E-03	381.24
1.00E+06	5.00E-03	15	8,979	4.92E-03	2.02E-01	1.80E-04	8.58E-03	381.24
1.00E+06	5.00E-03	15	10,245	4.88E-03	2.00E-01	1.80E-04	8.78E-03	381.24
1.00E+06	5.00E-03	15	9,410	1.74E-02	7.14E-01	1.80E-04	7.27E-03	381.24
1.00E+06	5.00E-03	15	8,244	5.32E-05	2.18E-03	1.80E-04	8.17E-03	381.24
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	381.24
1.00E+06	5.00E-03	15	9,673	1.30E-04	5.34E-03	1.80E-04	7.58E-03	381.24
1.00E+06	5.00E-03	15	4,578	8.57E-03	3.52E-01	1.80E-04	1.27E-02	381.24

Table B10-5: Site P-3A INTERCALCS

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)		(as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
					Chemical- and DATAENTER-Depth-Specific:						**Alpha values pasted in, from iterations:**
15	3.61E+03	1.25	8.33E+01	7.98E-03	5.00E+03	1.19E+09			Trichloroethy	4.5	1.080E-03
15	1.55E+01	1.25	8.33E+01	7.43E-03	5.00E+03	5.51E+09			cis-1,2-Dichlo	5.5	9.068E-04
15	1.33E+01	1.25	8.33E+01	6.12E-03	5.00E+03	6.78E+11			1,2,4-Trimeth	6.8	6.795E-04
15	2.02E+01	1.25	8.33E+01	8.88E-03	5.00E+03	1.40E+08			Benzene	6.8	8.772E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	6.8	#N/A
15	4.31E+01	1.25	8.33E+01	6.71E-03	5.00E+03	6.05E+10			Dichlorodifluo	6.8	7.261E-04
15	2.44E+02	1.25	8.33E+01	1.05E-02	5.00E+03	7.83E+06			Carbon disulf	9.5	7.735E-04
15	4.16E+01	1.25	8.33E+01	8.78E-03	5.00E+03	1.74E+08			Toluene	9.5	6.821E-04
15	6.41E+00	1.25	8.33E+01	6.08E-03	5.00E+03	8.12E+11			1,3,5-Trimeth	11.3	4.456E-04
15	3.10E+02	1.25	8.33E+01	1.25E-02	5.00E+03	5.89E+05			Acetone	11.3	7.711E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	11.3	#N/A
15	5.23E+01	1.25	8.33E+01	7.57E-03	5.00E+03	3.63E+09			Ethylbenzene	11.3	5.315E-04
15	2.18E+02	1.25	8.33E+01	8.58E-03	5.00E+03	2.72E+08			Xylenes	11.3	5.855E-04
15	1.35E+02	1.25	8.33E+01	8.78E-03	5.00E+03	1.74E+08			o-Xylene	11.3	5.959E-04
15	4.28E+01	1.25	8.33E+01	7.27E-03	5.00E+03	9.08E+09			Tetrachloroet	11.3	5.147E-04
15	9.17E+01	1.25	8.33E+01	8.17E-03	5.00E+03	7.19E+08	5.032E-04	4.61E-02	Methylethylke	13	5.032E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A	#N/A	#N/A	CAS No. not	13	#N/A
15	1.56E+01	1.25	8.33E+01	7.58E-03	5.00E+03	3.58E+09	4.735E-04	7.39E-03	Methylisobuty	13	4.735E-04
15	2.28E+00	1.25	8.33E+01	1.27E-02	5.00E+03	4.90E+05	7.031E-04	1.60E-03	Methyl chlorid	13	7.031E-04

Attachment B11

Site P-4A

Table B11-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR ($\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: ($\mu g/m^3$) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0311GS001NS	7/12/1996	5	Acetone	58.08	--	--	32	7.60E+01	1.286E-03	--	--	--
CP0311GS001NS	7/12/1996	5	Chloromethane	50.49	1.8E-06	HEAST	2.4	4.96E+00	1.294E-03	3.67E-08	7.33E-09	4.74E-09
CP0311GS001NS	7/12/1996	5	Ethyl Alcohol	46.07	--	--	160	3.01E+02	--	--	--	--
CP0794GS003NS	6/7/1999	11	n-Heptane	100.21	--	--	30	1.23E+02	--	--	--	--
CP0794GS003NS	6/7/1999	11	Hexane	86.18	--	--	1000	3.52E+03	1.059E-03	--	--	--
CP0794GS003NS	6/7/1999	11	Methylene Chloride	84.93	4.7E-07	IRIS	2.2	7.64E+00	6.798E-04	1.48E-08	2.95E-09	1.00E-09
CP0311GS001NS	7/12/1996	5	2-Propanol	60.1	--	--	8.3	2.04E+01	--	--	--	--
CP0311GS001NS	7/12/1996	5	Propylene	42.08	--	--	14	2.41E+01	--	--	--	--
CP0794GS003NS	6/7/1999	11	Toluene	92.14	--	--	84	3.17E+02	6.089E-04	--	--	--
CP0311GS001NS	7/12/1996	5	1,1,1-Trichloroethane	133.41	--	--	1.8	9.82E+00	1.002E-03	--	--	--
CP0559GS001NS	3/11/1997	7.5	Trichloroethene	131.39	2.0E-06	OEHHA	190	1.02E+03	7.609E-04	**8.39E-06**	**1.68E-06**	6.38E-07
CP0311GS001NS	7/12/1996	5	o-Xylene	106.17	--	--	1.6	6.95E+00	1.067E-03	--	--	--
CP0311GS001NS	7/12/1996	5	m- & p-Xylenes	106.17	--	--	3.4	1.48E+01	1.053E-03	--	--	--
									Cumulative Risk:	**8.4E-06**	**1.7E-06**	6.4E-07

"--" = data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:
HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\,atm}{R \times 298\,°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 ($\mu L/nL$)•(L/μL)•($\mu g/g$)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B11-3 through B11-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B11-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B11-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0311GS001NS	7/12/1996	5	Acetone	58.08	3.1E+04	ATSDR	32	7.60E+01	1.286E-03	2.35E-05	4.70E-06	3.02E-06
CP0311GS001NS	7/12/1996	5	Chloromethane	50.49	9.0E+01	IRIS	2.4	4.96E+00	1.294E-03	5.28E-04	1.06E-04	6.83E-05
CP0311GS001NS	7/12/1996	5	Ethyl Alcohol	46.07	--	--	160	3.01E+02	--	--	--	--
CP0794GS003NS	6/7/1999	11	n-Heptane	100.21	--	--	30	1.23E+02	--	--	--	--
CP0794GS003NS	6/7/1999	11	Hexane	86.18	7.0E+02	IRIS	1000	3.52E+03	1.059E-03	4.83E-02	9.66E-03	5.11E-03
CP0794GS003NS	6/7/1999	11	Methylene Chloride	84.93	4.0E+02	OEHHA	2.2	7.64E+00	6.798E-04	1.83E-04	3.66E-05	1.25E-05
CP0311GS001NS	7/12/1996	5	2-Propanol	60.1	7.0E+03	OEHHA	8.3	2.04E+01	--	2.79E-05	5.59E-06	--
CP0311GS001NS	7/12/1996	5	Propylene	42.08	3.0E+03	OEHHA	14	2.41E+01	--	7.70E-05	1.54E-05	--
CP0794GS003NS	6/7/1999	11	Toluene	92.14	5.0E+03	IRIS	84	3.17E+02	6.089E-04	6.07E-04	1.21E-04	3.70E-05
CP0311GS001NS	7/12/1996	5	1,1,1-Trichloroethane	133.41	5.0E+03	IRIS	1.8	9.82E+00	1.002E-03	1.88E-05	3.77E-06	1.89E-06
CP0559GS001NS	3/11/1997	7.5	Trichloroethene	131.39	6.0E+02	OEHHA	190	1.02E+03	7.609E-04	1.63E-02	3.26E-03	1.24E-03
CP0311GS001NS	7/12/1996	5	o-Xylene	106.17	1.0E+02	IRIS	1.6	6.95E+00	1.067E-03	6.66E-04	1.33E-04	7.11E-05
CP0311GS001NS	7/12/1996	5	m- & p-Xylenes	106.17	1.0E+02	IRIS	3.4	1.48E+01	1.053E-03	1.42E-03	2.83E-04	1.49E-04
									Hazard Index:	6.8E-02	1.4E-02	6.7E-03

"--" = data are not available

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL) (http://www.atsdr.cdc.gov/mrls/)

IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\,atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B11-3 through B11-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B11-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days/year \times 24\ hours/day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	µg/m^3
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	µg/m^3
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	µg/m^3

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

µg/m^3 = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-4A

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	71556			0.0018	1,1,1-Trichloroethane	5
2	67630			0.0083	CAS No. not found	5
3	67641			0.032	Acetone	5
4	74873			0.0024	Methyl chloride (chloromethane)	5
5	64175			0.16	CAS No. not found	5
6	1330207			0.0034	Xylenes	5
7	95476			0.0016	o-Xylene	5
8	115071			0.014	CAS No. not found	5
9	79016			0.19	Trichloroethylene	7.5
10	142825			0.03	CAS No. not found	11
11	110543			1	Hexane	11
12	75092			0.0022	Methylene chloride	11
13	108883			0.084	Toluene	11

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	335.28	24			1.00E-08

5 ft bgs = 152.4; 7.5 ft bgs = 228.6; 11 ft bgs = 335.28

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.62	0.387	0.103	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B11-4: Site P-4A CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
7.80E-02	8.80E-06	1.72E-02	25	7,136	347.24	545.00	0.0E+00	5.0E+00	133.40	1,1,1-Trichloroethane
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
1.24E-01	1.14E-05	3.87E-05	25	6,955	329.20	508.10	0.0E+00	3.1E+01	58.08	Acetone
1.26E-01	6.50E-06	8.80E-03	25	5,115	249.00	416.25	1.8E-06	9.0E-02	50.49	Methyl chloride (chloromethane)
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
8.50E-02	9.90E-06	5.18E-03	25	7,897	375.41	566.58	0.0E+00	7.0E-01	106.17	Xylenes
8.70E-02	1.00E-05	5.18E-03	25	8,661	417.60	630.30	0.0E+00	1.0E-01	106.17	o-Xylene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
2.00E-01	7.77E-06	1.66E+00	25	6,895	341.70	508.00	0.0E+00	7.0E-01	86.18	Hexane
1.01E-01	1.17E-05	2.18E-03	25	6,706	313.00	510.00	1.0E-06	4.0E-01	84.93	Methylene chloride
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene

END

Table B11-5: Site P-4A INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
320.28	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	9.85E+00	3.39E+04
320.28	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
320.28	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	7.62E+01	3.39E+04
320.28	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	4.97E+00	3.39E+04
320.28	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
320.28	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.48E+01	3.39E+04
320.28	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	6.97E+00	3.39E+04
320.28	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
320.28	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	1.02E+03	3.39E+04
320.28	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
320.28	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	3.53E+03	3.39E+04
320.28	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	7.66E+00	3.39E+04
320.28	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	3.17E+02	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	7,732	1.64E-02	6.73E-01	1.80E-04	7.87E-03	320.28
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	320.28
1.00E+06	5.00E-03	15	7,384	3.71E-05	1.52E-03	1.80E-04	1.25E-02	320.28
1.00E+06	5.00E-03	15	4,578	8.57E-03	3.52E-01	1.80E-04	1.27E-02	320.28
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	320.28
1.00E+06	5.00E-03	15	8,979	4.92E-03	2.02E-01	1.80E-04	8.58E-03	320.28
1.00E+06	5.00E-03	15	10,245	4.88E-03	2.00E-01	1.80E-04	8.78E-03	320.28
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	320.28
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	7.98E-03	320.28
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	320.28
1.00E+06	5.00E-03	15	7,549	1.59E+00	6.53E+01	1.80E-04	2.02E-02	320.28
1.00E+06	5.00E-03	15	6,884	2.10E-03	8.62E-02	1.80E-04	1.02E-02	320.28
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	8.78E-03	320.28

Chemical- and DATAENTER-Depth-Specific:

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	9.85E+00	1.25	8.33E+01	7.87E-03	5.00E+03	1.56E+09		
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A		
15	7.62E+01	1.25	8.33E+01	1.25E-02	5.00E+03	5.89E+05		
15	4.97E+00	1.25	8.33E+01	1.27E-02	5.00E+03	4.90E+05		
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A		
15	1.48E+01	1.25	8.33E+01	8.58E-03	5.00E+03	2.72E+08		
15	6.97E+00	1.25	8.33E+01	8.78E-03	5.00E+03	1.74E+08		
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A		
15	1.02E+03	1.25	8.33E+01	7.98E-03	5.00E+03	1.19E+09		
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A	#N/A	#N/A
15	3.53E+03	1.25	8.33E+01	2.02E-02	5.00E+03	3.84E+03	1.059E-03	3.74E+00
15	7.66E+00	1.25	8.33E+01	1.02E-02	5.00E+03	1.25E+07	6.798E-04	5.21E-03
15	3.17E+02	1.25	8.33E+01	8.78E-03	5.00E+03	1.74E+08	6.089E-04	1.93E-01

Alpha values pasted in, from iterations:

	(as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
1,1,1-Trichlor	5	1.002E-03
CAS No. not	5	#N/A
Acetone	5	1.286E-03
Methyl chlorid	5	1.294E-03
CAS No. not	5	#N/A
Xylenes	5	1.053E-03
o-Xylene	5	1.067E-03
CAS No. not	5	#N/A
Trichloroethy	7.5	7.609E-04
CAS No. not	11	#N/A
Hexane	11	1.059E-03
Methylene ch	11	6.798E-04
Toluene	11	6.089E-04

Attachment B12

Site P-4B

Table B12-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4B, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0822001NS	7/25/2000	6.5	Acetone	58.08	--	--	150	3.56E+02	8.379E-04	--	--	--
CP0831001NS	7/25/2000	6.5	Benzene	78.11	7.8E-06	IRIS	17	5.43E+01	6.549E-04	**1.74E-06**	3.48E-07	1.14E-07
CP0962GS001DS	11/1/2000	8.5	2-Butanone	72.11	--	--	79	2.33E+02	4.957E-04	--	--	--
CP0838001NS	7/25/2000	8.5	Carbon Disulfide	76.13	--	--	5.2	1.62E+01	5.988E-04	--	--	--
CP0831001FD	7/25/2000	6.5	Chloroform	119.38	2.3E-05	IRIS	13	6.35E+01	7.383E-04	**6.00E-06**	**1.20E-06**	4.43E-07
CP0822002NS	7/25/2000	8.5	Chloromethane	50.49	1.8E-06	HEAST	8	1.65E+01	6.899E-04	1.22E-07	2.44E-08	8.43E-09
CP0340GS001NS	7/16/1996	5	Cyclohexane	84.16	--	--	130	4.47E+02	--	--	--	--
CP0340GS001NS	7/16/1996	5	1,4-Dioxane	88.11	7.7E-06	OEHHA	40	1.44E+02	8.560E-04	**4.56E-06**	9.12E-07	3.90E-07
CP0342GS001NS	8/2/1996	6.5	Ethyl Alcohol	46.07	--	--	55	1.04E+02	--	--	--	--
CP0792GS001NS	6/8/1999	8.5	Ethylbenzene	106.17	2.5E-06	OEHHA	560	2.43E+03	4.633E-04	**2.50E-05**	**5.00E-06**	**1.16E-06**
CP0792GS001NS	6/8/1999	8.5	4-Ethyltoluene	120.2	--	--	28	1.38E+02	--	--	--	--
CP0792GS001NS	6/8/1999	8.5	n-Heptane	100.21	--	--	150	6.15E+02	--	--	--	--
CP0792GS001NS	6/8/1999	8.5	Hexane	86.18	--	--	1400	4.93E+03	9.401E-04	--	--	--
CP0792GS001NS	6/8/1999	8.5	Methyl Bromide	94.94	--	--	4.4	1.71E+01	4.522E-04	--	--	--
CP0831001FD	7/25/2000	6.5	Methylene Chloride	84.93	4.7E-07	IRIS	43	1.49E+02	7.233E-04	2.88E-07	5.77E-08	2.09E-08
CP0822003NS	7/25/2000	11.5	2-Propanol	60.1	--	--	110	2.70E+02	--	--	--	--
CP0822001NS	7/25/2000	6.5	Tetrachloroethene	165.83	5.9E-06	OEHHA	6	4.07E+01	5.631E-04	9.87E-07	1.97E-07	5.56E-08
CP0962GS001DS	11/1/2000	8.5	Tetrahydrofuran	72.11	--	--	67	1.98E+02	5.752E-04	--	--	--
CP0792GS001NS	6/8/1999	8.5	Toluene	92.14	--	--	110	4.14E+02	5.217E-04	--	--	--
CP0831001FD	7/25/2000	6.5	Trichloroethene	131.39	2.0E-06	OEHHA	2700	1.45E+04	6.044E-04	**1.19E-04**	**2.38E-05**	**7.21E-06**
CP0831001FD	7/25/2000	6.5	1,2,4-Trimethylbenzene	120.2	--	--	33	1.62E+02	4.918E-04	--	--	--
CP0555GS002NS	3/12/1997	10	1,3,5-Trimethylbenzene	120.2	--	--	3.9	1.92E+01	3.336E-04	--	--	--
CP0792GS001NS	6/8/1999	8.5	o-Xylene	106.17	--	--	720	3.13E+03	5.217E-04	--	--	--
CP0792GS001NS	6/8/1999	8.5	m- & p-Xylenes	106.17	--	--	2000	8.68E+03	5.122E-04	--	--	--
									Cumulative Risk:	**1.6E-04**	**3.2E-05**	**9.4E-06**

"--" = data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)

IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B12-3 through B12-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B12-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4B, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): $\alpha = 0.01$

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: $\alpha = 0.002$

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B12-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4B, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors RfC (µg/m^3)	Noncancer Toxicity Factors Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c] (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c] (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g] EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g] DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g] Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0822001NS	7/25/2000	6.5	Acetone	58.08	3.1E+04	ATSDR	150	3.56E+02	8.379E-04	1.10E-04	2.20E-05	9.23E-06
CP0831001NS	7/25/2000	6.5	Benzene	78.11	3.0E+01	IRIS	17	5.43E+01	6.549E-04	1.74E-02	3.47E-03	1.14E-03
CP0962GS001DS	11/1/2000	8.5	2-Butanone	72.11	5.0E+03	IRIS	79	2.33E+02	4.957E-04	4.47E-04	8.94E-05	2.21E-05
CP0838001NS	7/25/2000	8.5	Carbon Disulfide	76.13	7.0E+02	IRIS	5.2	1.62E+01	5.988E-04	2.22E-04	4.44E-05	1.33E-05
CP0831001FD	7/25/2000	6.5	Chloroform	119.38	3.0E+02	OEHHA	13	6.35E+01	7.383E-04	2.03E-03	4.06E-04	1.50E-04
CP0822002NS	7/25/2000	8.5	Chloromethane	50.49	9.0E+01	IRIS	8	1.65E+01	6.899E-04	1.76E-03	3.52E-04	1.21E-04
CP0340GS001NS	7/16/1996	5	Cyclohexane	84.16	6.0E+03	IRIS	130	4.47E+02	--	7.15E-04	1.43E-04	--
CP0340GS001NS	7/16/1996	5	1,4-Dioxane	88.11	3.0E+03	OEHHA	40	1.44E+02	8.560E-04	4.61E-04	9.21E-05	3.94E-05
CP0342GS001NS	8/2/1996	6.5	Ethyl Alcohol	46.07	--	--	55	1.04E+02	--	--	--	--
CP0792GS001NS	6/8/1999	8.5	Ethylbenzene	106.17	1.0E+03	IRIS	560	2.43E+03	4.633E-04	2.33E-02	4.66E-03	1.08E-03
CP0792GS001NS	6/8/1999	8.5	4-Ethyltoluene	120.2	--	--	28	1.38E+02	--	--	--	--
CP0792GS001NS	6/8/1999	8.5	n-Heptane	100.21	--	--	150	6.15E+02	--	--	--	--
CP0792GS001NS	6/8/1999	8.5	Hexane	86.18	7.0E+02	IRIS	1400	4.93E+03	9.401E-04	6.76E-02	1.35E-02	6.35E-03
CP0792GS001NS	6/8/1999	8.5	Methyl Bromide	94.94	5.0E+00	IRIS	4.4	1.71E+01	4.522E-04	3.28E-02	6.55E-03	1.48E-03
CP0831001FD	7/25/2000	6.5	Methylene Chloride	84.93	4.0E+02	OEHHA	43	1.49E+02	7.233E-04	3.58E-03	7.16E-04	2.59E-04
CP0822003NS	7/25/2000	11.5	2-Propanol	60.1	7.0E+03	OEHHA	110	2.70E+02	--	3.70E-04	7.41E-05	--
CP0822001NS	7/25/2000	6.5	Tetrachloroethene	165.83	3.5E+01	OEHHA	6	4.07E+01	5.631E-04	1.11E-02	2.23E-03	6.28E-04
CP0962GS001DS	11/1/2000	8.5	Tetrahydrofuran	72.11	3.5E+01	RIVM	67	1.98E+02	5.752E-04	5.41E-02	1.08E-02	3.11E-03
CP0792GS001NS	6/8/1999	8.5	Toluene	92.14	5.0E+03	IRIS	110	4.14E+02	5.217E-04	7.95E-04	1.59E-04	4.15E-05
CP0831001FD	7/25/2000	6.5	Trichloroethene	131.39	6.0E+02	OEHHA	2700	1.45E+04	6.044E-04	2.32E-01	4.64E-02	1.40E-02
CP0831001FD	7/25/2000	6.5	1,2,4-Trimethylbenzene	120.2	7.0E+00	PPRTV	33	1.62E+02	4.918E-04	2.22E-01	4.44E-02	1.09E-02
CP0555GS002NS	3/12/1997	10	1,3,5-Trimethylbenzene	120.2	6.0E+00	PPRTV	3.9	1.92E+01	3.336E-04	3.06E-02	6.13E-03	1.02E-03
CP0792GS001NS	6/8/1999	8.5	o-Xylene	106.17	1.0E+02	IRIS	720	3.13E+03	5.217E-04	3.00E-01	6.00E-02	1.56E-02
CP0792GS001NS	6/8/1999	8.5	m- & p-Xylenes	106.17	1.0E+02	IRIS	2000	8.68E+03	5.122E-04	8.33E-01	1.67E-01	4.26E-02
									Hazard Index:	**1.8E+00**	3.7E-01	9.9E-02

"--" = data are not available

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL) (http://www.atsdr.cdc.gov/mrls/)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)
PPRTV = Provisional Peer-Reviewed Reference Toxicity Value, as cited in EPA's Regional Screening Level (RSL) tables (http://www.epa.gov/region09/superfund/prg/)
RIVM = Provisional Tolerable Air Concentration (RIVM [Netherlands' National Institute for Public Health and the Environment] value in ITER/TOXNET database; http://toxnet.nlm.nih.gov/)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\,atm}{R \times 298\,°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B12-3 through B12-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B12-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4B, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m³)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m³) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days/year \times 24\ hours/day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	µg/m³
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	µg/m³
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	µg/m³

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

µg/m³ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-4B

Table B12-3: Site P-4B DATAENTER

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	123911			0.04	1,4-Dioxane	5
2	110827			0.13	CAS No. not found	5
3	95636			0.033	1,2,4-Trimethylbenzene	6.5
4	67641			0.15	Acetone	6.5
5	71432			0.017	Benzene	6.5
6	67663			0.013	Chloroform	6.5
7	64175			0.055	CAS No. not found	6.5
8	75092			0.043	Methylene chloride	6.5
9	127184			0.006	Tetrachloroethylene	6.5
10	79016			2.7	Trichloroethylene	6.5
11	622968			0.028	CAS No. not found	8.5
12	78933			0.079	Methylethylketone (2-butanone)	8.5
13	74839			0.0044	Methyl bromide	8.5
14	75150			0.0052	Carbon disulfide	8.5
15	74873			0.008	Methyl chloride (chloromethane)	8.5
16	100414			0.56	Ethylbenzene	8.5
17	142825			0.15	CAS No. not found	8.5
18	110543			1.4	Hexane	8.5
19	1330207			2	Xylenes	8.5
20	95476			0.72	o-Xylene	8.5
21	109999			0.067	Tetrahydrofuran	8.5
22	108883			0.11	Toluene	8.5
23	108678			0.0039	1,3,5-Trimethylbenzene	10
24	67630			0.11	CAS No. not found	11.5

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	304.8	24			1.00E-08

5 ft bgs = 152.4; 6.5 ft bgs = 198.12; 8.5 ft bgs = 259.08; 10 ft bgs = 304.8; 11.5 ft bgs = 350.52

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
L	1.59	0.399	0.148	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B12-4: Site P-4B CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
8.70E-02	1.10E-05	4.80E-06	25	8,164	374.30	587.20	7.7E-06	3.0E+03	88.11	1,4-Dioxane
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
6.06E-02	7.92E-06	6.14E-03	25	9,369	442.30	649.17	0.0E+00	7.0E-03	120.20	1,2,4-Trimethylbenzene
1.24E-01	1.14E-05	3.87E-05	25	6,955	329.20	508.10	0.0E+00	3.1E+01	58.08	Acetone
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	2.9E-05	3.0E-02	78.11	Benzene
1.04E-01	1.00E-05	3.66E-03	25	6,988	334.32	536.40	5.3E-06	3.0E-01	119.38	Chloroform
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
1.01E-01	1.17E-05	2.18E-03	25	6,706	313.00	510.00	1.0E-06	4.0E-01	84.93	Methylene chloride
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	3.5E-02	165.83	Tetrachloroethylene
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11	Methylethylketone (2-butanone)
7.28E-02	1.21E-05	6.22E-03	25	5,714	276.71	467.00	0.0E+00	5.0E-03	94.94	Methyl bromide
1.04E-01	1.00E-05	3.02E-02	25	6,391	319.00	552.00	0.0E+00	7.0E-01	76.13	Carbon disulfide
1.26E-01	6.50E-06	8.80E-03	25	5,115	249.00	416.25	1.8E-06	9.0E-02	50.49	Methyl chloride (chloromethane)
7.50E-02	7.80E-06	7.86E-03	25	8,501	409.34	617.20	2.5E-06	1.0E+00	106.17	Ethylbenzene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
2.00E-01	7.77E-06	1.66E+00	25	6,895	341.70	508.00	0.0E+00	7.0E-01	86.18	Hexane
8.50E-02	9.90E-06	5.18E-03	25	7,897	375.41	566.58	0.0E+00	7.0E-01	106.17	Xylenes
8.70E-02	1.00E-05	5.18E-03	25	8,661	417.60	630.30	0.0E+00	1.0E-01	106.17	o-Xylene
9.80E-02	1.05E-05	7.05E-05	25	7,125	339.00	540.43	0.0E+00	3.5E-02	72.11	Tetrahydrofuran
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene
6.02E-02	8.67E-06	5.87E-03	25	9,321	437.89	637.25	0.0E+00	6.0E-03	120.20	1,3,5-Trimethylbenzene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found

END

Table B12-5: Site P-4B INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.45E+02	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.63E+02	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	3.57E+02	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	5.45E+01	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	6.37E+01	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.50E+02	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	4.08E+01	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.46E+04	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	2.34E+02	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.71E+01	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.62E+01	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.66E+01	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	2.44E+03	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	4.95E+03	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	8.71E+03	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	3.14E+03	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.98E+02	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	4.16E+02	3.39E+04
289.8	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.92E+01	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	9,113	4.56E-06	1.87E-04	1.80E-04	6.11E-03	289.8
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	289.8
1.00E+06	5.00E-03	15	11,516	5.76E-03	2.36E-01	1.80E-04	3.81E-03	289.8
1.00E+06	5.00E-03	15	7,384	3.71E-05	1.52E-03	1.80E-04	7.89E-03	289.8
1.00E+06	5.00E-03	15	7,977	5.29E-03	2.17E-01	1.80E-04	5.54E-03	289.8
1.00E+06	5.00E-03	15	7,407	3.51E-03	1.44E-01	1.80E-04	6.55E-03	289.8
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	289.8
1.00E+06	5.00E-03	15	6,884	2.10E-03	8.62E-02	1.80E-04	6.36E-03	289.8
1.00E+06	5.00E-03	15	9,410	1.74E-02	7.14E-01	1.80E-04	4.53E-03	289.8
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	4.97E-03	289.8
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	289.8
1.00E+06	5.00E-03	15	8,244	5.32E-05	2.18E-03	1.80E-04	5.13E-03	289.8
1.00E+06	5.00E-03	15	5,508	6.03E-03	2.47E-01	1.80E-04	4.58E-03	289.8
1.00E+06	5.00E-03	15	6,572	2.91E-02	1.19E+00	1.80E-04	6.55E-03	289.8
1.00E+06	5.00E-03	15	4,578	8.57E-03	3.52E-01	1.80E-04	7.93E-03	289.8
1.00E+06	5.00E-03	15	9,994	7.43E-03	3.05E-01	1.80E-04	4.72E-03	289.8
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	289.8
1.00E+06	5.00E-03	15	7,549	1.59E+00	6.53E+01	1.80E-04	1.26E-02	289.8
1.00E+06	5.00E-03	15	8,979	4.92E-03	2.02E-01	1.80E-04	5.35E-03	289.8
1.00E+06	5.00E-03	15	10,245	4.88E-03	2.00E-01	1.80E-04	5.48E-03	289.8
1.00E+06	5.00E-03	15	7,609	6.75E-05	2.77E-03	1.80E-04	6.21E-03	289.8
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	5.48E-03	289.8
1.00E+06	5.00E-03	15	11,495	5.50E-03	2.25E-01	1.80E-04	3.79E-03	289.8

Table B12-5: Site P-4B INTERCALCS

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Chemical- and DATAENTER-Depth-Specific: Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)		Alpha values pasted in, from iterations: (as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
15	1.45E+02	1.25	8.33E+01	6.11E-03	5.00E+03	6.89E+11			1,4-Dioxane	5	8.560E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	5	#N/A
15	1.63E+02	1.25	8.33E+01	3.81E-03	5.00E+03	9.41E+18			1,2,4-Trimeth	6.5	4.918E-04
15	3.57E+02	1.25	8.33E+01	7.89E-03	5.00E+03	1.51E+09			Acetone	6.5	8.379E-04
15	5.45E+01	1.25	8.33E+01	5.54E-03	5.00E+03	1.16E+13			Benzene	6.5	6.549E-04
15	6.37E+01	1.25	8.33E+01	6.55E-03	5.00E+03	1.14E+11			Chloroform	6.5	7.383E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	6.5	#N/A
15	1.50E+02	1.25	8.33E+01	6.36E-03	5.00E+03	2.41E+11			Methylene ch	6.5	7.233E-04
15	4.08E+01	1.25	8.33E+01	4.53E-03	5.00E+03	9.35E+15			Tetrachloroet	6.5	5.631E-04
15	1.46E+04	1.25	8.33E+01	4.97E-03	5.00E+03	3.59E+14			Trichloroethy	6.5	6.044E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	8.5	#N/A
15	2.34E+02	1.25	8.33E+01	5.13E-03	5.00E+03	1.25E+14			Methylethylke	8.5	4.957E-04
15	1.71E+01	1.25	8.33E+01	4.58E-03	5.00E+03	6.22E+15			Methyl bromi	8.5	4.522E-04
15	1.62E+01	1.25	8.33E+01	6.55E-03	5.00E+03	1.14E+11			Carbon disulf	8.5	5.988E-04
15	1.66E+01	1.25	8.33E+01	7.93E-03	5.00E+03	1.34E+09			Methyl chlori	8.5	6.899E-04
15	2.44E+03	1.25	8.33E+01	4.72E-03	5.00E+03	2.14E+15			Ethylbenzene	8.5	4.633E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	8.5	#N/A
15	4.95E+03	1.25	8.33E+01	1.26E-02	5.00E+03	5.62E+05			Hexane	8.5	9.401E-04
15	8.71E+03	1.25	8.33E+01	5.35E-03	5.00E+03	3.37E+13			Xylenes	8.5	5.122E-04
15	3.14E+03	1.25	8.33E+01	5.48E-03	5.00E+03	1.64E+13			o-Xylene	8.5	5.217E-04
15	1.98E+02	1.25	8.33E+01	6.21E-03	5.00E+03	4.53E+11			Tetrahydrofu	8.5	5.752E-04
15	4.16E+02	1.25	8.33E+01	5.48E-03	5.00E+03	1.65E+13			Toluene	8.5	5.217E-04
15	1.92E+01	1.25	8.33E+01	3.79E-03	5.00E+03	1.26E+19	3.336E-04	6.41E-03	1,3,5-Trimeth	10	3.336E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A	#N/A	#N/A	CAS No. not	11.5	#N/A

Attachment B13

Site P-4C

Table B13-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4C, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0365GS003NS	7/16/1996	12.5	Acetone	58.08	--	--	91	2.16E+02	5.052E-04	--	--	--
CP0365GS003NS	7/16/1996	12.5	Benzene	78.11	7.8E-06	IRIS	3.3	1.05E+01	3.780E-04	3.38E-07	6.76E-08	1.28E-08
CP0365GS003NS	7/16/1996	12.5	2-Butanone	72.11	--	--	16	4.72E+01	3.543E-04	--	--	--
CP0365GS003NS	7/16/1996	12.5	Cyclohexane	84.16	--	--	350	1.20E+03	--	--	--	--
CP0365GS003NS	7/16/1996	12.5	1,4-Dichlorobenzene	147	1.1E-05	OEHHA	1.3	7.81E+00	3.066E-04	3.53E-07	7.07E-08	1.08E-08
CP0365GS003NS	7/16/1996	12.5	1,4-Dioxane	88.11	7.7E-06	OEHHA	11	3.96E+01	4.106E-04	**1.25E-06**	2.51E-07	5.15E-08
CP0365GS003NS	7/16/1996	12.5	Ethyl Alcohol	46.07	--	--	4.4	8.29E+00	--	--	--	--
CP0552GS002NS	3/12/1997	9.5	Ethylbenzene	106.17	2.5E-06	OEHHA	6.1	2.65E+01	4.206E-04	2.72E-07	5.44E-08	1.14E-08
CP0365GS003NS	7/16/1996	12.5	2-Propanol	60.1	--	--	9.2	2.26E+01	--	--	--	--
CP0552GS002NS	3/12/1997	9.5	Tetrachloroethene	165.83	5.9E-06	OEHHA	1.8	1.22E+01	4.066E-04	2.96E-07	5.92E-08	1.20E-08
CP0365GS003NS	7/16/1996	12.5	Toluene	92.14	--	--	6.1	2.30E+01	3.743E-04	--	--	--
CP0552GS002NS	3/12/1997	9.5	Trichloroethene	131.39	2.0E-06	OEHHA	5.8	3.12E+01	4.391E-04	2.56E-07	5.12E-08	1.12E-08
CP0552GS002NS	3/12/1997	9.5	1,2,4-Trimethylbenzene	120.2	--	--	2.7	1.33E+01	3.514E-04	--	--	--
CP0552GS002NS	3/12/1997	9.5	1,3,5-Trimethylbenzene	120.2	--	--	2	9.83E+00	3.494E-04	--	--	--
CP0552GS002NS	3/12/1997	9.5	o-Xylene	106.17	--	--	18	7.82E+01	4.749E-04	--	--	--
CP0552GS002NS	3/12/1997	9.5	m- & p-Xylenes	106.17	--	--	30	1.30E+02	4.661E-04	--	--	--
									Cumulative Risk:	**2.8E-06**	5.5E-07	1.1E-07

"--" = data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\,atm}{R \times 298\,°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B13-3 through B13-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B13-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4C, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B13-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4C, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors RfC (µg/m^3)	Noncancer Toxicity Factors Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c] (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c] (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g] EPA Screening [h]	DTSC Screening [i]	Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0365GS003NS	7/16/1996	12.5	Acetone	58.08	3.1E+04	ATSDR	91	2.16E+02	5.052E-04	6.69E-05	1.34E-05	3.38E-06
CP0365GS003NS	7/16/1996	12.5	Benzene	78.11	3.0E+01	IRIS	3.3	1.05E+01	3.780E-04	3.37E-03	6.74E-04	1.27E-04
CP0365GS003NS	7/16/1996	12.5	2-Butanone	72.11	5.0E+03	IRIS	16	4.72E+01	3.543E-04	9.05E-05	1.81E-05	3.21E-06
CP0365GS003NS	7/16/1996	12.5	Cyclohexane	84.16	6.0E+03	IRIS	350	1.20E+03	--	1.93E-03	3.85E-04	--
CP0365GS003NS	7/16/1996	12.5	1,4-Dichlorobenzene	147	8.0E+02	IRIS	1.3	7.81E+00	3.066E-04	9.37E-05	1.87E-05	2.87E-06
CP0365GS003NS	7/16/1996	12.5	1,4-Dioxane	88.11	3.0E+03	OEHHA	11	3.96E+01	4.106E-04	1.27E-04	2.53E-05	5.20E-06
CP0365GS003NS	7/16/1996	12.5	Ethyl Alcohol	46.07	--	--	4.4	8.29E+00	--	--	--	--
CP0552GS002NS	3/12/1997	9.5	Ethylbenzene	106.17	1.0E+03	IRIS	6.1	2.65E+01	4.206E-04	2.54E-04	5.08E-05	1.07E-05
CP0365GS003NS	7/16/1996	12.5	2-Propanol	60.1	7.0E+03	OEHHA	9.2	2.26E+01	--	3.10E-05	6.19E-06	--
CP0552GS002NS	3/12/1997	9.5	Tetrachloroethene	165.83	3.5E+01	OEHHA	1.8	1.22E+01	4.066E-04	3.34E-03	6.69E-04	1.36E-04
CP0365GS003NS	7/16/1996	12.5	Toluene	92.14	5.0E+03	IRIS	6.1	2.30E+01	3.743E-04	4.41E-05	8.82E-06	1.65E-06
CP0552GS002NS	3/12/1997	9.5	Trichloroethene	131.39	6.0E+02	OEHHA	5.8	3.12E+01	4.391E-04	4.98E-04	9.96E-05	2.19E-05
CP0552GS002NS	3/12/1997	9.5	1,2,4-Trimethylbenzene	120.2	7.0E+00	PPRTV	2.7	1.33E+01	3.514E-04	1.82E-02	3.64E-03	6.39E-04
CP0552GS002NS	3/12/1997	9.5	1,3,5-Trimethylbenzene	120.2	6.0E+00	PPRTV	2	9.83E+00	3.494E-04	1.57E-02	3.14E-03	5.49E-04
CP0552GS002NS	3/12/1997	9.5	o-Xylene	106.17	1.0E+02	IRIS	18	7.82E+01	4.749E-04	7.49E-03	1.50E-03	3.56E-04
CP0552GS002NS	3/12/1997	9.5	m- & p-Xylenes	106.17	1.0E+02	IRIS	30	1.30E+02	4.661E-04	1.25E-02	2.50E-03	5.82E-04
									Hazard Index:	6.4E-02	1.3E-02	2.4E-03

"--" = data are not available

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL) (http://www.atsdr.cdc.gov/mrls/)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)
PPRTV = Provisional Peer-Reviewed Reference Toxicity Value, as cited in EPA's Regional Screening Level (RSL) tables (http://www.epa.gov/region09/superfund/prg/)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\,atm}{R \times 298\,°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B13-3 through B13-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B13-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-4C, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days/year \times 24\ hours/day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	µg/m^3
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	µg/m^3
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	µg/m^3

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

µg/m^3 = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-4C

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	95636			0.0027	1,2,4-Trimethylbenzene	9.5
2	108678			0.002	1,3,5-Trimethylbenzene	9.5
3	100414			0.0061	Ethylbenzene	9.5
4	1330207			0.03	Xylenes	9.5
5	95476			0.018	o-Xylene	9.5
6	127184			0.0018	Tetrachloroethylene	9.5
7	79016			0.0058	Trichloroethylene	9.5
8	106467			0.0013	1,4-Dichlorobenzene	12.5
9	123911			0.011	1,4-Dioxane	12.5
10	78933			0.016	Methylethylketone (2-butanone)	12.5
11	67630			0.0092	CAS No. not found	12.5
12	67641			0.091	Acetone	12.5
13	71432			0.0033	Benzene	12.5
14	110827			0.35	CAS No. not found	12.5
15	64175			0.0044	CAS No. not found	12.5
16	108883			0.0061	Toluene	12.5

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	381	24			1.00E-08

9.5 ft bgs = 289.56; 12.5 ft bgs = 381

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
L	1.59	0.399	0.148	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B13-4: Site P-4C CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
6.06E-02	7.92E-06	6.14E-03	25	9,369	442.30	649.17	0.0E+00	7.0E-03	120.20	1,2,4-Trimethylbenzene
6.02E-02	8.67E-06	5.87E-03	25	9,321	437.89	637.25	0.0E+00	6.0E-03	120.20	1,3,5-Trimethylbenzene
7.50E-02	7.80E-06	7.86E-03	25	8,501	409.34	617.20	2.5E-06	1.0E+00	106.17	Ethylbenzene
8.50E-02	9.90E-06	5.18E-03	25	7,897	375.41	566.58	0.0E+00	7.0E-01	106.17	Xylenes
8.70E-02	1.00E-05	5.18E-03	25	8,661	417.60	630.30	0.0E+00	1.0E-01	106.17	o-Xylene
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	3.5E-02	165.83	Tetrachloroethylene
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
6.90E-02	7.90E-06	2.39E-03	25	9,271	447.21	684.75	1.1E-05	8.0E-01	147.00	1,4-Dichlorobenzene
8.70E-02	1.10E-05	4.80E-06	25	8,164	374.30	587.20	7.7E-06	3.0E+03	88.11	1,4-Dioxane
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11	Methylethylketone (2-butanone)
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
1.24E-01	1.14E-05	3.87E-05	25	6,955	329.20	508.10	0.0E+00	3.1E+01	58.08	Acetone
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	2.9E-05	3.0E-02	78.11	Benzene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene

END

Table B13-5: Site P-4C INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.33E+01	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	9.86E+00	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	2.66E+01	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.31E+02	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	7.84E+01	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.22E+01	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	3.13E+01	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	7.84E+00	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	3.98E+01	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	4.73E+01	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	2.17E+02	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.06E+01	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
366	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	2.31E+01	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	11,516	5.76E-03	2.36E-01	1.80E-04	3.81E-03	366
1.00E+06	5.00E-03	15	11,495	5.50E-03	2.25E-01	1.80E-04	3.79E-03	366
1.00E+06	5.00E-03	15	9,994	7.43E-03	3.05E-01	1.80E-04	4.72E-03	366
1.00E+06	5.00E-03	15	8,979	4.92E-03	2.02E-01	1.80E-04	5.35E-03	366
1.00E+06	5.00E-03	15	10,245	4.88E-03	2.00E-01	1.80E-04	5.48E-03	366
1.00E+06	5.00E-03	15	9,410	1.74E-02	7.14E-01	1.80E-04	4.53E-03	366
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	4.97E-03	366
1.00E+06	5.00E-03	15	11,098	2.25E-03	9.22E-02	1.80E-04	4.34E-03	366
1.00E+06	5.00E-03	15	9,113	4.56E-06	1.87E-04	1.80E-04	6.11E-03	366
1.00E+06	5.00E-03	15	8,244	5.32E-05	2.18E-03	1.80E-04	5.13E-03	366
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	366
1.00E+06	5.00E-03	15	7,384	3.71E-05	1.52E-03	1.80E-04	7.89E-03	366
1.00E+06	5.00E-03	15	7,977	5.29E-03	2.17E-01	1.80E-04	5.54E-03	366
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	366
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	366
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	5.48E-03	366

Chemical- and DATAENTER-Depth-Specific:

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	1.33E+01	1.25	8.33E+01	3.81E-03	5.00E+03	9.41E+18		
15	9.86E+00	1.25	8.33E+01	3.79E-03	5.00E+03	1.26E+19		
15	2.66E+01	1.25	8.33E+01	4.72E-03	5.00E+03	2.14E+15		
15	1.31E+02	1.25	8.33E+01	5.35E-03	5.00E+03	3.37E+13		
15	7.84E+01	1.25	8.33E+01	5.48E-03	5.00E+03	1.64E+13		
15	1.22E+01	1.25	8.33E+01	4.53E-03	5.00E+03	9.35E+15		
15	3.13E+01	1.25	8.33E+01	4.97E-03	5.00E+03	3.59E+14		
15	7.84E+00	1.25	8.33E+01	4.34E-03	5.00E+03	4.59E+16	3.066E-04	2.40E-03
15	3.98E+01	1.25	8.33E+01	6.11E-03	5.00E+03	6.89E+11	4.106E-04	1.63E-02
15	4.73E+01	1.25	8.33E+01	5.13E-03	5.00E+03	1.25E+14	3.543E-04	1.68E-02
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A	#N/A	#N/A
15	2.17E+02	1.25	8.33E+01	7.89E-03	5.00E+03	1.51E+09	5.052E-04	1.10E-01
15	1.06E+01	1.25	8.33E+01	5.54E-03	5.00E+03	1.16E+13	3.780E-04	4.00E-03
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A	#N/A	#N/A
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A	#N/A	#N/A
15	2.31E+01	1.25	8.33E+01	5.48E-03	5.00E+03	1.65E+13	3.743E-04	8.63E-03

Alpha values pasted in, from iterations:

	(as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
1,2,4-Trimeth	9.5	3.514E-04
1,3,5-Trimeth	9.5	3.494E-04
Ethylbenzene	9.5	4.206E-04
Xylenes	9.5	4.661E-04
o-Xylene	9.5	4.749E-04
Tetrachloroet	9.5	4.066E-04
Trichloroethyl	9.5	4.391E-04
1,4-Dichlorob	12.5	3.066E-04
1,4-Dioxane	12.5	4.106E-04
Methylethylke	12.5	3.543E-04
CAS No. not	12.5	#N/A
Acetone	12.5	5.052E-04
Benzene	12.5	3.780E-04
CAS No. not	12.5	#N/A
CAS No. not	12.5	#N/A
Toluene	12.5	3.743E-04

Attachment B14

Site P-5A

Table B14-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-5A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
SB1108GS002NS	7/7/2006	10.5	Butane	58.12	--	--	430	1.02E+03	--	--	--	--
SB1108GS002NS	7/7/2006	10.5	1-Butene	56.11	--	--	5	1.15E+01	--	--	--	--
SB1108GS002NS	7/7/2006	10.5	Isobutane	58.12	--	--	2400	5.70E+03	--	--	--	--
SB1108GS002NS	7/7/2006	10.5	Propane	44.1	--	--	430	7.75E+02	--	--	--	--
SB1108GS002NS	7/7/2006	10.5	Propylene	42.08	--	--	16	2.75E+01	--	--	--	--
CP1145GS001NS	11/7/2007	5	Trichloroethene	131.39	2.0E-06	OEHHA	6600	3.55E+04	1.010E-03	**2.91E-04**	**5.83E-05**	**2.94E-05**
									Cumulative Risk:	**2.9E-04**	**5.8E-05**	**2.9E-05**

"--" = data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298\,°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B14-3 through B14-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B14-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-5A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B14-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-5A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
SB1108GS002NS	7/7/2006	10.5	Butane	58.12	--	--	430	1.02E+03	--	--	--	--
SB1108GS002NS	7/7/2006	10.5	1-Butene	56.11	--	--	5	1.15E+01	--	--	--	--
SB1108GS002NS	7/7/2006	10.5	Isobutane	58.12	--	--	2400	5.70E+03	--	--	--	--
SB1108GS002NS	7/7/2006	10.5	Propane	44.1	--	--	430	7.75E+02	--	--	--	--
SB1108GS002NS	7/7/2006	10.5	Propylene	42.08	3.0E+03	OEHHA	16	2.75E+01	--	8.80E-05	1.76E-05	--
CP1145GS001NS	11/7/2007	5	Trichloroethene	131.39	6.0E+02	OEHHA	6600	3.55E+04	1.010E-03	5.67E-01	1.13E-01	5.72E-02
									Hazard Index:	5.7E-01	1.1E-01	5.7E-02

"--" = data are not available

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\,atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B14-3 through B14-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B14-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-5A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days/year \times 24\ hours/day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	µg/m^3
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	µg/m^3
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	µg/m^3

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

µg/m^3 = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-5A

Table B14-3: Site P-5A DATAENTER

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	79016			6.6	Trichloroethylene	5
2	106989			0.005	CAS No. not found	10.5
3	106978			0.43	CAS No. not found	10.5
4	75285			2.4	CAS No. not found	10.5
5	74986			0.43	CAS No. not found	10.5
6	115071			0.016	CAS No. not found	10.5

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152.4	24			1.00E-08

5 ft bgs = 152.4; 10.5 ft bgs = 320.04

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.62	0.387	0.103	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B14-4: Site P-5A CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found

END

Table B14-5: Site P-5A INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
137.4	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	3.56E+04	3.39E+04
137.4	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
137.4	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
137.4	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
137.4	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
137.4	0.284	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	7.98E-03	137.4
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	137.4
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	137.4
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	137.4
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	137.4
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	137.4

Chemical- and DATAENTER-Depth-Specific:

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)		(as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
15	3.56E+04	1.25	8.33E+01	7.98E-03	5.00E+03	1.19E+09	1.010E-03	3.59E+01	Trichloroethy	5	1.010E-03
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A	#N/A	#N/A	CAS No. not	10.5	#N/A
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A	#N/A	#N/A	CAS No. not	10.5	#N/A
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A	#N/A	#N/A	CAS No. not	10.5	#N/A
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A	#N/A	#N/A	CAS No. not	10.5	#N/A
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A	#N/A	#N/A	CAS No. not	10.5	#N/A

Alpha values pasted in, from iterations:

Attachment B15

Site P-6A

Table B15-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-6A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors IUR ($\mu g/m^3)^{-1}$	Cancer Toxicity Factors Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c] (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c] ($\mu g/m^3$) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g] EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g] DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g] Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP1024GS001NS	1/9/2002	12.3	Acetone	58.08	--	--	26	6.18E+01	5.120E-04	--	--	--
CP0840GS001DS	12/21/2000	6.5	Benzene	78.11	7.8E-06	IRIS	0.9	2.87E+00	6.549E-04	9.22E-08	1.84E-08	6.04E-09
CP0840GS001DS	12/21/2000	6.5	2-Butanone	72.11	--	--	6.4	1.89E+01	6.191E-04	--	--	--
CP0840GS001DS	12/21/2000	6.5	Carbon Disulfide	76.13	--	--	0.64	1.99E+00	7.382E-04	--	--	--
CP0840GS001DS	12/21/2000	6.5	Chloromethane	50.49	1.8E-06	HEAST	0.49	1.01E+00	8.410E-04	7.48E-09	1.50E-09	6.29E-10
CP0840GS001DS	12/21/2000	6.5	Methyl tert-Butyl Ether	88.15	2.6E-07	OEHHA	1.3	4.69E+00	7.306E-04	5.01E-09	1.00E-09	3.66E-10
CP0840GS001DS	12/21/2000	6.5	Ethylbenzene	106.17	2.5E-06	OEHHA	0.41	1.78E+00	5.810E-04	1.83E-08	3.66E-09	1.06E-09
CP0840GS001DS	12/21/2000	6.5	Methyl Bromide	94.94	--	--	0.29	1.13E+00	5.680E-04	--	--	--
CP0939GS001FD	1/9/2002	9.5	Toluene	92.14	--	--	830	3.13E+03	4.749E-04	--	--	--
VEW6A9GS001NS	12/20/2000	5	Trichloroethene	131.39	2.0E-06	OEHHA	280	1.50E+03	7.446E-04	**1.24E-05**	**2.47E-06**	9.21E-07
CP0840GS001DS	12/21/2000	6.5	Trichlorofluoromethane	137.37	--	--	0.22	1.24E+00	6.494E-04	--	--	--
CP0840GS001DS	12/21/2000	6.5	o-Xylene	106.17	--	--	0.52	2.26E+00	6.495E-04	--	--	--
CP0840GS001DS	12/21/2000	6.5	m- & p-Xylenes	106.17	--	--	1.4	6.08E+00	6.384E-04	--	--	--
									Cumulative Risk:	**1.2E-05**	**2.5E-06**	9.3E-07

"--" = toxicity data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:
HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298\,°K}$$

where:
$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 ($\mu L/nL$)•($L/\mu L$)•($\mu g/g$)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B15-3 through B15-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

Table B15-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-6A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ \ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ \ air} = C_{soil\ \ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): $\alpha = 0.01$

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: $\alpha = 0.002$

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B15-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-6A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP1024GS001NS	1/9/2002	12.3	Acetone	58.08	3.1E+04	ATSDR	26	6.18E+01	5.120E-04	1.91E-05	3.82E-06	9.78E-07
CP0840GS001DS	12/21/2000	6.5	Benzene	78.11	3.0E+01	IRIS	0.9	2.87E+00	6.549E-04	9.19E-04	1.84E-04	6.02E-05
CP0840GS001DS	12/21/2000	6.5	2-Butanone	72.11	5.0E+03	IRIS	6.4	1.89E+01	6.191E-04	3.62E-05	7.24E-06	2.24E-06
CP0840GS001DS	12/21/2000	6.5	Carbon Disulfide	76.13	7.0E+02	IRIS	0.64	1.99E+00	7.382E-04	2.73E-05	5.46E-06	2.01E-06
CP0840GS001DS	12/21/2000	6.5	Chloromethane	50.49	9.0E+01	IRIS	0.49	1.01E+00	8.410E-04	1.08E-04	2.16E-05	9.07E-06
CP0840GS001DS	12/21/2000	6.5	Methyl tert-Butyl Ether	88.15	3.0E+03	IRIS	1.3	4.69E+00	7.306E-04	1.50E-05	3.00E-06	1.09E-06
CP0840GS001DS	12/21/2000	6.5	Ethylbenzene	106.17	1.0E+03	IRIS	0.41	1.78E+00	5.810E-04	1.71E-05	3.41E-06	9.92E-07
CP0840GS001DS	12/21/2000	6.5	Methyl Bromide	94.94	5.0E+00	IRIS	0.29	1.13E+00	5.680E-04	2.16E-03	4.32E-04	1.23E-04
CP0939GS001FD	1/9/2002	9.5	Toluene	92.14	5.0E+03	IRIS	830	3.13E+03	4.749E-04	6.00E-03	1.20E-03	2.85E-04
VEW6A9GS001NS	12/20/2000	5	Trichloroethene	131.39	6.0E+02	OEHHA	280	1.50E+03	7.446E-04	2.40E-02	4.81E-03	1.79E-03
CP0840GS001DS	12/21/2000	6.5	Trichlorofluoromethane	137.37	7.0E+02	HEAST	0.22	1.24E+00	6.494E-04	1.69E-05	3.39E-06	1.10E-06
CP0840GS001DS	12/21/2000	6.5	o-Xylene	106.17	1.0E+02	IRIS	0.52	2.26E+00	6.495E-04	2.16E-04	4.33E-05	1.41E-05
CP0840GS001DS	12/21/2000	6.5	m- & p-Xylenes	106.17	1.0E+02	IRIS	1.4	6.08E+00	6.384E-04	5.83E-04	1.17E-04	3.72E-05
									Hazard Index:	3.4E-02	6.8E-03	2.3E-03

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL) (http://www.atsdr.cdc.gov/mrls/)
HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value (µg/m^3)
$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)
CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)
MW [molecular weight] = chemical-specific g/mole
R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B15-3 through B15-5).

[f] **Bold** values indicate a hazard estimate >1.

Table B15-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-6A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	µg/m^3
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	µg/m^3
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	µg/m^3

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

µg/m^3 = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-6A

Table B15-3: Site P-6A DATAENTER

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

	ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	79016			0.28	Trichloroethylene	5
2	78933			0.0064	Methylethylketone (2-butanone)	6.5
3	71432			0.0009	Benzene	6.5
4	74839			0.00029	Methyl bromide	6.5
5	75150			0.00064	Carbon disulfide	6.5
6	74873			0.00049	Methyl chloride (chloromethane)	6.5
7	100414			0.00041	Ethylbenzene	6.5
8	1330207			0.0014	Xylenes	6.5
9	95476			0.00052	o-Xylene	6.5
10	1634044			0.0013	MTBE	6.5
11	75694			0.00022	Trichlorofluoromethane	6.5
12	108883			0.83	Toluene	9.5
13	67641			0.026	Acetone	12.3

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	374.9	24			1.00E-08

5 ft bgs = 152.4; 6.5 ft bgs = 198.12; 9.5 ft bgs = 289.56; 12.3 ft bgs = 374.90

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
L	1.59	0.399	0.148	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B15-4: Site P-6A CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11	Methylethylketone (2-butanone)
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	2.9E-05	3.0E-02	78.11	Benzene
7.28E-02	1.21E-05	6.22E-03	25	5,714	276.71	467.00	0.0E+00	5.0E-03	94.94	Methyl bromide
1.04E-01	1.00E-05	3.02E-02	25	6,391	319.00	552.00	0.0E+00	7.0E-01	76.13	Carbon disulfide
1.26E-01	6.50E-06	8.80E-03	25	5,115	249.00	416.25	1.8E-06	9.0E-02	50.49	Methyl chloride (chloromethane)
7.50E-02	7.80E-06	7.86E-03	25	8,501	409.34	617.20	2.5E-06	1.0E+00	106.17	Ethylbenzene
8.50E-02	9.90E-06	5.18E-03	25	7,897	375.41	566.58	0.0E+00	7.0E-01	106.17	Xylenes
8.70E-02	1.00E-05	5.18E-03	25	8,661	417.60	630.30	0.0E+00	1.0E-01	106.17	o-Xylene
1.02E-01	1.05E-05	6.23E-04	25	6,678	328.30	497.10	2.6E-07	3.0E+00	88.15	MTBE
8.70E-02	9.70E-06	9.68E-02	25	5,999	296.70	471.00	0.0E+00	7.0E-01	137.36	Trichlorofluoromethane
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene
1.24E-01	1.14E-05	3.87E-05	25	6,955	329.20	508.10	0.0E+00	3.1E+01	58.08	Acetone

END

Table B15-5: Site P-6A INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
359.9	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.51E+03	3.39E+04
359.9	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.89E+01	3.39E+04
359.9	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	2.88E+00	3.39E+04
359.9	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.13E+00	3.39E+04
359.9	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	2.00E+00	3.39E+04
359.9	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.01E+00	3.39E+04
359.9	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.79E+00	3.39E+04
359.9	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	6.10E+00	3.39E+04
359.9	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	2.26E+00	3.39E+04
359.9	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	4.70E+00	3.39E+04
359.9	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	1.24E+00	3.39E+04
359.9	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	3.14E+03	3.39E+04
359.9	0.251	#N/A	#N/A	#N/A	1.00E-08	4,000	6.19E+01	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	4.97E-03	359.9
1.00E+06	5.00E-03	15	8,244	5.32E-05	2.18E-03	1.80E-04	5.13E-03	359.9
1.00E+06	5.00E-03	15	7,977	5.29E-03	2.17E-01	1.80E-04	5.54E-03	359.9
1.00E+06	5.00E-03	15	5,508	6.03E-03	2.47E-01	1.80E-04	4.58E-03	359.9
1.00E+06	5.00E-03	15	6,572	2.91E-02	1.19E+00	1.80E-04	6.55E-03	359.9
1.00E+06	5.00E-03	15	4,578	8.57E-03	3.52E-01	1.80E-04	7.93E-03	359.9
1.00E+06	5.00E-03	15	9,994	7.43E-03	3.05E-01	1.80E-04	4.72E-03	359.9
1.00E+06	5.00E-03	15	8,979	4.92E-03	2.02E-01	1.80E-04	5.35E-03	359.9
1.00E+06	5.00E-03	15	10,245	4.88E-03	2.00E-01	1.80E-04	5.48E-03	359.9
1.00E+06	5.00E-03	15	7,113	5.99E-04	2.46E-02	1.80E-04	6.45E-03	359.9
1.00E+06	5.00E-03	15	5,993	9.35E-02	3.84E+00	1.80E-04	5.48E-03	359.9
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	5.48E-03	359.9
1.00E+06	5.00E-03	15	7,384	3.71E-05	1.52E-03	1.80E-04	7.89E-03	359.9

Chemical- and DATAENTER-Depth-Specific:

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	1.51E+03	1.25	8.33E+01	4.97E-03	5.00E+03	3.59E+14		
15	1.89E+01	1.25	8.33E+01	5.13E-03	5.00E+03	1.25E+14		
15	2.88E+00	1.25	8.33E+01	5.54E-03	5.00E+03	1.16E+13		
15	1.13E+00	1.25	8.33E+01	4.58E-03	5.00E+03	6.22E+15		
15	2.00E+00	1.25	8.33E+01	6.55E-03	5.00E+03	1.14E+11		
15	1.01E+00	1.25	8.33E+01	7.93E-03	5.00E+03	1.34E+09		
15	1.79E+00	1.25	8.33E+01	4.72E-03	5.00E+03	2.14E+15		
15	6.10E+00	1.25	8.33E+01	5.35E-03	5.00E+03	3.37E+13		
15	2.26E+00	1.25	8.33E+01	5.48E-03	5.00E+03	1.64E+13		
15	4.70E+00	1.25	8.33E+01	6.45E-03	5.00E+03	1.67E+11		
15	1.24E+00	1.25	8.33E+01	5.48E-03	5.00E+03	1.65E+13		
15	3.14E+03	1.25	8.33E+01	5.48E-03	5.00E+03	1.65E+13		
15	6.19E+01	1.25	8.33E+01	7.89E-03	5.00E+03	1.51E+09	5.120E-04	3.17E-02

Alpha values pasted in, from iterations:

	(as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
Trichloroethy	5	7.446E-04
Methylethylke	6.5	6.191E-04
Benzene	6.5	6.549E-04
Methyl bromi	6.5	5.680E-04
Carbon disulf	6.5	7.382E-04
Methyl chlori	6.5	8.410E-04
Ethylbenzene	6.5	5.810E-04
Xylenes	6.5	6.384E-04
o-Xylene	6.5	6.495E-04
MTBE	6.5	7.306E-04
Trichlorofluor	6.5	6.494E-04
Toluene	9.5	4.749E-04
Acetone	12.3	5.120E-04

Attachment B16

Site P-8A

Table B16-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-8A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c] (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c] $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g] EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g] DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g] Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0797GS002NS	6/8/1999	10.9	Acetone	58.08	--	--	74	1.76E+02	5.313E-04	--	--	--
CP0797GS002NS	6/8/1999	10.9	Benzene	78.11	7.8E-06	IRIS	6.8	2.17E+01	3.964E-04	6.96E-07	1.39E-07	2.76E-08
CP0797GS002NS	6/8/1999	10.9	2-Butanone	72.11	--	--	28	8.26E+01	3.740E-04	--	--	--
SA15CPT9-2	10/13/1995	13	Carbon tetrachloride	153.82	1.5E-05	IRIS	13	8.18E+01	3.053E-04	**5.04E-06**	**1.01E-06**	1.54E-07
SA15CPT1-2	10/11/1995	11	Chloroethane	64.52	--	--	15	3.96E+01	9.087E-04	--	--	--
SA15CPT9-2	10/13/1995	13	Chloroform	119.38	2.3E-05	IRIS	9.6	4.69E+01	3.909E-04	**4.43E-06**	8.86E-07	1.73E-07
SA15CPT1-1	10/11/1995	5.5	Chloromethane	50.49	1.8E-06	HEAST	2.3	4.75E+00	8.946E-04	3.51E-08	7.03E-09	3.14E-09
CP0461GS003NS	7/12/1996	19	Cyclohexane	84.16	--	--	530	1.82E+03	--	--	--	--
SA15CPT10-2	10/13/1995	12	1,2-Dichlorobenzene	147	--	--	3	1.80E+01	2.950E-04	--	--	--
SA15CPT10-2	10/13/1995	12	1,3-Dichlorobenzene	147	--	--	1.8	1.08E+01	2.957E-04	--	--	--
CP0461GS003NS	7/12/1996	19	1,4-Dichlorobenzene	147	1.1E-05	OEHHA	6	3.61E+01	1.921E-04	**1.63E-06**	3.26E-07	3.13E-08
SA15CPT11-1	10/13/1995	6	Dichlorodifluoromethane	120.91	--	--	2.7	1.34E+01	5.294E-04	--	--	--
SA15CPT12-1	10/12/1995	6	1,1-Dichloroethene	96.94	--	--	2.1	8.33E+00	6.659E-04	--	--	--
SA15CPT4-4	10/11/1995	20.5	cis-1,2-Dichloroethene	96.94	--	--	6.6	2.62E+01	1.898E-04	--	--	--
CP0797GS002NS	6/8/1999	10.9	Ethyl Alcohol	46.07	--	--	30	5.65E+01	--	--	--	--
SA15CPT5-1	10/12/1995	6	Ethylbenzene	106.17	2.5E-06	OEHHA	30	1.30E+02	5.811E-04	**1.34E-06**	2.68E-07	7.78E-08
CP0797GS002NS	6/8/1999	10.9	n-Heptane	100.21	--	--	31	1.27E+02	--	--	--	--
CP0797GS002NS	6/8/1999	10.9	Hexane	86.18	--	--	2700	9.52E+03	7.475E-04	--	--	--
SA15CPT4-1	10/11/1995	6	Methyl Bromide	94.94	--	--	3.2	1.24E+01	5.681E-04	--	--	--
SA15CPT10-1	10/13/1995	6	Methylene Chloride	84.93	4.7E-07	IRIS	16	5.56E+01	7.235E-04	1.07E-07	2.15E-08	7.77E-09
SA15CPT10-2	10/13/1995	12	Styrene	104.15	--	--	2.1	8.94E+00	3.025E-04	--	--	--
CP0564GS001NS	3/12/1997	7	Tetrachloroethene	165.83	5.9E-06	OEHHA	7.1	4.81E+01	4.941E-04	**1.17E-06**	2.33E-07	5.77E-08
CP0797GS002NS	6/8/1999	10.9	Toluene	92.14	--	--	250	9.42E+02	3.926E-04	--	--	--
SA15CPT7-1	10/13/1995	6	1,2,4-Trichlorobenzene	181.45	--	--	2.2	1.63E+01	2.712E-04	--	--	--
SA15CPT12-1	10/12/1995	6	1,1,1-Trichloroethane	133.41	--	--	2.6	1.42E+01	5.987E-04	--	--	--
SA15CPT6A-3	10/13/1995	19	Trichloroethene	131.39	2.0E-06	OEHHA	840	4.51E+03	2.175E-04	**3.71E-05**	**7.42E-06**	8.07E-07
SA15CPT10-2	10/13/1995	12	1,2,4-Trimethylbenzene	120.2	--	--	5	2.46E+01	2.629E-04	--	--	--
SA15CPT10-2	10/13/1995	12	1,3,5-Trimethylbenzene	120.2	--	--	2	9.83E+00	2.613E-04	--	--	--
CP0564GS001NS	3/12/1997	7	o-Xylene	106.17	--	--	59	2.56E+02	5.731E-04	--	--	--
SA15CPT5-1	10/12/1995	6	m-Xylene	106.17	--	--	120	5.21E+02	5.511E-04	--	--	--
CP0564GS001NS	3/12/1997	7	m- & p-Xylenes	106.17	--	--	89	3.86E+02	5.629E-04	--	--	--
									Cumulative Risk:	**5.2E-05**	**1.0E-05**	**1.3E-06**

"--" = data are not available, or not appropriate (i.e., chemical is not recognized as a carcinogen)

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)

IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)

OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific risk was selected as the representative sample; the maximum concentration doesn't always result in the highest site-specific risk, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

Table B16-1. Cumulative Risk Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-8A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Cancer Toxicity Factors: IUR $(\mu g/m^3)^{-1}$	Cancer Toxicity Factors: Reference [b]	Highest-Risk Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Risk Concentration Detected in Soil Vapor [c]: $(\mu g/m^3)$ [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Cancer Risk Estimates [f,g]: EPA Screening [h]	Residential Land Use Cancer Risk Estimates [f,g]: DTSC Screening [i]	Residential Land Use Cancer Risk Estimates [f,g]: Site-Specific [j]

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B16-3 through B16-5).

[f] **Bold** values indicate a risk estimate $>1\times10^{-6}$.

[g] Residential cancer-risk estimates were derived using:

$$Risk = IUR \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_c \times 365\ days\ /\ year \times 24\ hours\ /\ day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, carcinogens	AT_c	70	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	ED_r	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Unit-Risk Factor	IUR	chemical-specific	$(\mu g/m^3)^{-1}$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
IUR = inhalation unit risk [factor]
ppbv = part per billion by volume

Table B16-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-8A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC (µg/m^3)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: (µg/m^3) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]
Volatile Organic Compounds (VOCs)												
CP0797GS002NS	6/8/1999	10.9	Acetone	58.08	3.1E+04	ATSDR	74	1.76E+02	5.313E-04	5.44E-05	1.09E-05	2.89E-06
CP0797GS002NS	6/8/1999	10.9	Benzene	78.11	3.0E+01	IRIS	6.8	2.17E+01	3.964E-04	6.94E-03	1.39E-03	2.75E-04
CP0797GS002NS	6/8/1999	10.9	2-Butanone	72.11	5.0E+03	IRIS	28	8.26E+01	3.740E-04	1.58E-04	3.17E-05	5.92E-06
SA15CPT9-2	10/13/1995	13	Carbon tetrachloride	153.82	4.0E+01	OEHHA	13	8.18E+01	3.053E-04	1.96E-02	3.92E-03	5.98E-04
SA15CPT1-2	10/11/1995	11	Chloroethane	64.52	1.0E+04	IRIS	15	3.96E+01	9.087E-04	3.80E-05	7.59E-06	3.45E-06
SA15CPT9-2	10/13/1995	13	Chloroform	119.38	3.0E+02	OEHHA	9.6	4.69E+01	3.909E-04	1.50E-03	3.00E-04	5.86E-05
SA15CPT1-1	10/11/1995	5.5	Chloromethane	50.49	9.0E+01	IRIS	2.3	4.75E+00	8.946E-04	5.06E-04	1.01E-04	4.53E-05
CP0461GS003NS	7/12/1996	19	Cyclohexane	84.16	6.0E+03	IRIS	530	1.82E+03	--	2.92E-03	5.83E-04	0.00E+00
SA15CPT10-2	10/13/1995	12	1,2-Dichlorobenzene	147	2.0E+02	HEAST	3	1.80E+01	2.950E-04	8.65E-04	1.73E-04	2.55E-05
SA15CPT10-2	10/13/1995	12	1,3-Dichlorobenzene	147	--	--	1.8	1.08E+01	2.957E-04	--	--	--
CP0461GS003NS	7/12/1996	19	1,4-Dichlorobenzene	147	8.0E+02	IRIS	6	3.61E+01	1.921E-04	4.32E-04	8.65E-05	8.31E-06
SA15CPT11-1	10/13/1995	6	Dichlorodifluoromethan	120.91	2.0E+02	HEAST	2.7	1.34E+01	5.294E-04	6.40E-04	1.28E-04	3.39E-05
SA15CPT12-1	10/12/1995	6	1,1-Dichloroethene	96.94	2.0E+02	IRIS	2.1	8.33E+00	6.659E-04	3.99E-04	7.98E-05	2.66E-05
SA15CPT4-4	10/11/1995	20.5	cis-1,2-Dichloroethene	96.94	--	--	6.6	2.62E+01	1.898E-04	--	--	--
CP0797GS002NS	6/8/1999	10.9	Ethyl Alcohol	46.07	--	--	30	5.65E+01	--	--	--	--
SA15CPT5-1	10/12/1995	6	Ethylbenzene	106.17	1.0E+03	IRIS	30	1.30E+02	5.811E-04	1.25E-03	2.50E-04	7.26E-05
CP0797GS002NS	6/8/1999	10.9	n-Heptane	100.21	--	--	31	1.27E+02	--	--	--	--
CP0797GS002NS	6/8/1999	10.9	Hexane	86.18	7.0E+02	IRIS	2700	9.52E+03	7.475E-04	1.30E-01	2.61E-02	9.74E-03
SA15CPT4-1	10/11/1995	6	Methyl Bromide	94.94	5.0E+00	IRIS	3.2	1.24E+01	5.681E-04	2.38E-02	4.77E-03	1.35E-03
SA15CPT10-1	10/13/1995	6	Methylene Chloride	84.93	4.0E+02	OEHHA	16	5.56E+01	7.235E-04	1.33E-03	2.66E-04	9.64E-05
SA15CPT10-2	10/13/1995	12	Styrene	104.15	1.0E+03	IRIS	2.1	8.94E+00	3.025E-04	8.58E-05	1.72E-05	2.59E-06
CP0564GS001NS	3/12/1997	7	Tetrachloroethene	165.83	3.5E+01	OEHHA	7.1	4.81E+01	4.941E-04	1.32E-02	2.64E-03	6.52E-04
CP0797GS002NS	6/8/1999	10.9	Toluene	92.14	5.0E+03	IRIS	250	9.42E+02	3.926E-04	1.81E-03	3.61E-04	7.09E-05
SA15CPT7-1	10/13/1995	6	1,2,4-Trichlorobenzene	181.45	2.0E+00	PPRTV	2.2	1.63E+01	2.712E-04	7.83E-02	1.57E-02	2.12E-03
SA15CPT12-1	10/12/1995	6	1,1,1-Trichloroethane	133.41	5.0E+03	IRIS	2.6	1.42E+01	5.987E-04	2.72E-05	5.44E-06	1.63E-06
SA15CPT6A-3	10/13/1995	19	Trichloroethene	131.39	6.0E+02	OEHHA	840	4.51E+03	2.175E-04	7.21E-02	1.44E-02	1.57E-03
SA15CPT10-2	10/13/1995	12	1,2,4-Trimethylbenzene	120.2	7.0E+00	PPRTV	5	2.46E+01	2.629E-04	3.37E-02	6.73E-03	8.85E-04
SA15CPT10-2	10/13/1995	12	1,3,5-Trimethylbenzene	120.2	6.0E+00	PPRTV	2	9.83E+00	2.613E-04	1.57E-02	3.14E-03	4.11E-04
CP0564GS001NS	3/12/1997	7	o-Xylene	106.17	1.0E+02	IRIS	59	2.56E+02	5.731E-04	2.46E-02	4.91E-03	1.41E-03
SA15CPT5-1	10/12/1995	6	m-Xylene	106.17	1.0E+02	IRIS	120	5.21E+02	5.511E-04	5.00E-02	9.99E-03	2.75E-03
CP0564GS001NS	3/12/1997	7	m- & p-Xylenes	106.17	1.0E+02	IRIS	89	3.86E+02	5.629E-04	3.71E-02	7.41E-03	2.09E-03
									Hazard Index:	5.2E-01	1.0E-01	2.4E-02

"--" = toxicity data are not available

[a] EPA EPISuite v4.0 software (http://www.epa.gov/oppt/exposure/pubs/episuitedl.htm)

[b] References:

ATSDR = Agency for Toxic Substances and Disease Registry, Minimal Risk Level (MRL) (http://www.atsdr.cdc.gov/mrls/)
HEAST = EPA Health Effects Assessment Summary Tables, FY 1997 Update (EPA-540-R-97-036)
IRIS = EPA Integrated Risk Information System (http://www.epa.gov/iris/)
OEHHA = Cal/EPA Office of Environmental Health Hazard Assessment (http://www.oehha.ca.gov/risk/ChemicalDB/index.asp)
PPRTV = Provisional Peer-Reviewed Reference Toxicity Value, as cited in EPA's Regional Screening Level (RSL) tables (http://www.epa.gov/region09/superfund/prg/)

[c] Detected-concentration data (Attachment B17) were reviewed and, for each chemical, the sample that would result in the highest site-specific hazard was selected as the representative sample; the maximum concentration doesn't always result in the highest hazard, as a shallower sample with a lower concentration might result in higher predicted indoor-air concentration.

Table B16-2. Cumulative Hazard Estimates: Vapor Intrusion Pathway, Residential Land Use, Site P-8A, Sharpe Site

Sample Name	Sample Date	Sample Depth (feet bgs)	Detected Analyte	Molecular Weight [a] (g/mole)	Noncancer Toxicity Factors: RfC ($\mu g/m^3$)	Noncancer Toxicity Factors: Reference [b]	Highest-Hazard Concentration Detected in Soil Vapor [c]: (ppbv)	Highest-Hazard Concentration Detected in Soil Vapor [c]: ($\mu g/m^3$) [d]	Chemical- and Depth-Specific Attenuation Factor (α) [e] (dimensionless)	Residential Land Use Noncancer Hazard Estimates [f,g]: EPA Screening [h]	Residential Land Use Noncancer Hazard Estimates [f,g]: DTSC Screening [i]	Residential Land Use Noncancer Hazard Estimates [f,g]: Site-Specific [j]

[d] Based on:

$$C_{soil\ gas} = C_{(soil\ gas)v} \times CF_v \times MW \times \frac{1\ atm}{R \times 298°K}$$

where:

$C_{soil\ gas}$ = sample-specific value ($\mu g/m^3$)

$C_{(soil\ gas)v}$ [volumetric soil-gas concentration] = sample-specific value, ppbv (=nL/L)

CF_v [volumetric conversion factor] = 1E-03 (µL/nL)•(L/µL)•(µg/g)

MW [molecular weight] = chemical-specific g/mole

R [Universal Gas Constant] = 8.205746E-05 (atm•m^3)/(mole•°K)

[e] Chemical- and depth-specific attenuation factor "α" (see Tables B16-3 through B16-5).

[f] **Bold** values indicate a hazard estimate >1.

[g] Residential hazard quotients were derived using:

$$Hazard = \frac{1}{RfC} \times \left[C_{indoor\ air} \times \left(\frac{ED_r \times EF_r \times ET_r}{AT_{nc,r} \times 365\ days/year \times 24\ hours/day} \right) \right]$$

where:

$$C_{indoor\ air} = C_{soil\ gas} \times \alpha$$

and:

Attenuation factor	α	scenario-specific	dimensionless (see footnotes h, i, and j)
Averaging Time, noncarcinogens, resident	$AT_{nc,r}$	30	yrs
Analyte Concentration in indoor air	$C_{indoor\ air}$	chemical-specific	$\mu g/m^3$
Analyte Concentration in soil gas	$C_{soil\ gas}$	chemical-specific	$\mu g/m^3$
Exposure Duration, resident	EDr	30	yrs
Exposure Frequency, resident	EF_r	350	days/yr
Exposure Time, resident	ET_r	24	hours/day
Inhalation Reference Concentration	RfC	chemical-specific	$\mu g/m^3$

[h] Based on the EPA (2002) attenuation factor screening value for deep soil (>5 feet bgs): α = 0.01

[i] Based on the DTSC (2005) attenuation factor screening value for slab-on-grade current residential use: α = 0.002

[j] Based on the chemical- and depth-specific attenuation factor

$\mu g/m^3$ = microgram per cubic meter
bgs = below ground surface
DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency
g/mole = grams per mole
ppbv = part per billion by volume
RfC = reference concentration

Derivation of Chemical- and Depth-Specific Attenuation Factors

Site P-8A

Table B16-3: Site P-8A DATAENTER

SG-SCREEN
Version 3.1; 02/04

SG-SCREEN Version 3.1 adapted for:
DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

	ENTER Chemical CAS No. (numbers only, no dashes)	Soil Gas Concentration Data: ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical	Sampled interval (ft bgs) top depth
1	74873			0.0023	Methyl chloride (chloromethane)	5.5
2	71556			0.0026	1,1,1-Trichloroethane	6
3	75354			0.0021	1,1-Dichloroethylene	6
4	120821			0.0022	1,2,4-Trichlorobenzene	6
5	75718			0.0027	Dichlorodifluoromethane	6
6	100414			0.03	Ethylbenzene	6
7	74839			0.0032	Methyl bromide	6
8	75092			0.016	Methylene chloride	6
9	108383			0.12	m-Xylene	6
10	1330207			0.089	Xylenes	7
11	95476			0.059	o-Xylene	7
12	127184			0.0071	Tetrachloroethylene	7
13	78933			0.028	Methylethylketone (2-butanone)	10.9
14	67641			0.074	Acetone	10.9
15	71432			0.0068	Benzene	10.9
16	64175			0.03	CAS No. not found	10.9
17	110543			2.7	Hexane	10.9
18	142825			0.031	CAS No. not found	10.9
19	108883			0.25	Toluene	10.9
20	75003			0.015	Chloroethane (ethyl chloride)	11
21	95636			0.005	1,2,4-Trimethylbenzene	12
22	95501			0.003	1,2-Dichlorobenzene	12
23	108678			0.002	1,3,5-Trimethylbenzene	12
24	541731			0.0018	1,3-Dichlorobenzene	12
25	100425			0.0021	Styrene	12
26	56235			0.013	Carbon tetrachloride	13
27	67663			0.0096	Chloroform	13
28	106467			0.006	1,4-Dichlorobenzene	19
29	110827			0.53	CAS No. not found	19
30	79016			0.84	Trichloroethylene	19
31	156592			0.0066	cis-1,2-Dichloroethylene	20.5

Table B16-3: Site P-8A DATAENTER

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	624.84	24			1.00E-08

5.5 ft bgs = 167.64; 6 ft bgs = 182.9; 7 ft bgs = 213.36; 10.9 ft bgs = 332.23; 11 ft bgs = 335.28; 12 ft bgs = 365.76; 13 ft bgs = 396.24
19 ft bgs = 579.12; 20.5 ft bgs = 624.84

MORE ↓

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SIL	1.49	0.439	0.18	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

Table B16-4: Site P-8A CHEMPROPS

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	
1.26E-01	6.50E-06	8.80E-03	25	5,115	249.00	416.25	1.8E-06	9.0E-02	50.49	Methyl chloride (chloromethane)
7.80E-02	8.80E-06	1.72E-02	25	7,136	347.24	545.00	0.0E+00	5.0E+00	133.40	1,1,1-Trichloroethane
9.00E-02	1.04E-05	2.60E-02	25	6,247	304.75	576.05	0.0E+00	7.0E-02	96.94	1,1-Dichloroethylene
3.00E-02	8.23E-06	1.42E-03	25	10,471	486.15	725.00	0.0E+00	4.0E-03	181.45	1,2,4-Trichlorobenzene
6.65E-02	9.92E-06	3.42E-01	25	9,421	243.20	384.95	0.0E+00	2.0E-01	120.92	Dichlorodifluoromethane
7.50E-02	7.80E-06	7.86E-03	25	8,501	409.34	617.20	2.5E-06	1.0E+00	106.17	Ethylbenzene
7.28E-02	1.21E-05	6.22E-03	25	5,714	276.71	467.00	0.0E+00	5.0E-03	94.94	Methyl bromide
1.01E-01	1.17E-05	2.18E-03	25	6,706	313.00	510.00	1.0E-06	4.0E-01	84.93	Methylene chloride
7.00E-02	7.80E-06	7.32E-03	25	8,523	412.27	617.05	0.0E+00	1.0E-01	106.17	m-Xylene
8.50E-02	9.90E-06	5.18E-03	25	7,897	375.41	566.58	0.0E+00	7.0E-01	106.17	Xylenes
8.70E-02	1.00E-05	5.18E-03	25	8,661	417.60	630.30	0.0E+00	1.0E-01	106.17	o-Xylene
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	5.9E-06	3.5E-02	165.83	Tetrachloroethylene
8.08E-02	9.80E-06	5.58E-05	25	7,481	352.50	536.78	0.0E+00	5.0E+00	72.11	Methylethylketone (2-butanone)
1.24E-01	1.14E-05	3.87E-05	25	6,955	329.20	508.10	0.0E+00	3.1E+01	58.08	Acetone
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	2.9E-05	3.0E-02	78.11	Benzene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
2.00E-01	7.77E-06	1.66E+00	25	6,895	341.70	508.00	0.0E+00	7.0E-01	86.18	Hexane
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14	Toluene
2.71E-01	1.15E-05	8.80E-03	25	5,879	285.30	460.40	8.3E-07	1.0E+01	64.51	Chloroethane (ethyl chloride)
6.06E-02	7.92E-06	6.14E-03	25	9,369	442.30	649.17	0.0E+00	7.0E-03	120.20	1,2,4-Trimethylbenzene
6.90E-02	7.90E-06	1.90E-03	25	9,700	453.57	705.00	0.0E+00	2.0E-01	147.00	1,2-Dichlorobenzene
6.02E-02	8.67E-06	5.87E-03	25	9,321	437.89	637.25	0.0E+00	6.0E-03	120.20	1,3,5-Trimethylbenzene
6.92E-02	7.86E-06	3.09E-03	25	9,230	446.00	684.00	0.0E+00	1.1E-01	147.00	1,3-Dichlorobenzene
7.10E-02	8.00E-06	2.74E-03	25	8,737	418.31	636.00	0.0E+00	9.0E-01	104.15	Styrene
7.80E-02	8.80E-06	3.03E-02	25	7,127	349.90	556.60	4.2E-05	4.0E-02	153.82	Carbon tetrachloride
1.04E-01	1.00E-05	3.66E-03	25	6,988	334.32	536.40	5.3E-06	3.0E-01	119.38	Chloroform
6.90E-02	7.90E-06	2.39E-03	25	9,271	447.21	684.75	1.1E-05	8.0E-01	147.00	1,4-Dichlorobenzene
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	CAS No. not found
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	2.0E-06	6.0E-01	131.39	Trichloroethylene
7.36E-02	1.13E-05	4.07E-03	25	7,192	333.65	544.00	0.0E+00	3.5E-02	96.94	cis-1,2-Dichloroethylene

END

Table B16-5: Site P-8A INTERCALCS

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	4.76E+00	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.42E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	8.35E+00	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.64E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.34E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.31E+02	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.25E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	5.57E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	5.23E+02	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	3.88E+02	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	2.57E+02	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	4.83E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	8.28E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.76E+02	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	2.18E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	9.54E+03	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	9.45E+02	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	3.97E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	2.47E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.81E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	9.86E+00	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	1.09E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	8.97E+00	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	8.20E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	4.70E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	3.62E+01	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	#N/A	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	4.53E+03	3.39E+04
609.84	0.259	#N/A	#N/A	#N/A	1.00E-08	4,000	2.62E+01	3.39E+04

Table B16-5: Site P-8A INTERCALCS

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	4,578	8.57E-03	3.52E-01	1.80E-04	7.27E-03	609.84
1.00E+06	5.00E-03	15	7,732	1.64E-02	6.73E-01	1.80E-04	4.50E-03	609.84
1.00E+06	5.00E-03	15	6,299	2.51E-02	1.03E+00	1.80E-04	5.20E-03	609.84
1.00E+06	5.00E-03	15	13,069	1.32E-03	5.39E-02	1.80E-04	1.73E-03	609.84
1.00E+06	5.00E-03	15	7,961	3.27E-01	1.34E+01	1.80E-04	3.84E-03	609.84
1.00E+06	5.00E-03	15	9,994	7.43E-03	3.05E-01	1.80E-04	4.33E-03	609.84
1.00E+06	5.00E-03	15	5,508	6.03E-03	2.47E-01	1.80E-04	4.20E-03	609.84
1.00E+06	5.00E-03	15	6,884	2.10E-03	8.62E-02	1.80E-04	5.83E-03	609.84
1.00E+06	5.00E-03	15	10,090	6.91E-03	2.84E-01	1.80E-04	4.04E-03	609.84
1.00E+06	5.00E-03	15	8,979	4.92E-03	2.02E-01	1.80E-04	4.91E-03	609.84
1.00E+06	5.00E-03	15	10,245	4.88E-03	2.00E-01	1.80E-04	5.02E-03	609.84
1.00E+06	5.00E-03	15	9,410	1.74E-02	7.14E-01	1.80E-04	4.16E-03	609.84
1.00E+06	5.00E-03	15	8,244	5.32E-05	2.18E-03	1.80E-04	4.74E-03	609.84
1.00E+06	5.00E-03	15	7,384	3.71E-05	1.52E-03	1.80E-04	7.29E-03	609.84
1.00E+06	5.00E-03	15	7,977	5.29E-03	2.17E-01	1.80E-04	5.08E-03	609.84
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	609.84
1.00E+06	5.00E-03	15	7,549	1.59E+00	6.53E+01	1.80E-04	1.15E-02	609.84
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	609.84
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	5.02E-03	609.84
1.00E+06	5.00E-03	15	5,740	8.52E-03	3.49E-01	1.80E-04	1.56E-02	609.84
1.00E+06	5.00E-03	15	11,516	5.76E-03	2.36E-01	1.80E-04	3.50E-03	609.84
1.00E+06	5.00E-03	15	11,546	1.77E-03	7.28E-02	1.80E-04	3.98E-03	609.84
1.00E+06	5.00E-03	15	11,495	5.50E-03	2.25E-01	1.80E-04	3.48E-03	609.84
1.00E+06	5.00E-03	15	11,029	2.90E-03	1.19E-01	1.80E-04	4.00E-03	609.84
1.00E+06	5.00E-03	15	10,294	2.59E-03	1.06E-01	1.80E-04	4.10E-03	609.84
1.00E+06	5.00E-03	15	7,716	2.90E-02	1.19E+00	1.80E-04	4.50E-03	609.84
1.00E+06	5.00E-03	15	7,407	3.51E-03	1.44E-01	1.80E-04	6.00E-03	609.84
1.00E+06	5.00E-03	15	11,098	2.25E-03	9.22E-02	1.80E-04	3.98E-03	609.84
1.00E+06	5.00E-03	15	#N/A	#N/A	#N/A	1.80E-04	#N/A	609.84
1.00E+06	5.00E-03	15	8,382	9.80E-03	4.02E-01	1.80E-04	4.56E-03	609.84
1.00E+06	5.00E-03	15	7,592	3.90E-03	1.60E-01	1.80E-04	4.25E-03	609.84

Table B16-5: Site P-8A INTERCALCS

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)		(as specified on DATAENTER) Sample Begin Depth	Infinite source indoor attenuation coefficient, α (unitless)
					Chemical- and DATAENTER-Depth-Specific:						**Alpha values pasted in, from iterations:**
15	4.76E+00	1.25	8.33E+01	7.27E-03	5.00E+03	8.94E+09			Methyl chlori	5.5	8.946E-04
15	1.42E+01	1.25	8.33E+01	4.50E-03	5.00E+03	1.19E+16			1,1,1-Trichlo	6	5.987E-04
15	8.35E+00	1.25	8.33E+01	5.20E-03	5.00E+03	8.55E+13			1,1-Dichloroe	6	6.659E-04
15	1.64E+01	1.25	8.33E+01	1.73E-03	5.00E+03	5.43E+41			1,2,4-Trichlo	6	2.712E-04
15	1.34E+01	1.25	8.33E+01	3.84E-03	5.00E+03	7.18E+18			Dichlorodiflu	6	5.294E-04
15	1.31E+02	1.25	8.33E+01	4.33E-03	5.00E+03	5.22E+16			Ethylbenzene	6	5.811E-04
15	1.25E+01	1.25	8.33E+01	4.20E-03	5.00E+03	1.66E+17			Methyl bromi	6	5.681E-04
15	5.57E+01	1.25	8.33E+01	5.83E-03	5.00E+03	2.57E+12			Methylene ch	6	7.235E-04
15	5.23E+02	1.25	8.33E+01	4.04E-03	5.00E+03	8.15E+17			m-Xylene	6	5.511E-04
15	3.88E+02	1.25	8.33E+01	4.91E-03	5.00E+03	5.62E+14			Xylenes	7	5.629E-04
15	2.57E+02	1.25	8.33E+01	5.02E-03	5.00E+03	2.57E+14			o-Xylene	7	5.731E-04
15	4.83E+01	1.25	8.33E+01	4.16E-03	5.00E+03	2.60E+17			Tetrachloroe	7	4.941E-04
15	8.28E+01	1.25	8.33E+01	4.74E-03	5.00E+03	1.85E+15			Methylethylk	10.9	3.740E-04
15	1.76E+02	1.25	8.33E+01	7.29E-03	5.00E+03	8.58E+09			Acetone	10.9	5.313E-04
15	2.18E+01	1.25	8.33E+01	5.08E-03	5.00E+03	1.77E+14			Benzene	10.9	3.964E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	10.9	#N/A
15	9.54E+03	1.25	8.33E+01	1.15E-02	5.00E+03	1.86E+06			Hexane	10.9	7.475E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	10.9	#N/A
15	9.45E+02	1.25	8.33E+01	5.02E-03	5.00E+03	2.58E+14			Toluene	10.9	3.926E-04
15	3.97E+01	1.25	8.33E+01	1.56E-02	5.00E+03	4.24E+04			Chloroethane	11	9.087E-04
15	2.47E+01	1.25	8.33E+01	3.50E-03	5.00E+03	4.88E+20			1,2,4-Trimeth	12	2.629E-04
15	1.81E+01	1.25	8.33E+01	3.98E-03	5.00E+03	1.46E+18			1,2-Dichlorob	12	2.950E-04
15	9.86E+00	1.25	8.33E+01	3.48E-03	5.00E+03	6.69E+20			1,3,5-Trimeth	12	2.613E-04
15	1.09E+01	1.25	8.33E+01	4.00E-03	5.00E+03	1.30E+18			1,3-Dichlorob	12	2.957E-04
15	8.97E+00	1.25	8.33E+01	4.10E-03	5.00E+03	4.52E+17			Styrene	12	3.025E-04
15	8.20E+01	1.25	8.33E+01	4.50E-03	5.00E+03	1.19E+16			Carbon tetra	13	3.053E-04
15	4.70E+01	1.25	8.33E+01	6.00E-03	5.00E+03	1.13E+12			Chloroform	13	3.909E-04
15	3.62E+01	1.25	8.33E+01	3.98E-03	5.00E+03	1.47E+18			1,4-Dichlorob	19	1.921E-04
15	#N/A	1.25	8.33E+01	#N/A	5.00E+03	#N/A			CAS No. not	19	#N/A
15	4.53E+03	1.25	8.33E+01	4.56E-03	5.00E+03	7.43E+15			Trichloroethy	19	2.175E-04
15	2.62E+01	1.25	8.33E+01	4.25E-03	5.00E+03	1.08E+17	1.898E-04	4.98E-03	cis-1,2-Dichl	20.5	1.898E-04

Attachment B17

Analytical Data Sets

Table B17-1. Analytical Data Set, Detected Analytes, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-1A	SGAS	CLOSURE2	CP1022	CP1022GS002FD	1/9/2002 12:55	10.5	10.5	GS	TO15	78-93-3	2-Butanone (MEK)	FD1	2.9	=	ppbv	1.4	0.1			
P-1A	SGAS	CLOSURE2	CP0942	CP0942GS003FD	1/7/2002 15:00	13	13	GS	TO15	78-93-3	2-Butanone (MEK)	FD1	6.4	=	ppbv	4.2	0.1			max
P-1A	SGAS	CLOSURE2	CP0946	CP0946GS001FD	1/7/2002 13:05	6	6	GS	TO15	67-64-1	Acetone	FD1	17	=	ppbv	8.4	0.084			max
P-1A	SGAS	CLOSURE2	CP1022	CP1022GS002FD	1/9/2002 12:55	10.5	10.5	GS	TO15	67-64-1	Acetone	FD1	12	=	ppbv	1.7	0.084			
P-1A	SGAS	CLOSURE2	CP0942	CP0942GS003FD	1/7/2002 15:00	13	13	GS	TO15	67-64-1	Acetone	FD1	17	=	ppbv	5.3	0.084			
P-1A	SGAS	CLOSURE2	CP1022	CP1022GS002FD	1/9/2002 12:55	10.5	10.5	GS	TO15	71-43-2	Benzene	FD1	2.1	=	ppbv	1.3	0.025			max
P-1A	SGAS	CLOSURE2	CP1022	CP1022GS002FD	1/9/2002 12:55	10.5	10.5	GS	TO15	75-15-0	Carbon Disulfide	FD1	1.4	=	ppbv	1.3	0.064			max
P-1A	SGAS	CLOSURE2	CP1022	CP1022GS002FD	1/9/2002 12:55	10.5	10.5	GS	TO15	67-66-3	Chloroform	FD1	4.1	=	ppbv	0.82	0.041			max
P-1A	SGAS	CLOSURE2	CP0942	CP0942GS003FD	1/7/2002 15:00	13	13	GS	TO15	XYLMP	m,p-Xylenes	FD1	3.3	=	ppbv	2.9	0.046			max
P-1A	SGAS	CLOSURE2	VEW-1A1	VEW1A1GS001FD	1/7/2002 14:32	5	15	GS	TO15	127-18-4	Tetrachloroethene	FD1	14	=	ppbv	3	0.03			max
P-1A	SGAS	CLOSURE2	CP1022	CP1022GS002FD	1/9/2002 12:55	10.5	10.5	GS	TO15	127-18-4	Tetrachloroethene	FD1	2	=	ppbv	0.59	0.03			
P-1A	SGAS	CLOSURE2	CP0946	CP0946GS001FD	1/7/2002 13:05	6	6	GS	TO15	108-88-3	Toluene	FD1	310	=	ppbv	5.3	0.053			
P-1A	SGAS	CLOSURE2	CP0944	CP0944GS002FD	1/8/2002 9:08	10	10	GS	TO15	108-88-3	Toluene	FD1	1300	=	ppbv	27	0.053			max
P-1A	SGAS	CLOSURE2	CP1022	CP1022GS002FD	1/9/2002 12:55	10.5	10.5	GS	TO15	108-88-3	Toluene	FD1	64	=	ppbv	1.1	0.053			
P-1A	SGAS	CLOSURE2	CP0942	CP0942GS003FD	1/7/2002 15:00	13	13	GS	TO15	108-88-3	Toluene	FD1	280	=	ppbv	3.3	0.053			
P-1A	SGAS	CLOSURE2	VMW-1A5	VMW1A5GS001NS	1/8/2002 10:31	3.5	4.5	GS	M18MS	79-01-6	Trichloroethylene	NS1	490	=	ppbv	200	200			
P-1A	SGAS	CLOSURE2	VEW-1A1	VEW1A1GS001NS	1/7/2002 14:32	5	15	GS	M18MS	79-01-6	Trichloroethylene	NS1	630	=	ppbv	200	200			
P-1A	SGAS	CLOSURE2	VEW-1A1	VEW1A1GS001FD	1/7/2002 14:32	5	15	GS	TO15	79-01-6	Trichloroethylene	FD1	310	=	ppbv	3.7	0.056			
P-1A	SGAS	CLOSURE2	VEW-1A4	VEW1A4GS001NS	1/8/2002 9:55	5	15	GS	M18MS	79-01-6	Trichloroethylene	NS1	360	=	ppbv	200	200			
P-1A	SGAS	CLOSURE2	VEW-1A5	VEW1A5GS001NS	1/8/2002 10:06	5	15	GS	M18MS	79-01-6	Trichloroethylene	NS1	270	=	ppbv	200	200			
P-1A	SGAS	CLOSURE2	VEW-1A8	VEW1A8GS001NS	1/8/2002 11:09	5	15	GS	M18MS	79-01-6	Trichloroethylene	NS1	660	=	ppbv	200	200			max
P-1A	SGAS	CLOSURE2	CP0947	CP0947GS001NS	1/7/2002 9:42	7	7	GS	M18MS	79-01-6	Trichloroethylene	NS1	580	=	ppbv	200	200			
P-1A	SGAS	CLOSURE2	CP0943	CP0943GS001NS	1/8/2002 9:57	7.5	7.5	GS	M18MS	79-01-6	Trichloroethylene	NS1	380	=	ppbv	200	200			
P-1A	SGAS	CLOSURE2	CP1021	CP1021GS002NS	1/9/2002 12:31	10	10	GS	M18MS	79-01-6	Trichloroethylene	NS1	220	=	ppbv	200	200			
P-1A	SGAS	CLOSURE2	CP1022	CP1022GS002FD	1/9/2002 12:55	10.5	10.5	GS	TO15	79-01-6	Trichloroethylene	FD1	0.84	=	ppbv	0.74	0.056			
P-1A	SGAS	CLOSURE2	CP1022	CP1022GS002FD	1/9/2002 12:55	10.5	10.5	GS	TO15	75-69-4	Trichlorofluoromethane	FD1	3.3	=	ppbv	1.4	0.053			max
P-1B	SGAS	CLOSURE2	CP0953	CP0953GS001FD	1/8/2002 11:22	6	6	GS	TO15	108-88-3	Toluene	FD1	820	=	ppbv	13	0.053			max
P-1B	SGAS	CLOSURE2	VEW-1B2	VEW1B2GS001NS	1/7/2002 13:04	5	12.5	GS	M18MS	79-01-6	Trichloroethylene	NS1	330	=	ppbv	200	200			
P-1B	SGAS	CLOSURE2	VMW-1B1	VMW1B1GS002NS	1/9/2002 13:38	8.5	9.5	GS	M18MS	79-01-6	Trichloroethylene	NS1	800	=	ppbv	200	200			max
P-1C	SGAS	CLOSURE2	VMW-1C1	VMW1C1GS003FD	1/9/2002 12:50	12.5	13.5	GS	TO15	78-93-3	2-Butanone (MEK)	FD1	0.87	=	ppbv	0.68	0.1			max
P-1C	SGAS	CLOSURE2	VMW-1C1	VMW1C1GS003FD	1/9/2002 12:50	12.5	13.5	GS	TO15	67-64-1	Acetone	FD1	3.1	=	ppbv	0.84	0.084			max
P-1C	SGAS	CLOSURE2	VMW-1C1	VMW1C1GS003FD	1/9/2002 12:50	12.5	13.5	GS	TO15	75-15-0	Carbon Disulfide	FD1	1	=	ppbv	0.64	0.064			max
P-1C	SGAS	CLOSURE2	CP0960	CP0960GS003FD	1/8/2002 14:10	13	13	GS	TO15	108-88-3	Toluene	FD1	1900	=	ppbv	27	0.053			max
P-1C	SGAS	CLOSURE2	VEW-1C2	VEW1C2GS001NS	1/7/2002 13:24	5	12.5	GS	M18MS	79-01-6	Trichloroethylene	NS1	800	=	ppbv	200	200			max
P-1C	SGAS	CLOSURE2	VEW-1C3	VEW1C3GS001NS	1/7/2002 13:40	5	12.5	GS	M18MS	79-01-6	Trichloroethylene	NS1	310	=	ppbv	200	200			
P-1C	SGAS	CLOSURE2	VMW-1C1	VMW1C1GS003FD	1/9/2002 12:50	12.5	13.5	GS	TO15	79-01-6	Trichloroethylene	FD1	24	=	ppbv	0.37	0.056			
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	15	=	ppbv	0.94	0.79	J+		max
P-1D	OU2	SRAD	CP0089	CP0089GS002NS	7/10/1996 16:45	11	11.25	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.4	=	ppbv	1.2	0.97			
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	3.8	=	ppbv	0.94	0.6	J+		max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	541-73-1	1,3-Dichlorobenzene	NS1	9.4	=	ppbv	0.94	0.8	J+		max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	8.8	=	ppbv	0.94	0.75	J+		max
P-1D	OU2	SRAD	CP0089	CP0089GS002NS	7/10/1996 16:45	11	11.25	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	3.3	=	ppbv	1.2	0.92			
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	123-91-1	1,4-Dioxane	NS1	6.4	=	ppbv	3.7		J+		max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	622-96-8	1-Ethyl-4-methylbenzene / 4-Ethyltoluene	NS1	5	=	ppbv	3.7		J+		max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	16	=	ppbv	3.7		J+		max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	14	=	ppbv	4.9	1			
P-1D	OU2	SRAD	CP0089	CP0089GS002NS	7/10/1996 16:45	11	11.25	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	5.4	=	ppbv	4.6				
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	67-64-1	Acetone	NS1	200	=	ppbv	3.7		J+		max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	67-64-1	Acetone	NS1	59	=	ppbv	4.9	1.3			
P-1D	OU2	SRAD	CP0089	CP0089GS002NS	7/10/1996 16:45	11	11.25	GS	TO14	67-64-1	Acetone	NS1	42	=	ppbv	4.6				
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	71-43-2	Benzene	NS1	5.7	=	ppbv	0.94	0.49	J+		max
P-1D	OU2	SRAD	CP0089	CP0089GS002NS	7/10/1996 16:45	11	11.25	GS	TO14	71-43-2	Benzene	NS1	5.3	=	ppbv	1.2	0.6			
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	74-83-9	Bromomethane	NS1	2.7	=	ppbv	1.2	0.39 J	J		max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	74-87-3	Chloromethane	NS1	2.4	=	ppbv	1.2	0.61 J	J		max
P-1D	OU2	SRAD	CP0089	CP0089GS002NS	7/10/1996 16:45	11	11.25	GS	TO14	110-82-7	Cyclohexane	NS1	7	=	ppbv	4.6				max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	64-17-5	Ethanol	NS1	32	=	ppbv	3.7		J+		max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	100-41-4	Ethylbenzene	NS1	7.7	=	ppbv	1.2	0.17			max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	142-82-5	Heptane	NS1	9.1	=	ppbv	4.9	0.9 J	J		max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	110-54-3	Hexane	NS1	710	=	ppbv	4.9	0.93 J	E		max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	XYLMP	m,p-Xylenes	NS1	8.2	=	ppbv	0.94	0.86	J+		
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	XYLMP	m,p-Xylenes	NS1	31	=	ppbv	1.2	0.39			max
P-1D	OU2	SRAD	CP0089	CP0089GS002NS	7/10/1996 16:45	11	11.25	GS	TO14	XYLMP	m,p-Xylenes	NS1	1.4	=	ppbv	1.2	1.1			
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	75-09-2	Methylene Chloride	NS1	3.2	=	ppbv	1.2	0.32 J	J		max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	95-47-6	o-Xylene	NS1	3.3	=	ppbv	0.94	0.54	J+		
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	95-47-6	o-Xylene	NS1	6	=	ppbv	1.2	0.32			max
P-1D	OU2	SRAD	CP0089	CP0089GS002NS	7/10/1996 16:45	11	11.25	GS	TO14	115-07-1	Propylene	NS1	15	=	ppbv	4.6				max

Table B17-1. Analytical Data Set, Detected Analytes, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	100-42-5	Styrene	NS1	1.1	=	ppbv	0.94	0.56		J+	max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	127-18-4	Tetrachloroethene	NS1	2.2	=	ppbv	1.2	0.37	J	J	max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	108-88-3	Toluene	NS1	12	=	ppbv	0.94	0.5		J+	
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	108-88-3	Toluene	NS1	93	=	ppbv	1.2	0.24			max
P-1D	OU2	SRAD	CP0089	CP0089GS002NS	7/10/1996 16:45	11	11.25	GS	TO14	108-88-3	Toluene	NS1	2.3	=	ppbv	1.2	0.62			
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	3200	=	ppbv	9.4			J+	
P-1D	OU2	SRAD	CP0089	CP0089GS002NS	7/10/1996 16:45	11	11.25	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	1500	=	ppbv	12				
P-1D	OU2	SRAD	CP0543	CP0543GS001NS	3/13/1997 10:50	4.5	4.6	GS	E18	79-01-6	Trichloroethylene	NS1	160	=	ppbv	130	130			hi-Risk
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	79-01-6	Trichloroethylene	NS1	1.7	=	ppbv	0.94	0.39		J+	
P-1D	OU2	SRAD	CP0543	CP0543GS002NS	3/13/1997 10:55	9	9.1	GS	E18	79-01-6	Trichloroethylene	NS1	210	=	ppbv	150	150			
P-1D	OU2	SRAD	CP0543	CP0543GS002DS	3/13/1997 10:55	9	9.1	GS	E18	79-01-6	Trichloroethylene	FD1	210	=	ppbv	160	160			
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	78-93-3	2-Butanone (MEK)	FD1	5.2	=	ppbv	0.34	0.088			max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	67-64-1	Acetone	FD1	6.2	=	ppbv	0.42	0.1			max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	71-43-2	Benzene	FD1	0.24	=	ppbv	0.31	0.1	J		max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	75-15-0	Carbon Disulfide	FD1	0.86	=	ppbv	0.32	0.093			max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	74-87-3	Chloromethane	FD1	0.42	=	ppbv	0.48	0.11	J		max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	100-41-4	Ethylbenzene	FD1	0.14	=	ppbv	0.23	0.079	J		max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	XYLMP	m,p-Xylenes	FD1	0.38	=	ppbv	0.23	0.14		U	max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	95-47-6	o-Xylene	FD1	0.14	=	ppbv	0.23	0.075	J		max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	1634-04-4	tert-Butyl methyl ether (MTBE)	FD1	0.27	=	ppbv	0.28	0.067	J		max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	108-88-3	Toluene	FD1	2.1	=	ppbv	0.27	0.076			max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	79-01-6	Trichloroethylene	FD1	0.22	=	ppbv	0.19	0.035			
P-1E	SGAS	CLOSURE	VEW-1E1	VEW1E1GS001NS	12/20/2000 10:54	5	17.5	GS	M18MS	79-01-6	Trichloroethylene	NS1	320	=	ppbv	200	100			max
P-1E	SGAS	CLOSURE	VEW-1E1	VEW1E1GS001DS	12/20/2000 10:54	5	17.5	GS	M18MS	79-01-6	Trichloroethylene	FD1	320	=	ppbv	200	100			
P-1E	SGAS	CLOSURE	VEW-1E2	VEW1E2GS001NS	12/20/2000 10:58	5	17.5	GS	M18MS	79-01-6	Trichloroethylene	NS1	220	=	ppbv	200	100			
P-1E	B649	ROD	DP0060	DP0060GS002NS	10/6/2009 12:50	15.5	16	GS	TO15	79-01-6	Trichloroethylene	NS1	190	=	PPBV	12	1.2		U	
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	75-69-4	Trichlorofluoromethane	FD1	0.2	=	ppbv	0.18	0.15			max
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.4	=	ppbv	1.2	0.98			
P-1F	OU2	SRAD	CP0163	CP0163GS001NS	7/10/1996 13:33	7	7.25	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	4.4	=	ppbv	1.3	1.2			max
P-1F	OU2	SRAD	CP0161	CP0161GS001NS	7/10/1996 10:10	9	9.25	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	3.1	=	ppbv	0.86	0.79			
P-1F	OU2	SRAD	CP0161	CP0161GS001NS	7/10/1996 10:10	9	9.25	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	0.95	=	ppbv	0.86	0.86			max
P-1F	OU2	SRAD	CP0161	CP0161GS001NS	7/10/1996 10:10	9	9.25	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	4.2	=	ppbv	0.86	0.58			max
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	6	=	ppbv	4.7	2.4			
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	27	=	ppbv	6.6	1.4			max
P-1F	OU2	SRAD	CP0163	CP0163GS001NS	7/10/1996 13:33	7	7.25	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	22	=	ppbv	5	1.7			
P-1F	OU2	SRAD	CP0161	CP0161GS001NS	7/10/1996 10:10	9	9.25	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	13	=	ppbv	3.4	1.1			
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	67-63-0	2-Propanol	NS1	8.8	=	ppbv	6.6	2.1	J	J	
P-1F	OU2	SRAD	CP0163	CP0163GS001NS	7/10/1996 13:33	7	7.25	GS	TO14	67-63-0	2-Propanol	NS1	13	=	ppbv	5	1.1			max
P-1F	OU2	SRAD	CP0161	CP0161GS001NS	7/10/1996 10:10	9	9.25	GS	TO14	67-63-0	2-Propanol	NS1	7.5	=	ppbv	3.4	0.74			
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	67-64-1	Acetone	NS1	27	=	ppbv	4.7	2			
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	67-64-1	Acetone	NS1	170	=	ppbv	6.6	1.8			max
P-1F	OU2	SRAD	CP0163	CP0163GS001NS	7/10/1996 13:33	7	7.25	GS	TO14	67-64-1	Acetone	NS1	170	=	ppbv	5	2.5		J+	
P-1F	OU2	SRAD	CP0161	CP0161GS001NS	7/10/1996 10:10	9	9.25	GS	TO14	67-64-1	Acetone	NS1	86	=	ppbv	3.4	1.7		J+	
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	71-43-2	Benzene	NS1	6.2	=	ppbv	1.6	0.36	J	J	max
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	71-43-2	Benzene	NS1	4.3	=	ppbv	1.2	0.77			
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	75-15-0	Carbon Disulfide	NS1	11	=	ppbv	4.7	1.2			max
P-1F	OU2	SRAD	CP0163	CP0163GS001NS	7/10/1996 13:33	7	7.25	GS	TO14	110-82-7	Cyclohexane	NS1	6.8	=	ppbv	5	1.2			max
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	64-17-5	Ethanol	NS1	35	=	ppbv	4.7	4			
P-1F	OU2	SRAD	CP0163	CP0163GS001NS	7/10/1996 13:33	7	7.25	GS	TO14	64-17-5	Ethanol	NS1	42	=	ppbv	5	5			max
P-1F	OU2	SRAD	CP0161	CP0161GS001NS	7/10/1996 10:10	9	9.25	GS	TO14	64-17-5	Ethanol	NS1	28	=	ppbv	3.4	3.4			
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	100-41-4	Ethylbenzene	NS1	28	=	ppbv	1.2	0.68			max
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	100-41-4	Ethylbenzene	NS1	11	=	ppbv	1.6	0.23			
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	142-82-5	Heptane	NS1	7.9	=	ppbv	6.6	1.2	J	J	max
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	110-54-3	Hexane	NS1	390	=	ppbv	6.6	1.2			max
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	XYLMP	m,p-Xylenes	NS1	140	=	ppbv	1.2	1			max
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	XYLMP	m,p-Xylenes	NS1	57	=	ppbv	1.6	0.52			
P-1F	OU2	SRAD	CP0163	CP0163GS001NS	7/10/1996 13:33	7	7.25	GS	TO14	XYLMP	m,p-Xylenes	NS1	2.1	=	ppbv	1.3	1.3			
P-1F	OU2	SRAD	CP0161	CP0161GS001NS	7/10/1996 10:10	9	9.25	GS	TO14	XYLMP	m,p-Xylenes	NS1	1.6	=	ppbv	0.86	0.86			
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	75-09-2	Methylene Chloride	NS1	4.7	=	ppbv	1.6	0.43	J	J	max
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	95-47-6	o-Xylene	NS1	83	=	ppbv	1.2	0.56			max
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	95-47-6	o-Xylene	NS1	19	=	ppbv	1.6	0.43			
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	100-42-5	Styrene	NS1	1.8	=	ppbv	1.6	0.33	J	J	max
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	108-88-3	Toluene	NS1	2.6	=	ppbv	1.2	0.98			
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	108-88-3	Toluene	NS1	39	=	ppbv	1.6	0.33			max
P-1F	OU2	SRAD	CP0163	CP0163GS001NS	7/10/1996 13:33	7	7.25	GS	TO14	108-88-3	Toluene	NS1	5.1	=	ppbv	1.3	0.4			
P-1F	OU2	SRAD	CP0161	CP0161GS001NS	7/10/1996 10:10	9	9.25	GS	TO14	108-88-3	Toluene	NS1	3.3	=	ppbv	0.86	0.27			

Table B17-1. Analytical Data Set, Detected Analytes, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-1F	OU2	SRAD	CP0163	CP0163GS001NS	7/10/1996 13:33	7	7.25	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	1400	=	ppbv	13				
P-1F	OU2	SRAD	CP0161	CP0161GS001NS	7/10/1996 10:10	9	9.25	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	800	=	ppbv	8.6				
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	79-01-6	Trichloroethylene	NS1	2.7	=	ppbv	1.2	0.79			max
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.5	=	ppbv	0.88	0.74			max
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	106-99-0	1,3-Butadiene	NS1	3.9	=	ppbv	3.5	2.6			max
P-1G	OU2	SRAD	CP0190	CP0190GS002NS	7/16/1996 10:48	10	10.25	GS	TO14	123-91-1	1,4-Dioxane	NS1	22	=	ppbv	11	0			max
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	9.6	=	ppbv	3.5	1.8			max
P-1G	OU2	SRAD	CP0785	CP0785GS003NS	6/9/1999 10:35	11.5	11.6	GS	TO14	67-64-1	Acetone	NS1	18	=	ppbv	16	6.6	J	J	
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	67-64-1	Acetone	NS1	19	=	ppbv	3.5	1.5			
P-1G	OU2	SRAD	CP0190	CP0190GS002NS	7/16/1996 10:48	10	10.25	GS	TO14	67-64-1	Acetone	NS1	79	=	ppbv	11	0			max
P-1G	OU2	SRAD	CP0548	CP0548GS002NS	3/13/1997 13:38	10.7	10.8	GS	TO14	67-64-1	Acetone	NS1	10	=	ppbv	4.3	1.8			
P-1G	OU2	SRAD	CP0574	CP0574GS001NS	6/27/1997 14:10	7		GS	TO14	67-64-1	Acetone	NS1	34	=	ppbv	20	8.7			
P-1G	OU2	SRAD	CP0190	CP0190GS002NS	7/16/1996 10:48	10	10.25	GS	TO14	71-43-2	Benzene	NS1	8.4	=	ppbv	2.7	1.4			max
P-1G	OU2	SRAD	CP0190	CP0190GS002NS	7/16/1996 10:48	10	10.25	GS	TO14	110-82-7	Cyclohexane	NS1	130	=	ppbv	11	0			max
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	64-17-5	Ethanol	NS1	64	=	ppbv	3.5	3			max
P-1G	OU2	SRAD	CP0190	CP0190GS002NS	7/16/1996 10:48	10	10.25	GS	TO14	64-17-5	Ethanol	NS1	21	=	ppbv	11	0			
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	100-41-4	Ethylbenzene	NS1	1.9	=	ppbv	0.88	0.51			
P-1G	OU2	SRAD	CP0548	CP0548GS002NS	3/13/1997 13:38	10.7	10.8	GS	TO14	100-41-4	Ethylbenzene	NS1	2.6	=	ppbv	1.1	0.62			
P-1G	OU2	SRAD	CP0574	CP0574GS001NS	6/27/1997 14:10	7		GS	TO14	100-41-4	Ethylbenzene	NS1	17	=	ppbv	5.1	2.9			max
P-1G	OU2	SRAD	CP0574	CP0574GS001NS	6/27/1997 14:10	7		GS	TO14	142-82-5	Heptane	NS1	24	=	ppbv	20	11			max
P-1G	OU2	SRAD	CP0785	CP0785GS003NS	6/9/1999 10:35	11.5	11.6	GS	TO14	110-54-3	Hexane	NS1	2000	=	ppbv	16	9.3	J	E	max
P-1G	OU2	SRAD	CP0785	CP0785GS003NS	6/9/1999 10:35	11.5	11.6	GS	TO14	XYLMP	m,p-Xylenes	NS1	7.2	=	ppbv	3.9	2.5	J	J	
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	XYLMP	m,p-Xylenes	NS1	5.8	=	ppbv	0.88	0.79			
P-1G	OU2	SRAD	CP0548	CP0548GS002NS	3/13/1997 13:38	10.7	10.8	GS	TO14	XYLMP	m,p-Xylenes	NS1	11	=	ppbv	1.1	0.96			
P-1G	OU2	SRAD	CP0574	CP0574GS001NS	6/27/1997 14:10	7		GS	TO14	XYLMP	m,p-Xylenes	NS1	54	=	ppbv	5.1	4.5			max
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	95-47-6	o-Xylene	NS1	3	=	ppbv	0.88	0.42			
P-1G	OU2	SRAD	CP0548	CP0548GS002NS	3/13/1997 13:38	10.7	10.8	GS	TO14	95-47-6	o-Xylene	NS1	7.3	=	ppbv	1.1	0.51			
P-1G	OU2	SRAD	CP0574	CP0574GS001NS	6/27/1997 14:10	7		GS	TO14	95-47-6	o-Xylene	NS1	22	=	ppbv	5.1	2.4			max
P-1G	OU2	SRAD	CP0574	CP0574GS001NS	6/27/1997 14:10	7		GS	TO14	115-07-1	Propylene	NS1	150	=	ppbv	20	15			max
P-1G	OU2	SRAD	CP0785	CP0785GS003NS	6/9/1999 10:35	11.5	11.6	GS	TO14	108-88-3	Toluene	NS1	15	=	ppbv	3.9	2.9	J	J	
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	108-88-3	Toluene	NS1	8.4	=	ppbv	0.88	0.74			hi-Risk
P-1G	OU2	SRAD	CP0190	CP0190GS002NS	7/16/1996 10:48	10	10.25	GS	TO14	108-88-3	Toluene	NS1	6.4	=	ppbv	2.7	1.4			
P-1G	OU2	SRAD	CP0548	CP0548GS002NS	3/13/1997 13:38	10.7	10.8	GS	TO14	108-88-3	Toluene	NS1	10	=	ppbv	1.1	0.89			
P-1G	OU2	SRAD	CP0190	CP0190GS002NS	7/16/1996 10:48	10	10.25	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	610	=	ppbv	27				
P-1G	OU2	SRAD	CP0578	CP0578GS001NS	6/3/1997 11:10	4.5	4.75	GS	E18	79-01-6	Trichloroethylene	NS1	1100	=	ppbv	100	100			
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	79-01-6	Trichloroethylene	NS1	26	=	ppbv	0.88	0.6			
P-1G	OU2	SRAD	CP0577	CP0577GS001NS	6/3/1997 12:05	5	5.25	GS	E18	79-01-6	Trichloroethylene	NS1	1100	=	ppbv	110	110			
P-1G	OU2	SRAD	CP0547	CP0547GS001NS	3/13/1997 14:00	5	5.1	GS	E18	79-01-6	Trichloroethylene	NS1	180	=	ppbv	130	130			
P-1G	OU2	SRAD	CP0567	CP0567GS001NS	3/13/1997 14:55	5.1	5.2	GS	E18	79-01-6	Trichloroethylene	NS1	330	=	ppbv	130	130			
P-1G	OU2	SRAD	CP0571	CP0571GS001NS	4/5/1997 9:55	5.6	5.8	GS	E18	79-01-6	Trichloroethylene	NS1	340	=	ppbv	120	120			
P-1G	OU2	SRAD	CP0188	CP0188GS001NS	7/9/1996 15:03	7.5	7.75	GS	M18	79-01-6	Trichloroethylene	NS1	220	=	ppbv	0.2	0.2			
P-1G	OU2	SRAD	CP0189	CP0189GS001NS	7/9/1996 14:20	8.5	8.75	GS	M18	79-01-6	Trichloroethylene	NS1	250	=	ppbv	0.2	0.2			
P-1G	OU2	SRAD	CP0577	CP0577GS002NS	6/3/1997 12:27	8.75	9	GS	E18	79-01-6	Trichloroethylene	NS1	1600	=	ppbv	100	100			max
P-1G	OU2	SRAD	CP0578	CP0578GS002NS	6/3/1997 11:30	9.5	9.75	GS	E18	79-01-6	Trichloroethylene	NS1	250	=	ppbv	120	120			
P-1G	OU2	SRAD	CP0567	CP0567GS002NS	3/13/1997 15:05	9.5	9.6	GS	E18	79-01-6	Trichloroethylene	NS1	390	=	ppbv	130	130			
P-1G	OU2	SRAD	CP0571	CP0571GS002NS	4/5/1997 10:12	9.5	9.7	GS	E18	79-01-6	Trichloroethylene	NS1	480	=	ppbv	120	120			
P-1G	OU2	SRAD	CP0546	CP0546GS002NS	3/13/1997 15:38	10	10.1	GS	E18	79-01-6	Trichloroethylene	NS1	160	=	ppbv	100	100			
P-1G	OU2	SRAD	CP0547	CP0547GS002NS	3/13/1997 14:15	10	10.1	GS	E18	79-01-6	Trichloroethylene	NS1	840	=	ppbv	120	120			
P-1G	OU2	SRAD	CP0547	CP0547GS002DS	3/13/1997 14:15	10	10.1	GS	E18	79-01-6	Trichloroethylene	FD1	940	=	ppbv	120	120			
P-1G	OU2	SRAD	CP0548	CP0548GS002NS	3/13/1997 13:38	10.7	10.8	GS	TO14	79-01-6	Trichloroethylene	NS1	21	=	ppbv	1.1	0.72			
P-1G	OU2	SRAD	CP0582	CP0582GS001NS	6/27/1997 11:16	5		GS	E18	79-01-6	Trichloroethylene	NS1	270	=	ppbv	110	110			
P-1G	OU2	SRAD	CP0582	CP0582GS001DS	6/27/1997 11:16	5		GS	E18	79-01-6	Trichloroethylene	FD1	220	=	ppbv	130	130			
P-1G	OU2	SRAD	CP0573	CP0573GS001NS	6/27/1997 12:38	10		GS	E18	79-01-6	Trichloroethylene	NS1	230	=	ppbv	130	130			
P-1G	OU2	SRAD	CP0573	CP0573GS002NS	6/27/1997 13:05	10		GS	E18	79-01-6	Trichloroethylene	NS1	150	=	ppbv	140	140			
P-1G	OU2	SRAD	CP0575	CP0575GS002NS	6/27/1997 13:37	7		GS	E18	79-01-6	Trichloroethylene	NS1	210	=	ppbv	130	130			
P-1G	OU2	SRAD	CP0575	CP0575GS001NS	6/27/1997 13:32	7		GS	E18	79-01-6	Trichloroethylene	NS1	330	=	ppbv	130	130			
P-1G	OU2	SRAD	CP0574	CP0574GS001NS	6/27/1997 14:10	7		GS	TO14	79-01-6	Trichloroethylene	NS1	99	=	ppbv	5.1	3.4			
P-1G	OU2	SRAD	CP0574	CP0574GS001NS	6/27/1997 14:10	7		GS	E18	79-01-6	Trichloroethylene	NS1	150	=	ppbv	110	110			
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	71-55-6	1,1,1-Trichloroethane	NS1	2	=	ppbv	1.1	0.36			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.6	=	ppbv	0.92	0.7			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	53	=	ppbv	3.7	1.8			max
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	67-63-0	2-Propanol	NS1	7.6	=	ppbv	4.2				
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	67-63-0	2-Propanol	NS1	9.6	=	ppbv	3.7	2.3			max
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	67-64-1	Acetone	NS1	27	=	ppbv	4.2				
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	67-64-1	Acetone	NS1	260	=	ppbv	3.7	3.2			max
P-2A	OU2	SRAD	CP0239	CP0239GS002NS	7/12/1996 13:50	7.5	7.75	GS	TO14	67-64-1	Acetone	NS1	37	=	ppbv	18				

Table B17-1. Analytical Data Set, Detected Analytes, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	71-43-2	Benzene	NS1	2	=	ppbv	0.92	0.59			max
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	75-15-0	Carbon Disulfide	NS1	5.8	=	ppbv	4.2				
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	75-15-0	Carbon Disulfide	NS1	4.3	=	ppbv	3.7	1.7			
P-2A	OU2	SRAD	CP0239	CP0239GS002NS	7/12/1996 13:50	7.5	7.75	GS	TO14	75-15-0	Carbon Disulfide	NS1	47	=	ppbv	18				max
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	74-87-3	Chloromethane	NS1	1.8	=	ppbv	1.1	0.87			
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	74-87-3	Chloromethane	NS1	3.2	=	ppbv	0.92	0.55			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	110-82-7	Cyclohexane	NS1	180	=	ppbv	3.7	2.2			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	2.4	=	ppbv	0.92	0.81			max
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	64-17-5	Ethanol	NS1	150	=	ppbv	4.2				max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	64-17-5	Ethanol	NS1	84	=	ppbv	3.7	0.86			
P-2A	OU2	SRAD	CP0239	CP0239GS002NS	7/12/1996 13:50	7.5	7.75	GS	TO14	64-17-5	Ethanol	NS1	89	=	ppbv	18				
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	142-82-5	Heptane	NS1	4	=	ppbv	3.7	1.6			max
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	XYLMP	m,p-Xylenes	NS1	3.5	=	ppbv	1.1	0.98			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	XYLMP	m,p-Xylenes	NS1	2	=	ppbv	0.92	0.71			
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	95-47-6	o-Xylene	NS1	1.8	=	ppbv	1.1	0.61			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	95-47-6	o-Xylene	NS1	1.4	=	ppbv	0.92	0.31			
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	115-07-1	Propylene	NS1	6.2	=	ppbv	4.2				
P-2A	OU2	SRAD	CP0239	CP0239GS002NS	7/12/1996 13:50	7.5	7.75	GS	TO14	115-07-1	Propylene	NS1	19	=	ppbv	18				max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	127-18-4	Tetrachloroethene	NS1	4	=	ppbv	0.92	0.29			max
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	108-88-3	Toluene	NS1	1.9	=	ppbv	1.1	0.57			
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	108-88-3	Toluene	NS1	9.9	=	ppbv	0.92	0.62			max
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	1800	=	ppbv	11				
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	2900	=	ppbv	9.2				
P-2A	OU2	SRAD	CP0241	CP0241GS001NS	7/31/1996 15:21	5	5.25	GS	M18	79-01-6	Trichloroethylene	NS1	490	=	ppbv	0.2	0.2	J		
P-2A	OU2	SRAD	CP0241	CP0241GS002NS	7/31/1996 15:27	9.3	9.55	GS	M18	79-01-6	Trichloroethylene	NS1	620	=	ppbv	0.2	0.2	J		
P-2A	OU2	SRAD	CP0240	CP0240GS001NS	7/15/1996 8:10	5	5.25	GS	M18	79-01-6	Trichloroethylene	NS1	1700	=	ppbv	0.2	0.2			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	79-01-6	Trichloroethylene	NS1	40	=	ppbv	0.92	0.88			
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	M18	79-01-6	Trichloroethylene	NS1	280	=	ppbv	0.2	0.2			
P-2A	OU2	SRAD	CP0239	CP0239GS002NS	7/12/1996 13:50	7.5	7.75	GS	TO14	79-01-6	Trichloroethylene	NS1	9.7	=	ppbv	4.5	1.9			
P-2A	OU2	SRAD	CP0240	CP0240GS002NS	7/15/1996 8:15	8.5	8.75	GS	M18	79-01-6	Trichloroethylene	NS1	570	=	ppbv	0.2	0.2			
P-2A	OU2	SRAD	CP0242	CP0242GS002NS	7/31/1996 16:10	9	9.25	GS	M18	79-01-6	Trichloroethylene	NS1	490	=	ppbv	0.2	0.2			
P-2A	CPT	P-2A	CP1117	CP1117GS002NS	10/26/2007 15:31	10		GS	TO15	79-01-6	Trichloroethylene	NS1	36	=	ppbv	11	3.1			
P-2A	OU2	SRAD	CP0240	CP0240GS003NS	7/15/1996 8:20	12	12.25	GS	M18	79-01-6	Trichloroethylene	NS1	510	=	ppbv	0.2	0.2			
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	2.2	=	ppbv	1.5	1.2			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.8	=	ppbv	0.92	0.7			hi-Risk
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.1	=	ppbv	1.5	1.1			
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	1.8	=	ppbv	1.5	1.2			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	123-91-1	1,4-Dioxane	NS1	16	=	ppbv	3.7	3			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	8.8	=	ppbv	3.7	1.8			
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	19	=	ppbv	5.8	2.9			max
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	67-63-0	2-Propanol	NS1	7.2	=	ppbv	5.8	3.6			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	67-64-1	Acetone	NS1	41	=	ppbv	3.7	3.2			
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	67-64-1	Acetone	NS1	83	=	ppbv	5.8	5			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	71-43-2	Benzene	NS1	1.4	=	ppbv	0.92	0.59			max
P-2B	OU2	SRAD	CP0272	CP0272GS002NS	8/13/1996 9:27	12.5	12.75	GS	M18	56-23-5	Carbon tetrachloride	NS1	430	=	ppbv	0.2	0.2			max
P-2B	OU2	SRAD	CP0273	CP0273GS003NS	8/13/1996 8:03	13.5	13.75	GS	M18	56-23-5	Carbon tetrachloride	NS1	270	=	ppbv	0.2	0.2			
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	74-87-3	Chloromethane	NS1	1.1	=	ppbv	0.92	0.55			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	110-82-7	Cyclohexane	NS1	12	=	ppbv	3.7	2.2			
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	110-82-7	Cyclohexane	NS1	340	=	ppbv	5.8	3.5			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	64-17-5	Ethanol	NS1	24	=	ppbv	3.7	0.86			max
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	64-17-5	Ethanol	NS1	15	=	ppbv	5.8	1.4			
P-2B	OU2	SRAD	CP0789	CP0789GS002NS	6/7/1999 15:18	9	9.1	GS	TO14	110-54-3	Hexane	NS1	290000	=	ppbv	2700	1200	J	E	max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	XYLMP	m,p-Xylenes	NS1	1.2	=	ppbv	0.92	0.71			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	127-18-4	Tetrachloroethene	NS1	51	=	ppbv	0.92	0.29			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	108-88-3	Toluene	NS1	2.8	=	ppbv	0.92	0.62			
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	108-88-3	Toluene	NS1	4.7	=	ppbv	1.5	0.99			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	1500	=	ppbv	9.2				
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	1600	=	ppbv	15				
P-2B	OU2	SRAD	CP0265	CP0265GS001NS	7/9/1996 10:39	4	4.25	GS	M18	79-01-6	Trichloroethylene	NS1	420	=	ppbv	0.2	0.2			
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	79-01-6	Trichloroethylene	NS1	7.9	=	ppbv	0.92	0.88			
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	79-01-6	Trichloroethylene	NS1	3	=	ppbv	1.5	1.4			
P-2B	OU2	SRAD	CP0263	CP0263GS001NS	7/8/1996 8:20	10.25	10.75	GS	M18	79-01-6	Trichloroethylene	NS1	520	=	ppbv	0.2	0.2			max
P-2B	OU2	SRAD	CP0272	CP0272GS002NS	8/13/1996 9:27	12.5	12.75	GS	M18	79-01-6	Trichloroethylene	NS1	460	=	ppbv	0.2	0.2			
P-2B	OU2	SRAD	CP0273	CP0273GS003NS	8/13/1996 8:03	13.5	13.75	GS	M18	79-01-6	Trichloroethylene	NS1	290	=	ppbv	0.2	0.2			
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.7	=	ppbv	0.94	0.71			hi-Risk
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.4	=	ppbv	0.9	0.82			

Table B17-1. Analytical Data Set, Detected Analytes, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	3.1	=	ppbv	0.92	0.7			
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	1.3	=	ppbv	0.9	0.9			max
P-3A	OU2	SRAD	CP0551	CP0551GS001NS	3/13/1997 9:03	5.5	5.6	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	3.6	=	ppbv	3.5	1.8			
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	6.2	=	ppbv	3.7	1.9			
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	16	=	ppbv	3.6	1.2			
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	31	=	ppbv	3.7	1.8			max
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	67-63-0	2-Propanol	NS1	8.1	=	ppbv	3.6	0.77			
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	67-63-0	2-Propanol	NS1	8.9	=	ppbv	3.7	2.3			max
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	108-10-1	4-Methyl-2-pentanone (MIBK)	NS1	3.8	=	ppbv	3.7	3.4			max
P-3A	OU2	SRAD	CP0551	CP0551GS001NS	3/13/1997 9:03	5.5	5.6	GS	TO14	67-64-1	Acetone	NS1	14	=	ppbv	3.5	1.5			
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	67-64-1	Acetone	NS1	26	=	ppbv	3.7	3.3			
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	67-64-1	Acetone	NS1	130	=	ppbv	3.6	1.8			max
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	67-64-1	Acetone	NS1	130	=	ppbv	3.7	3.2			
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	71-43-2	Benzene	NS1	6.3	=	ppbv	0.94	0.6			max
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	71-43-2	Benzene	NS1	1	=	ppbv	0.92	0.59			
P-3A	OU2	SRAD	CP0288	CP0288GS002NS	7/11/1996 8:27	9.5	9.75	GS	TO14	75-15-0	Carbon Disulfide	NS1	78	=	ppbv	27				max
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	74-87-3	Chloromethane	NS1	1.1	=	ppbv	0.92	0.55			max
P-3A	OU2	SRAD	CP0551	CP0551GS001NS	3/13/1997 9:03	5.5	5.6	GS	TO14	156-59-2	cis-1,2-Dichloroethene	NS1	3.9	=	ppbv	0.88	0.53			max
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	110-82-7	Cyclohexane	NS1	120	=	ppbv	3.7	2.2			max
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	110-82-7	Cyclohexane	NS1	82	=	ppbv	3.6	0.84			
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	110-82-7	Cyclohexane	NS1	45	=	ppbv	3.7	2.2			
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	8.7	=	ppbv	0.94	0.82			max
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	2.8	=	ppbv	0.9	0.21			
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	1.1	=	ppbv	0.92	0.81			
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	64-17-5	Ethanol	NS1	30	=	ppbv	3.7	0.88			
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	64-17-5	Ethanol	NS1	290	=	ppbv	3.6	3.6	J+		max
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	64-17-5	Ethanol	NS1	79	=	ppbv	3.7	0.86			
P-3A	OU2	SRAD	CP0551	CP0551GS001NS	3/13/1997 9:03	5.5	5.6	GS	TO14	100-41-4	Ethylbenzene	NS1	3.9	=	ppbv	0.88	0.51			
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	100-41-4	Ethylbenzene	NS1	12	=	ppbv	0.9	0.55			max
P-3A	OU2	SRAD	CP0551	CP0551GS001NS	3/13/1997 9:03	5.5	5.6	GS	TO14	XYLMP	m,p-Xylenes	NS1	16	=	ppbv	0.88	0.79			
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	XYLMP	m,p-Xylenes	NS1	1.2	=	ppbv	0.94	0.73			
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	XYLMP	m,p-Xylenes	NS1	50	=	ppbv	0.9	0.9			max
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	XYLMP	m,p-Xylenes	NS1	1.4	=	ppbv	0.92	0.71			
P-3A	OU2	SRAD	CP0551	CP0551GS001NS	3/13/1997 9:03	5.5	5.6	GS	TO14	95-47-6	o-Xylene	NS1	8.7	=	ppbv	0.88	0.42			
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	95-47-6	o-Xylene	NS1	31	=	ppbv	0.9	0.9			max
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	95-47-6	o-Xylene	NS1	0.95	=	ppbv	0.92	0.31			
P-3A	OU2	SRAD	CP0551	CP0551GS001NS	3/13/1997 9:03	5.5	5.6	GS	TO14	127-18-4	Tetrachloroethene	NS1	1.8	=	ppbv	0.88	0.53			
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	127-18-4	Tetrachloroethene	NS1	6.3	=	ppbv	0.9	0.36			max
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	127-18-4	Tetrachloroethene	NS1	3.1	=	ppbv	0.92	0.29			
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	108-88-3	Toluene	NS1	2.3	=	ppbv	0.94	0.64			
P-3A	OU2	SRAD	CP0288	CP0288GS002NS	7/11/1996 8:27	9.5	9.75	GS	TO14	108-88-3	Toluene	NS1	11	=	ppbv	6.7	3.6			max
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	108-88-3	Toluene	NS1	4.2	=	ppbv	0.9	0.29			
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	108-88-3	Toluene	NS1	6.7	=	ppbv	0.92	0.62			
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	1600	=	ppbv	9.4				
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	1400	=	ppbv	9				
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	2300	=	ppbv	9.2				
P-3A	OU2	SRAD	CP0286	CP0286GS001NS	7/10/1996 15:46	4.5	4.75	GS	M18	79-01-6	Trichloroethylene	NS1	420	=	ppbv	0.2	0.2			
P-3A	OU2	SRAD	CP0289	CP0289GS001DS	7/11/1996 7:48	4.5	4.75	GS	M18	79-01-6	Trichloroethylene	FD1	540	=	ppbv	0.2	0.2			
P-3A	OU2	SRAD	CP0289	CP0289GS001NS	7/11/1996 7:48	4.5	4.75	GS	M18	79-01-6	Trichloroethylene	NS1	670	=	ppbv	0.2	0.2			max
P-3A	OU2	SRAD	CP0287	CP0287GS001NS	7/10/1996 16:15	5	5.25	GS	M18	79-01-6	Trichloroethylene	NS1	340	=	ppbv	0.2	0.2			
P-3A	OU2	SRAD	CP0551	CP0551GS001NS	3/13/1997 9:03	5.5	5.6	GS	E18	79-01-6	Trichloroethylene	NS1	480	=	ppbv	88	88			
P-3A	OU2	SRAD	CP0551	CP0551GS001NS	3/13/1997 9:03	5.5	5.6	GS	TO14	79-01-6	Trichloroethylene	NS1	350	=	ppbv	0.88	0.6			
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	79-01-6	Trichloroethylene	NS1	5	=	ppbv	0.94	0.9			
P-3A	OU2	SRAD	CP0296	CP0296GS001NS	8/8/1996 13:42	8.7	8.95	GS	M18	79-01-6	Trichloroethylene	NS1	200	=	ppbv	0.2	0.2			
P-3A	OU2	SRAD	CP0288	CP0288GS002NS	7/11/1996 8:27	9.5	9.75	GS	TO14	79-01-6	Trichloroethylene	NS1	36	=	ppbv	6.7	2.8			
P-3A	OU2	SRAD	CP0286	CP0286GS002NS	7/10/1996 15:50	11	11.25	GS	M18	79-01-6	Trichloroethylene	NS1	570	=	ppbv	0.2	0.2			
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	79-01-6	Trichloroethylene	NS1	51	=	ppbv	0.9	0.39			
P-3A	OU2	SRAD	CP0551	CP0551GS002NS	3/13/1997 9:15	12	12.1	GS	E18	79-01-6	Trichloroethylene	NS1	200	=	ppbv	130	130			
P-3A	OU2	SRAD	CP0550	CP0550GS002NS	3/13/1997 8:37	12.5	12.6	GS	E18	79-01-6	Trichloroethylene	NS1	140	=	ppbv	130	130			
P-3A	OU2	SRAD	CP0549	CP0549GS002NS	3/13/1997 8:04	12.9	13	GS	E18	79-01-6	Trichloroethylene	NS1	120	=	ppbv	110	110			
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	79-01-6	Trichloroethylene	NS1	13	=	ppbv	0.92	0.88			
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	71-55-6	1,1,1-Trichloroethane	NS1	1.8	=	ppbv	1.3	0.43			max
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	67-63-0	2-Propanol	NS1	8.3	=	ppbv	5				max
P-4A	OU2	SRAD	CP0794	CP0794GS003NS	6/7/1999 11:37	11	11.1	GS	TO14	67-64-1	Acetone	NS1	9.3	=	ppbv	7.3	3.5	J	J	
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	67-64-1	Acetone	NS1	32	=	ppbv	5				max
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	74-87-3	Chloromethane	NS1	2.4	=	ppbv	1.3	1			max

Table B17-1. Analytical Data Set, Detected Analytes, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	64-17-5	Ethanol	NS1	160	=	ppbv	5				max
P-4A	OU2	SRAD	CP0794	CP0794GS003NS	6/7/1999 11:37	11	11.1	GS	TO14	142-82-5	Heptane	NS1	30	=	ppbv	7.3	3.1	J		max
P-4A	OU2	SRAD	CP0794	CP0794GS003NS	6/7/1999 11:37	11	11.1	GS	TO14	110-54-3	Hexane	NS1	1000	=	ppbv	7.3	3.2	J	E	max
P-4A	OU2	SRAD	CP0794	CP0794GS003NS	6/7/1999 11:37	11	11.1	GS	TO14	XYLMP	m,p-Xylenes	NS1	3.9	=	ppbv	1.8	2.6	J	J	
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	XYLMP	m,p-Xylenes	NS1	3.4	=	ppbv	1.3	1.2			hi-Risk
P-4A	OU2	SRAD	CP0794	CP0794GS003NS	6/7/1999 11:37	11	11.1	GS	TO14	75-09-2	Methylene Chloride	NS1	2.2	=	ppbv	1.8	0.51	J	J	max
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	95-47-6	o-Xylene	NS1	1.6	=	ppbv	1.3	0.73			max
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	115-07-1	Propylene	NS1	14	=	ppbv	5				max
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	108-88-3	Toluene	NS1	2.6	=	ppbv	1.3	0.68			
P-4A	OU2	SRAD	CP0794	CP0794GS003NS	6/7/1999 11:37	11	11.1	GS	TO14	108-88-3	Toluene	NS1	84	=	ppbv	1.8	0.7			max
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	100	=	ppbv	13			J	
P-4A	OU2	SRAD	CP0559	CP0559GS001NS	3/11/1997 16:10	7.5	7.6	GS	E18	79-01-6	Trichloroethylene	NS1	190	=	ppbv	120	120			max
P-4B	SGAS	P4B	CP0970	CP0970GS003DS	11/1/2000 12:30	11.5	11.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	FD1	11	=	ppbv	4.8	0.87	J+		
P-4B	OU2	SRAD	CP0340	CP0340GS001NS	7/16/1996 8:56	5	5.25	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.3	=	ppbv	0.88	0.74			
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.1	=	ppbv	0.92	0.7			
P-4B	SGAS	P4B	CP0822	CP0822001NS	7/25/2000 9:15	6.5	6.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	5.4	=	ppbv	5.2	1.8			
P-4B	SGAS	P4B	CP0824	CP0824001NS	7/25/2000 10:15	6.5	6.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	5.6	=	ppbv	4.9	1.3			
P-4B	SGAS	P4B	CP0831	CP0831001FD	7/25/2000 13:58	6.5	6.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	FD1	33	=	ppbv	10	2.7			max
P-4B	SGAS	P4B	CP0823	CP0823001NS	7/25/2000 9:50	6.5	6.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	17	=	ppbv	6.6	1.7			
P-4B	SGAS	P4B	CP0822	CP0822002NS	7/25/2000 9:20	8.5	8.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	5.2	=	ppbv	4.2	1.4			
P-4B	SGAS	P4B	CP0824	CP0824002NS	7/25/2000 10:29	8.5	8.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	5	=	ppbv	4.9	1.3			
P-4B	SGAS	P4B	CP0823	CP0823002NS	7/25/2000 10:00	8.5	8.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	6.2	=	ppbv	5.3	1.4			
P-4B	SGAS	P4B	CP0836	CP0836001NS	7/25/2000 15:30	8.5	8.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.7	=	ppbv	0.9	0.3			
P-4B	SGAS	P4B	CP0838	CP0838001NS	7/25/2000 15:50	8.5	8.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	3.5	=	ppbv	0.9	0.3			
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	5.4	=	ppbv	0.92	0.77			
P-4B	SGAS	P4B	CP0822	CP0822003NS	7/25/2000 9:40	11.5	11.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	8.7	=	ppbv	5.8	2			
P-4B	SGAS	P4B	CP0824	CP0824003NS	7/25/2000 10:40	11.5	11.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	6.4	=	ppbv	5.5	1.9			
P-4B	SGAS	P4B	CP0824	CP0824003FD	7/25/2000 10:41	11.5	11.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	FD1	8.2	=	ppbv	6.6	2.2			
P-4B	SGAS	P4B	CP0821	CP0821002NS	7/25/2000 16:45	11.5	11.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	13	=	ppbv	1.7	0.44			
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	3.9	=	ppbv	0.92	0.64			max
P-4B	SGAS	P4B	CP0821	CP0821002NS	7/25/2000 16:45	11.5	11.5	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	3.7	=	ppbv	1.7	0.57			
P-4B	OU2	SRAD	CP0340	CP0340GS001NS	7/16/1996 8:56	5	5.25	GS	TO14	123-91-1	1,4-Dioxane	NS1	40	=	ppbv	3.5	0			max
P-4B	SGAS	P4B	CP0838	CP0838001NS	7/25/2000 15:50	8.5	8.5	GS	TO14	123-91-1	1,4-Dioxane	NS1	12	=	ppbv	3.6	1.2			
P-4B	SGAS	P4B	CP0829	CP0829001NS	7/25/2000 13:05	8.5	8.5	GS	TO14	123-91-1	1,4-Dioxane	NS1	37	=	ppbv	35	13			
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	622-96-8	1-Ethyl-4-methylbenzene / 4-Ethyltoluene	NS1	28	=	ppbv	13	7.3	J	J	max
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	TO14	622-96-8	1-Ethyl-4-methylbenzene / 4-Ethyltoluene	NS1	4.2	=	ppbv	3.7	0.64			
P-4B	SGAS	P4B	CP0821	CP0821002NS	7/25/2000 16:45	11.5	11.5	GS	TO14	622-96-8	1-Ethyl-4-methylbenzene / 4-Ethyltoluene	NS1	13	=	ppbv	6.7	2			
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	23	=	ppbv	13	4.8	J	J	
P-4B	SGAS	P4B	CP0962	CP0962GS001DS	11/1/2000 16:20	8.5	8.5	GS	TO14	78-93-3	2-Butanone (MEK)	FD1	79	=	ppbv	23	2.6	J+		max
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	15	=	ppbv	3.7	1.8			
P-4B	SGAS	P4B	CP0836	CP0836001NS	7/25/2000 15:30	8.5	8.5	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	7.1	=	ppbv	3.6	1			
P-4B	SGAS	P4B	CP0838	CP0838001NS	7/25/2000 15:50	8.5	8.5	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	6.4	=	ppbv	3.6	1			
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	4.4	=	ppbv	3.7	1.9			
P-4B	SGAS	P4B	CP0821	CP0821002NS	7/25/2000 16:45	11.5	11.5	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	11	=	ppbv	6.7	1.4			
P-4B	OU2	SRAD	CP0340	CP0340GS001NS	7/16/1996 8:56	5	5.25	GS	TO14	67-63-0	2-Propanol	NS1	3.7	=	ppbv	3.5	0			
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	67-63-0	2-Propanol	NS1	4.5	=	ppbv	3.7	2.3			
P-4B	SGAS	P4B	CP0822	CP0822001NS	7/25/2000 9:15	6.5	6.5	GS	TO14	67-63-0	2-Propanol	NS1	70	=	ppbv	21	6.6			
P-4B	SGAS	P4B	CP0823	CP0823001NS	7/25/2000 9:50	6.5	6.5	GS	TO14	67-63-0	2-Propanol	NS1	34	=	ppbv	26	2.2			
P-4B	SGAS	P4B	CP0830	CP0830002NS	7/25/2000 13:40	8.5	8.5	GS	TO14	67-63-0	2-Propanol	NS1	25	=	ppbv	20	6.5			
P-4B	SGAS	P4B	CP0824	CP0824002NS	7/25/2000 10:29	8.5	8.5	GS	TO14	67-63-0	2-Propanol	NS1	46	=	ppbv	20	1.7			
P-4B	SGAS	P4B	CP0823	CP0823002NS	7/25/2000 10:00	8.5	8.5	GS	TO14	67-63-0	2-Propanol	NS1	48	=	ppbv	21	1.8			
P-4B	SGAS	P4B	CP0832	CP0832001NS	7/25/2000 14:11	8.5	8.5	GS	TO14	67-63-0	2-Propanol	NS1	37	=	ppbv	19	1.6			
P-4B	SGAS	P4B	CP0829	CP0829001NS	7/25/2000 13:05	8.5	8.5	GS	TO14	67-63-0	2-Propanol	NS1	77	=	ppbv	35	2.9			
P-4B	SGAS	P4B	CP0822	CP0822003NS	7/25/2000 9:40	11.5	11.5	GS	TO14	67-63-0	2-Propanol	NS1	110	=	ppbv	23	7.4			max
P-4B	SGAS	P4B	CP0824	CP0824003NS	7/25/2000 10:40	11.5	11.5	GS	TO14	67-63-0	2-Propanol	NS1	67	=	ppbv	22	7			
P-4B	SGAS	P4B	CP0824	CP0824003FD	7/25/2000 10:41	11.5	11.5	GS	TO14	67-63-0	2-Propanol	FD1	31	=	ppbv	26	8.4			
P-4B	SGAS	P4B	CP0830	CP0830001NS	7/25/2000 13:25	6.5	6.5	GS	TO14	67-64-1	Acetone	NS1	75	=	ppbv	32	13	J		
P-4B	SGAS	P4B	CP0822	CP0822001NS	7/25/2000 9:15	6.5	6.5	GS	TO14	67-64-1	Acetone	NS1	150	=	ppbv	21	16	J		max
P-4B	SGAS	P4B	CP0831	CP0831001FD	7/25/2000 13:58	6.5	6.5	GS	TO14	67-64-1	Acetone	FD1	120	=	ppbv	41	16	J		
P-4B	SGAS	P4B	CP0823	CP0823001NS	7/25/2000 9:50	6.5	6.5	GS	TO14	67-64-1	Acetone	NS1	68	=	ppbv	26	10	J		
P-4B	SGAS	P4B	CP0830	CP0830002NS	7/25/2000 13:40	8.5	8.5	GS	TO14	67-64-1	Acetone	NS1	32	=	ppbv	20	16	J		
P-4B	SGAS	P4B	CP0823	CP0823002NS	7/25/2000 10:00	8.5	8.5	GS	TO14	67-64-1	Acetone	NS1	67	=	ppbv	21	8.5	J		
P-4B	SGAS	P4B	CP0832	CP0832001NS	7/25/2000 14:11	8.5	8.5	GS	TO14	67-64-1	Acetone	NS1	92	=	ppbv	19	7.6	J		
P-4B	SGAS	P4B	CP0834	CP0834001NS	7/25/2000 14:52	8.5	8.5	GS	TO14	67-64-1	Acetone	NS1	36	=	ppbv	20	7.9	J		
P-4B	SGAS	P4B	CP0835	CP0835001NS	7/25/2000 15:07	8.5	8.5	GS	TO14	67-64-1	Acetone	NS1	16	=	ppbv	14	5.7	J		
P-4B	SGAS	P4B	CP0836	CP0836001NS	7/25/2000 15:30	8.5	8.5	GS	TO14	67-64-1	Acetone	NS1	34	=	ppbv	3.6	2.8	J		

Table B17-1. Analytical Data Set, Detected Analytes, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-4B	SGAS	P4B	CP0838	CP0838001NS	7/25/2000 15:50	8.5	8.5	GS	TO14	67-64-1	Acetone	NS1	27	=	ppbv	3.6	2.8	J		
P-4B	SGAS	P4B	CP0829	CP0829001NS	7/25/2000 13:05	8.5	8.5	GS	TO14	67-64-1	Acetone	NS1	52	=	ppbv	35	14	J		
P-4B	SGAS	P4B	CP0822	CP0822003NS	7/25/2000 9:40	11.5	11.5	GS	TO14	67-64-1	Acetone	NS1	66	=	ppbv	23	18	J		
P-4B	SGAS	P4B	CP0824	CP0824003NS	7/25/2000 10:40	11.5	11.5	GS	TO14	67-64-1	Acetone	NS1	42	=	ppbv	22	17	J		
P-4B	SGAS	P4B	CP0824	CP0824003FD	7/25/2000 10:41	11.5	11.5	GS	TO14	67-64-1	Acetone	FD1	43	=	ppbv	26	21	J		
P-4B	SGAS	P4B	CP0962	CP0962GS001DS	11/1/2000 16:20	8.5	8.5	GS	TO14	67-64-1	Acetone	FD1	120	=	ppbv	23	19	J+		
P-4B	SGAS	P4B	CP0970	CP0970GS003DS	11/1/2000 12:30	11.5	11.5	GS	TO14	67-64-1	Acetone	FD1	41	=	ppbv	19	16	J+		
P-4B	OU2	SRAD	CP0340	CP0340GS001NS	7/16/1996 8:56	5	5.25	GS	TO14	67-64-1	Acetone	NS1	22	=	ppbv	3.5	0			
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	67-64-1	Acetone	NS1	81	=	ppbv	3.7	3.2			
P-4B	SGAS	P4B	CP0824	CP0824001NS	7/25/2000 10:15	6.5	6.5	GS	TO14	67-64-1	Acetone	NS1	46	=	ppbv	20	7.9			
P-4B	SGAS	P4B	CP0831	CP0831001NS	7/25/2000 13:56	6.5	6.5	GS	TO14	67-64-1	Acetone	NS1	98	=	ppbv	41	16			
P-4B	SGAS	P4B	CP0826	CP0826GS001DS	11/1/2000 10:25	6.5	6.5	GS	TO14	67-64-1	Acetone	FD1	37	=	ppbv	20	16			
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	67-64-1	Acetone	NS1	79	=	ppbv	13	5.7			
P-4B	SGAS	P4B	CP0822	CP0822002NS	7/25/2000 9:20	8.5	8.5	GS	TO14	67-64-1	Acetone	NS1	72	=	ppbv	17	13			
P-4B	SGAS	P4B	CP0824	CP0824002NS	7/25/2000 10:29	8.5	8.5	GS	TO14	67-64-1	Acetone	NS1	39	=	ppbv	20	7.9			
P-4B	SGAS	P4B	CP0821	CP0821001NS	7/25/2000 9:00	8.5	8.5	GS	TO14	67-64-1	Acetone	NS1	65	=	ppbv	19	7.4			
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	TO14	67-64-1	Acetone	NS1	15	=	ppbv	3.7	1.6			
P-4B	SGAS	P4B	CP0821	CP0821002NS	7/25/2000 16:45	11.5	11.5	GS	TO14	67-64-1	Acetone	NS1	56	=	ppbv	6.7	2.7			
P-4B	SGAS	P4B	CP0962	CP0962GS001DS	11/1/2000 16:20	8.5	8.5	GS	TO14	71-43-2	Benzene	FD1	6	=	ppbv	5.6	0.9	J+		
P-4B	OU2	SRAD	CP0340	CP0340GS001NS	7/16/1996 8:56	5	5.25	GS	TO14	71-43-2	Benzene	NS1	4	=	ppbv	0.88	0.46			
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	71-43-2	Benzene	NS1	1.9	=	ppbv	0.92	0.59			
P-4B	SGAS	P4B	CP0822	CP0822001NS	7/25/2000 9:15	6.5	6.5	GS	TO14	71-43-2	Benzene	NS1	8.7	=	ppbv	5.2	4.4			
P-4B	SGAS	P4B	CP0824	CP0824001NS	7/25/2000 10:15	6.5	6.5	GS	TO14	71-43-2	Benzene	NS1	9.5	=	ppbv	4.9	28			
P-4B	SGAS	P4B	CP0831	CP0831001NS	7/25/2000 13:56	6.5	6.5	GS	TO14	71-43-2	Benzene	NS1	17	=	ppbv	10	58			max
P-4B	SGAS	P4B	CP0823	CP0823001NS	7/25/2000 9:50	6.5	6.5	GS	TO14	71-43-2	Benzene	NS1	8.2	=	ppbv	6.6	37			
P-4B	SGAS	P4B	CP0822	CP0822002NS	7/25/2000 9:20	8.5	8.5	GS	TO14	71-43-2	Benzene	NS1	6	=	ppbv	4.2	3.6			
P-4B	SGAS	P4B	CP0823	CP0823002NS	7/25/2000 10:00	8.5	8.5	GS	TO14	71-43-2	Benzene	NS1	7.7	=	ppbv	5.3	30			
P-4B	SGAS	P4B	CP0836	CP0836001NS	7/25/2000 15:30	8.5	8.5	GS	TO14	71-43-2	Benzene	NS1	1.1	=	ppbv	0.9	0.77			
P-4B	SGAS	P4B	CP0838	CP0838001NS	7/25/2000 15:50	8.5	8.5	GS	TO14	71-43-2	Benzene	NS1	1	=	ppbv	0.9	0.77			
P-4B	SGAS	P4B	CP0821	CP0821001NS	7/25/2000 9:00	8.5	8.5	GS	TO14	71-43-2	Benzene	NS1	5.7	=	ppbv	4.7	26			
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	TO14	71-43-2	Benzene	NS1	2.1	=	ppbv	0.92	0.6			
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	74-83-9	Bromomethane	NS1	4.4	=	ppbv	3.4	3.2	J	J	max
P-4B	SGAS	P4B	CP0836	CP0836001NS	7/25/2000 15:30	8.5	8.5	GS	TO14	75-15-0	Carbon Disulfide	NS1	3.7	=	ppbv	3.6	0.8			
P-4B	SGAS	P4B	CP0838	CP0838001NS	7/25/2000 15:50	8.5	8.5	GS	TO14	75-15-0	Carbon Disulfide	NS1	5.2	=	ppbv	3.6	0.8			max
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	67-66-3	Chloroform	NS1	1.9	=	ppbv	0.92	0.9			
P-4B	SGAS	P4B	CP0831	CP0831001NS	7/25/2000 13:56	6.5	6.5	GS	TO14	67-66-3	Chloroform	NS1	11	=	ppbv	10	2.1			
P-4B	SGAS	P4B	CP0831	CP0831001FD	7/25/2000 13:58	6.5	6.5	GS	TO14	67-66-3	Chloroform	FD1	13	=	ppbv	10	2.1			max
P-4B	OU2	SRAD	CP0340	CP0340GS001NS	7/16/1996 8:56	5	5.25	GS	TO14	74-87-3	Chloromethane	NS1	2.2	=	ppbv	0.88	0.72			
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	74-87-3	Chloromethane	NS1	2.1	=	ppbv	0.92	0.55			
P-4B	SGAS	P4B	CP0822	CP0822002NS	7/25/2000 9:20	8.5	8.5	GS	TO14	74-87-3	Chloromethane	NS1	8	=	ppbv	4.2	1.6			max
P-4B	SGAS	P4B	CP0824	CP0824002NS	7/25/2000 10:29	8.5	8.5	GS	TO14	74-87-3	Chloromethane	NS1	6.3	=	ppbv	4.9	3.6			
P-4B	SGAS	P4B	CP0821	CP0821002NS	7/25/2000 16:45	11.5	11.5	GS	TO14	74-87-3	Chloromethane	NS1	2.8	=	ppbv	1.7	1.2			
P-4B	OU2	SRAD	CP0340	CP0340GS001NS	7/16/1996 8:56	5	5.25	GS	TO14	110-82-7	Cyclohexane	NS1	130	=	ppbv	3.5	0			max
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	110-82-7	Cyclohexane	NS1	35	=	ppbv	3.7	2.2			
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	64-17-5	Ethanol	NS1	55	=	ppbv	3.7	0.86			max
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	64-17-5	Ethanol	NS1	36	=	ppbv	13	12			
P-4B	SGAS	P4B	CP0822	CP0822002NS	7/25/2000 9:20	8.5	8.5	GS	TO14	64-17-5	Ethanol	NS1	30	=	ppbv	17	6.8			
P-4B	SGAS	P4B	CP0836	CP0836001NS	7/25/2000 15:30	8.5	8.5	GS	TO14	64-17-5	Ethanol	NS1	8.6	=	ppbv	3.6	1.5			
P-4B	SGAS	P4B	CP0838	CP0838001NS	7/25/2000 15:50	8.5	8.5	GS	TO14	64-17-5	Ethanol	NS1	7.3	=	ppbv	3.6	1.5			
P-4B	SGAS	P4B	CP0821	CP0821002NS	7/25/2000 16:45	11.5	11.5	GS	TO14	64-17-5	Ethanol	NS1	15	=	ppbv	6.7	1.7			
P-4B	SGAS	P4B	CP0962	CP0962GS001DS	11/1/2000 16:20	8.5	8.5	GS	TO14	100-41-4	Ethylbenzene	FD1	59	=	ppbv	5.6	1	J+		
P-4B	SGAS	P4B	CP0970	CP0970GS003DS	11/1/2000 12:30	11.5	11.5	GS	TO14	100-41-4	Ethylbenzene	FD1	8.3	=	ppbv	4.8	0.87	J+		
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	100-41-4	Ethylbenzene	NS1	2.7	=	ppbv	0.92	0.59			
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	100-41-4	Ethylbenzene	NS1	560	=	ppbv	3.4	1.1			max
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	TO14	100-41-4	Ethylbenzene	NS1	36	=	ppbv	0.92	0.53			
P-4B	SGAS	P4B	CP0821	CP0821002NS	7/25/2000 16:45	11.5	11.5	GS	TO14	100-41-4	Ethylbenzene	NS1	2.5	=	ppbv	1.7	0.4			
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	142-82-5	Heptane	NS1	150	=	ppbv	13	6.7			max
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	TO14	142-82-5	Heptane	NS1	8	=	ppbv	3.7	2			
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	110-54-3	Hexane	NS1	1400	=	ppbv	13	8.1	J	E	max
P-4B	SGAS	P4B	CP0962	CP0962GS001DS	11/1/2000 16:20	8.5	8.5	GS	TO14	XYLMP	m,p-Xylenes	FD1	180	=	ppbv	5.6	3.6	J+		
P-4B	SGAS	P4B	CP0970	CP0970GS003DS	11/1/2000 12:30	11.5	11.5	GS	TO14	XYLMP	m,p-Xylenes	FD1	31	=	ppbv	4.8	3.1	J+		
P-4B	OU2	SRAD	CP0340	CP0340GS001NS	7/16/1996 8:56	5	5.25	GS	TO14	XYLMP	m,p-Xylenes	NS1	0.91	=	ppbv	0.88	0.81			
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	XYLMP	m,p-Xylenes	NS1	13	=	ppbv	0.92	0.71			
P-4B	SGAS	P4B	CP0822	CP0822001NS	7/25/2000 9:15	6.5	6.5	GS	TO14	XYLMP	m,p-Xylenes	NS1	22	=	ppbv	5.2	3.7			
P-4B	SGAS	P4B	CP0823	CP0823001NS	7/25/2000 9:50	6.5	6.5	GS	TO14	XYLMP	m,p-Xylenes	NS1	7.8	=	ppbv	6.6	4.8			
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	XYLMP	m,p-Xylenes	NS1	2000	=	ppbv	3.4	2.2			max

Table B17-1. Analytical Data Set, Detected Analytes, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-4B	SGAS	P4B	CP0823	CP0823002NS	7/25/2000 10:00	8.5	8.5	GS	TO14	XYLMP	m,p-Xylenes	NS1	9.1	=	ppbv	5.3	3.9			
P-4B	SGAS	P4B	CP0836	CP0836001NS	7/25/2000 15:30	8.5	8.5	GS	TO14	XYLMP	m,p-Xylenes	NS1	2.4	=	ppbv	0.9	0.64			
P-4B	SGAS	P4B	CP0838	CP0838001NS	7/25/2000 15:50	8.5	8.5	GS	TO14	XYLMP	m,p-Xylenes	NS1	3.3	=	ppbv	0.9	0.64			
P-4B	SGAS	P4B	CP0821	CP0821001NS	7/25/2000 9:00	8.5	8.5	GS	TO14	XYLMP	m,p-Xylenes	NS1	11	=	ppbv	4.7	3.4			
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	TO14	XYLMP	m,p-Xylenes	NS1	150	=	ppbv	0.92	0.82			
P-4B	SGAS	P4B	CP0821	CP0821002NS	7/25/2000 16:45	11.5	11.5	GS	TO14	XYLMP	m,p-Xylenes	NS1	8.9	=	ppbv	1.7	1.2			
P-4B	SGAS	P4B	CP0831	CP0831001FD	7/25/2000 13:58	6.5	6.5	GS	TO14	75-09-2	Methylene Chloride	FD1	43	=	ppbv	10	2.7			max
P-4B	SGAS	P4B	CP0826	CP0826GS001DS	11/1/2000 10:25	6.5	6.5	GS	TO14	75-09-2	Methylene Chloride	FD1	13	=	ppbv	4.9	0.69			
P-4B	SGAS	P4B	CP0962	CP0962GS001DS	11/1/2000 16:20	8.5	8.5	GS	TO14	95-47-6	o-Xylene	FD1	63	=	ppbv	5.6	1.9	J+		
P-4B	SGAS	P4B	CP0970	CP0970GS003DS	11/1/2000 12:30	11.5	11.5	GS	TO14	95-47-6	o-Xylene	FD1	14	=	ppbv	4.8	1.6	J+		
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	95-47-6	o-Xylene	NS1	7.4	=	ppbv	0.92	0.31			
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	95-47-6	o-Xylene	NS1	720	=	ppbv	3.4	1.9			max
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	TO14	95-47-6	o-Xylene	NS1	100	=	ppbv	0.92	0.44			
P-4B	SGAS	P4B	CP0821	CP0821002NS	7/25/2000 16:45	11.5	11.5	GS	TO14	95-47-6	o-Xylene	NS1	2.4	=	ppbv	1.7	0.6			
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	127-18-4	Tetrachloroethene	NS1	4.3	=	ppbv	3.4	2.4	J	J	
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	127-18-4	Tetrachloroethene	NS1	1.7	=	ppbv	0.92	0.29			
P-4B	SGAS	P4B	CP0822	CP0822001NS	7/25/2000 9:15	6.5	6.5	GS	TO14	127-18-4	Tetrachloroethene	NS1	6	=	ppbv	5.2	1.8			max
P-4B	SGAS	P4B	CP0836	CP0836001NS	7/25/2000 15:30	8.5	8.5	GS	TO14	127-18-4	Tetrachloroethene	NS1	2	=	ppbv	0.9	0.32			
P-4B	SGAS	P4B	CP0838	CP0838001NS	7/25/2000 15:50	8.5	8.5	GS	TO14	127-18-4	Tetrachloroethene	NS1	2.1	=	ppbv	0.9	0.32			
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	TO14	127-18-4	Tetrachloroethene	NS1	1	=	ppbv	0.92	0.55			
P-4B	SGAS	P4B	CP0821	CP0821002NS	7/25/2000 16:45	11.5	11.5	GS	TO14	127-18-4	Tetrachloroethene	NS1	3.1	=	ppbv	1.7	0.5			
P-4B	SGAS	P4B	CP0962	CP0962GS001DS	11/1/2000 16:20	8.5	8.5	GS	TO14	109-99-9	Tetrahydrofuran	FD1	67	=	ppbv	23	1.6	J+		max
P-4B	SGAS	P4B	CP0824	CP0824003NS	7/25/2000 10:40	11.5	11.5	GS	TO14	108-88-3	Toluene	NS1	13	=	ppbv	5.5	1.5	J		
P-4B	SGAS	P4B	CP0824	CP0824003FD	7/25/2000 10:41	11.5	11.5	GS	TO14	108-88-3	Toluene	FD1	7.3	=	ppbv	6.6	1.8	J		
P-4B	SGAS	P4B	CP0962	CP0962GS001DS	11/1/2000 16:20	8.5	8.5	GS	TO14	108-88-3	Toluene	FD1	11	=	ppbv	5.6	1.4	J+		
P-4B	OU2	SRAD	CP0340	CP0340GS001NS	7/16/1996 8:56	5	5.25	GS	TO14	108-88-3	Toluene	NS1	2.5	=	ppbv	0.88	0.48			
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	108-88-3	Toluene	NS1	5.2	=	ppbv	0.92	0.62			
P-4B	SGAS	P4B	CP0822	CP0822001NS	7/25/2000 9:15	6.5	6.5	GS	TO14	108-88-3	Toluene	NS1	31	=	ppbv	5.2	1.4			
P-4B	SGAS	P4B	CP0824	CP0824001NS	7/25/2000 10:15	6.5	6.5	GS	TO14	108-88-3	Toluene	NS1	8.7	=	ppbv	4.9	1.6			
P-4B	SGAS	P4B	CP0831	CP0831001NS	7/25/2000 13:56	6.5	6.5	GS	TO14	108-88-3	Toluene	NS1	13	=	ppbv	10	3.3			
P-4B	SGAS	P4B	CP0823	CP0823001NS	7/25/2000 9:50	6.5	6.5	GS	TO14	108-88-3	Toluene	NS1	13	=	ppbv	6.6	2.1			
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	108-88-3	Toluene	NS1	110	=	ppbv	3.4	2.6			max
P-4B	SGAS	P4B	CP0830	CP0830002NS	7/25/2000 13:40	8.5	8.5	GS	TO14	108-88-3	Toluene	NS1	6.1	=	ppbv	5	1.4			
P-4B	SGAS	P4B	CP0822	CP0822002NS	7/25/2000 9:20	8.5	8.5	GS	TO14	108-88-3	Toluene	NS1	5.6	=	ppbv	4.2	1.2			
P-4B	SGAS	P4B	CP0824	CP0824002NS	7/25/2000 10:29	8.5	8.5	GS	TO14	108-88-3	Toluene	NS1	7.1	=	ppbv	4.9	1.6			
P-4B	SGAS	P4B	CP0823	CP0823002NS	7/25/2000 10:00	8.5	8.5	GS	TO14	108-88-3	Toluene	NS1	11	=	ppbv	5.3	1.7			
P-4B	SGAS	P4B	CP0832	CP0832001NS	7/25/2000 14:11	8.5	8.5	GS	TO14	108-88-3	Toluene	NS1	6.4	=	ppbv	4.8	1.5			
P-4B	SGAS	P4B	CP0834	CP0834001NS	7/25/2000 14:52	8.5	8.5	GS	TO14	108-88-3	Toluene	NS1	7.5	=	ppbv	4.9	1.6			
P-4B	SGAS	P4B	CP0836	CP0836001NS	7/25/2000 15:30	8.5	8.5	GS	TO14	108-88-3	Toluene	NS1	5	=	ppbv	0.9	0.25			
P-4B	SGAS	P4B	CP0838	CP0838001NS	7/25/2000 15:50	8.5	8.5	GS	TO14	108-88-3	Toluene	NS1	6.3	=	ppbv	0.9	0.25			
P-4B	SGAS	P4B	CP0821	CP0821001NS	7/25/2000 9:00	8.5	8.5	GS	TO14	108-88-3	Toluene	NS1	18	=	ppbv	4.7	1.5			
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	TO14	108-88-3	Toluene	NS1	3	=	ppbv	0.92	0.77			
P-4B	SGAS	P4B	CP0822	CP0822003NS	7/25/2000 9:40	11.5	11.5	GS	TO14	108-88-3	Toluene	NS1	6.3	=	ppbv	5.8	1.6			
P-4B	SGAS	P4B	CP0821	CP0821002NS	7/25/2000 16:45	11.5	11.5	GS	TO14	108-88-3	Toluene	NS1	19	=	ppbv	1.7	0.54			
P-4B	OU2	SRAD	CP0340	CP0340GS001NS	7/16/1996 8:56	5	5.25	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	2200	=	ppbv	8.8				
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	2400	=	ppbv	9.2				
P-4B	SGAS	P4B	CP0824	CP0824003NS	7/25/2000 10:40	11.5	11.5	GS	TO14	79-01-6	Trichloroethylene	NS1	8.4	=	ppbv	5.5	2.1	J		
P-4B	SGAS	P4B	CP0824	CP0824003FD	7/25/2000 10:41	11.5	11.5	GS	TO14	79-01-6	Trichloroethylene	FD1	130	=	ppbv	6.6	2.5	J		
P-4B	SGAS	P4B	CP0962	CP0962GS001DS	11/1/2000 16:20	8.5	8.5	GS	TO14	79-01-6	Trichloroethylene	FD1	270	=	ppbv	5.6	1.4	J+		
P-4B	SGAS	P4B	CP0970	CP0970GS003DS	11/1/2000 12:30	11.5	11.5	GS	TO14	79-01-6	Trichloroethylene	FD1	27	=	ppbv	4.8	1.2	J+		
P-4B	OU2	SRAD	CP0555	CP0555GS001NS	3/12/1997 9:27	4	4.1	GS	E18	79-01-6	Trichloroethylene	NS1	210	=	ppbv	120	120			
P-4B	OU2	SRAD	CP0336	CP0336GS001NS	7/15/1996 9:00	4	4.25	GS	M18	79-01-6	Trichloroethylene	NS1	320	=	ppbv	0.2	0.2			
P-4B	OU2	SRAD	CP0340	CP0340GS001NS	7/16/1996 8:56	5	5.25	GS	TO14	79-01-6	Trichloroethylene	NS1	270	=	ppbv	0.88	0.37			
P-4B	OU2	SRAD	CP0340	CP0340GS001DS	7/16/1996 8:56	5	5.25	GS	M18	79-01-6	Trichloroethylene	FD1	380	=	ppbv	0.2	0.2			
P-4B	OU2	SRAD	CP0556	CP0556GS001NS	3/12/1997 8:55	6	6.1	GS	E18	79-01-6	Trichloroethylene	NS1	220	=	ppbv	120	120			
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	79-01-6	Trichloroethylene	NS1	280	=	ppbv	0.92	0.88			
P-4B	SGAS	P4B	CP0830	CP0830001NS	7/25/2000 13:25	6.5	6.5	GS	TO14	79-01-6	Trichloroethylene	NS1	610	=	ppbv	8.1	2.6			
P-4B	SGAS	P4B	CP0824	CP0824001NS	7/25/2000 10:15	6.5	6.5	GS	TO14	79-01-6	Trichloroethylene	NS1	180	=	ppbv	4.9	1.6			
P-4B	SGAS	P4B	CP0831	CP0831001NS	7/25/2000 13:56	6.5	6.5	GS	TO14	79-01-6	Trichloroethylene	NS1	2200	=	ppbv	10	3.3			
P-4B	SGAS	P4B	CP0831	CP0831001FD	7/25/2000 13:58	6.5	6.5	GS	TO14	79-01-6	Trichloroethylene	FD1	2700	=	ppbv	10	3.3			max
P-4B	SGAS	P4B	CP0826	CP0826GS001DS	11/1/2000 10:25	6.5	6.5	GS	TO14	79-01-6	Trichloroethylene	FD1	260	=	ppbv	4.9	1.2			
P-4B	SGAS	P4B	CP0826	CP0826GS001NS	11/1/2000 10:20	6.5	6.5	GS	M18MS	79-01-6	Trichloroethylene	NS1	350	=	ppbv	200	100			
P-4B	SGAS	P4B	CP0962	CP0962GS001NS	11/1/2000 16:05	6.5	6.5	GS	M18MS	79-01-6	Trichloroethylene	NS1	420	=	ppbv	200	100			
P-4B	SGAS	P4B	CP0965	CP0965GS001NS	11/1/2000 15:40	6.5	6.5	GS	M18MS	79-01-6	Trichloroethylene	NS1	200	=	ppbv	200	100			
P-4B	OU2	SRAD	CP0343	CP0343GS001NS	8/1/1996 15:22	7.5	7.75	GS	M18	79-01-6	Trichloroethylene	NS1	430	=	ppbv	0.2	0.2			
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	79-01-6	Trichloroethylene	NS1	540	=	ppbv	3.4	2			

Table B17-1. Analytical Data Set, Detected Analytes, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-4B	SGAS	P4B	CP0830	CP0830002NS	7/25/2000 13:40	8.5	8.5	GS	TO14	79-01-6	Trichloroethylene	NS1	710	=	ppbv	5	1.9			
P-4B	SGAS	P4B	CP0822	CP0822002NS	7/25/2000 9:20	8.5	8.5	GS	TO14	79-01-6	Trichloroethylene	NS1	66	=	ppbv	4.2	1.6			
P-4B	SGAS	P4B	CP0823	CP0823002NS	7/25/2000 10:00	8.5	8.5	GS	TO14	79-01-6	Trichloroethylene	NS1	150	=	ppbv	5.3	1.7			
P-4B	SGAS	P4B	CP0832	CP0832001NS	7/25/2000 14:11	8.5	8.5	GS	TO14	79-01-6	Trichloroethylene	NS1	640	=	ppbv	4.8	1.5			
P-4B	SGAS	P4B	CP0834	CP0834001NS	7/25/2000 14:52	8.5	8.5	GS	TO14	79-01-6	Trichloroethylene	NS1	110	=	ppbv	4.9	1.6			
P-4B	SGAS	P4B	CP0835	CP0835001NS	7/25/2000 15:07	8.5	8.5	GS	TO14	79-01-6	Trichloroethylene	NS1	970	=	ppbv	3.6	1.1			
P-4B	SGAS	P4B	CP0836	CP0836001NS	7/25/2000 15:30	8.5	8.5	GS	TO14	79-01-6	Trichloroethylene	NS1	230	=	ppbv	0.9	0.34			
P-4B	SGAS	P4B	CP0838	CP0838001NS	7/25/2000 15:50	8.5	8.5	GS	TO14	79-01-6	Trichloroethylene	NS1	100	=	ppbv	0.9	0.34			
P-4B	SGAS	P4B	CP0829	CP0829001NS	7/25/2000 13:05	8.5	8.5	GS	TO14	79-01-6	Trichloroethylene	NS1	100	=	ppbv	8.6	2.8			
P-4B	SGAS	P4B	CP0962	CP0962GS002NS	11/1/2000 16:15	8.5	8.5	GS	M18MS	79-01-6	Trichloroethylene	NS1	260	=	ppbv	200	100			
P-4B	OU2	SRAD	CP0338	CP0338GS002NS	7/15/1996 10:23	9	9.25	GS	M18	79-01-6	Trichloroethylene	NS1	360	=	ppbv	0.2	0.2			
P-4B	OU2	SRAD	CP0336	CP0336GS002NS	7/15/1996 9:10	9.5	9.75	GS	M18	79-01-6	Trichloroethylene	NS1	360	=	ppbv	0.2	0.2			
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	E18	79-01-6	Trichloroethylene	NS1	310	=	ppbv	92	92			
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	TO14	79-01-6	Trichloroethylene	NS1	200	=	ppbv	0.92	0.62			
P-4B	SGAS	P4B	CP0821	CP0821002NS	7/25/2000 16:45	11.5	11.5	GS	TO14	79-01-6	Trichloroethylene	NS1	5.1	=	ppbv	1.7	0.54			
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.7	=	ppbv	0.96	0.8			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.1	=	ppbv	0.94	0.79			
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	2	=	ppbv	0.96	0.67			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	1.3	=	ppbv	0.94	0.75			max
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	123-91-1	1,4-Dioxane	NS1	6.8	=	ppbv	3.8	2.7			
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	123-91-1	1,4-Dioxane	NS1	11	=	ppbv	3.7	0			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	16	=	ppbv	3.7	0			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	67-63-0	2-Propanol	NS1	9.2	=	ppbv	3.7	0			max
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	67-64-1	Acetone	NS1	12	=	ppbv	3.8	1.6			
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	67-64-1	Acetone	NS1	91	=	ppbv	3.7	0			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	71-43-2	Benzene	NS1	3.3	=	ppbv	0.94	0.49			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	110-82-7	Cyclohexane	NS1	350	=	ppbv	3.7	0			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	64-17-5	Ethanol	NS1	4.4	=	ppbv	3.7	0			max
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	100-41-4	Ethylbenzene	NS1	6.1	=	ppbv	0.96	0.55			max
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	XYLMP	m,p-Xylenes	NS1	30	=	ppbv	0.96	0.86			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	XYLMP	m,p-Xylenes	NS1	1.2	=	ppbv	0.94	0.86			
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	95-47-6	o-Xylene	NS1	18	=	ppbv	0.96	0.46			max
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	127-18-4	Tetrachloroethene	NS1	1.8	=	ppbv	0.96	0.57			max
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	108-88-3	Toluene	NS1	0.96	=	ppbv	0.96	0.8			
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	108-88-3	Toluene	NS1	6.1	=	ppbv	0.94	0.5			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	2400	=	ppbv	9.4				
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	79-01-6	Trichloroethylene	NS1	5.8	=	ppbv	0.96	0.65			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	79-01-6	Trichloroethylene	NS1	4.8	=	ppbv	0.94	0.39			
P-5A	CPT	P5A	SB1108	SB1108GS002NS	7/7/2006 10:05	10.5		GS	TO14A	106-98-9	1-Butene	NS1	5	=	ppbv	4.6	0			max
P-5A	CPT	P5A	SB1108	SB1108GS002NS	7/7/2006 10:05	10.5		GS	TO14A	106-97-8	Butane	NS1	430	=	ppbv	11	0	J	M	max
P-5A	CPT	P5A	SB1108	SB1108GS002NS	7/7/2006 10:05	10.5		GS	TO14A	75-28-5	Isobutane	NS1	2400	=	ppbv	4.6	0			max
P-5A	CPT	P5A	SB1108	SB1108GS002NS	7/7/2006 10:05	10.5		GS	TO14A	74-98-6	Propane	NS1	430	=	ppbv	4.6	0			max
P-5A	CPT	P5A	SB1111	SB1111GS001NS	7/7/2006 14:15	6.5		GS	TO14A	74-98-6	Propane	NS1	8.1	=	ppbv	4.5	0			
P-5A	CPT	P5A	SB1108	SB1108GS002NS	7/7/2006 10:05	10.5		GS	TO14A	115-07-1	Propylene	NS1	16	=	ppbv	4.6	0			max
P-5A	CPT	P5A	SB1111	SB1111GS001NS	7/7/2006 14:15	6.5		GS	TO14A	115-07-1	Propylene	NS1	12	=	ppbv	4.5	0			
P-5A	CPT	P5A	SB1104	SB1104GS001NS	7/6/2006 14:10	5		GS	TO14DI	79-01-6	Trichloroethylene	NS1	20	=	ppbv	11	2.8			
P-5A	CPT	P5A	SB1104	SB1104GS002NS	7/6/2006 14:47	10		GS	TO14DI	79-01-6	Trichloroethylene	NS1	1600	=	ppbv	11	2.8			
P-5A	CPT	P5A	SB1105	SB1105GS001NS	7/6/2006 9:33	5.5		GS	TO14DI	79-01-6	Trichloroethylene	NS1	780	=	ppbv	12	3			
P-5A	CPT	P5A	SB1105	SB1105GS002NS	7/6/2006 10:18	9		GS	TO14DI	79-01-6	Trichloroethylene	NS1	1400	=	ppbv	12	3.1			
P-5A	CPT	P5A	SB1106	SB1106GS001NS	7/6/2006 11:14	5		GS	TO14DI	79-01-6	Trichloroethylene	NS1	350	=	ppbv	12	3			
P-5A	CPT	P5A	SB1106	SB1106GS002NS	7/6/2006 11:59	10		GS	TO14DI	79-01-6	Trichloroethylene	NS1	100	=	ppbv	12	3			
P-5A	CPT	P5A	SB1107	SB1107GS001NS	7/7/2006 7:55	7.5		GS	TO14DI	79-01-6	Trichloroethylene	NS1	220	=	ppbv	12	3.5			
P-5A	CPT	P5A	SB1107	SB1107GS002NS	7/7/2006 8:37	12.5		GS	TO14DI	79-01-6	Trichloroethylene	NS1	1400	=	ppbv	12	3.5			
P-5A	CPT	P5A	SB1108	SB1108GS002NS	7/7/2006 10:05	10.5		GS	TO14DI	79-01-6	Trichloroethylene	NS1	120	=	ppbv	11	3.3			
P-5A	CPT	P-5A	CP1128	CP1128GS001DS	10/23/2007 14:15	5		GS	TO15	79-01-6	Trichloroethylene	FD1	160	=	ppbv	12	3.3			
P-5A	CPT	P-5A	CP1128	CP1128GS001NS	10/23/2007 14:15	5		GS	TO15	79-01-6	Trichloroethylene	NS1	160	=	ppbv	12	3.3			
P-5A	CPT	P-5A	CP1128	CP1128GS002NS	10/23/2007 15:23	12		GS	TO15	79-01-6	Trichloroethylene	NS1	550	=	ppbv	12	3.3			
P-5A	CPT	P-5A	CP1131	CP1131GS001NS	10/23/2007 9:06	5		GS	TO15	79-01-6	Trichloroethylene	NS1	17	=	ppbv	11	3.1			
P-5A	CPT	P-5A	CP1131	CP1131GS002NS	10/23/2007 10:09	10		GS	TO15	79-01-6	Trichloroethylene	NS1	12	=	ppbv	11	3.2			
P-5A	CPT	P-5A	CP1132	CP1132GS002NS	10/23/2007 12:30	10		GS	TO15	79-01-6	Trichloroethylene	NS1	15	=	ppbv	12	3.3			
P-5A	CPT	P-5A	CP1127	CP1127GS001NS	10/23/2007 16:00	5		GS	TO15	79-01-6	Trichloroethylene	NS1	1200	=	ppbv	11	3.1			
P-5A	CPT	P-5A	CP1127	CP1127GS002NS	10/23/2007 16:33	11		GS	TO15	79-01-6	Trichloroethylene	NS1	31	=	ppbv	11	3.2			
P-5A	CPT	P-5A	CP1126	CP1126GS001NS	10/25/2007 11:32	7		GS	TO15	79-01-6	Trichloroethylene	NS1	31	=	ppbv	11	3.1			
P-5A	CPT	P-5A	CP1133	CP1133GS001NS	10/25/2007 10:07	6		GS	TO15	79-01-6	Trichloroethylene	NS1	55	=	ppbv	11	3.2			
P-5A	CPT	P-5A	CP1133	CP1133GS002NS	10/25/2007 10:45	11		GS	TO15	79-01-6	Trichloroethylene	NS1	110	=	ppbv	12	3.3			
P-5A	CPT	P-5A	CP1126	CP1126GS002DS	10/25/2007 13:03	10		GS	TO15	79-01-6	Trichloroethylene	FD1	82	=	ppbv	12	3.3			

Table B17-1. Analytical Data Set, Detected Analytes, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-5A	CPT	P-5A	CP1126	CP1126GS002NS	10/25/2007 13:03	10		GS	TO15	79-01-6	Trichloroethylene	NS1	79	=	ppbv	11	3.1			
P-5A	CPT	P-5A	CP1139	CP1139GS001NS	11/1/2007 11:20	5		GS	TO15	79-01-6	Trichloroethylene	NS1	98	=	ppbv	12	0.33			
P-5A	CPT	P-5A	CP1139	CP1139GS002NS	11/1/2007 11:45	11		GS	TO15	79-01-6	Trichloroethylene	NS1	140	=	ppbv	11	0.31			
P-5A	CPT	P-5A	CP1141	CP1141GS002NS	11/2/2007 11:26	8.5		GS	TO15	79-01-6	Trichloroethylene	NS1	16	=	ppbv	11	0.04			
P-5A	CPT	P-5A	CP1142	CP1142GS001NS	11/1/2007 14:50	6		GS	TO15	79-01-6	Trichloroethylene	NS1	130	=	ppbv	12	0.04			
P-5A	CPT	P-5A	CP1142	CP1142GS002NS	11/1/2007 15:24	10		GS	TO15	79-01-6	Trichloroethylene	NS1	210	=	ppbv	12	0.041			
P-5A	CPT	P-5A	CP1143	CP1143GS002NS	11/1/2007 14:02	10		GS	TO15	79-01-6	Trichloroethylene	NS1	15	=	ppbv	11	0.039			
P-5A	CPT	P-5A	CP1146	CP1146GS001NS	11/7/2007 10:00	5		GS	TO15	79-01-6	Trichloroethylene	NS1	51	=	ppbv	12	3.3			
P-5A	CPT	P-5A	CP1146	CP1146GS002NS	11/7/2007 10:32	10		GS	TO15	79-01-6	Trichloroethylene	NS1	84	=	ppbv	12	3.3			
P-5A	CPT	P-5A	CP1145	CP1145GS001NS	11/7/2007 13:03	5		GS	TO15	79-01-6	Trichloroethylene	NS1	6600	=	ppbv	11	1.2			hi-Risk
P-5A	CPT	P-5A	CP1145	CP1145GS002NS	11/7/2007 13:33	10		GS	TO15	79-01-6	Trichloroethylene	NS1	8300	=	ppbv	12	1.4			
P-5A	CPT	P-5A	CP1147	CP1147GS001NS	11/7/2007 14:11	6.5		GS	TO15	79-01-6	Trichloroethylene	NS1	160	=	ppbv	11	1.3			
P-5A	CPT	P-5A	CP1147	CP1147GS002NS	11/7/2007 14:38	11		GS	TO15	79-01-6	Trichloroethylene	NS1	480	=	ppbv	12	1.3			
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	78-93-3	2-Butanone (MEK)	FD1	6.4	=	ppbv	0.68	0.041			max
P-6A	SGAS	CLOSURE	CP0848	CP0848GS002DS	12/20/2000 14:05	9.5	9.5	GS	TO14	67-64-1	Acetone	FD1	14	=	ppbv	28	0.1	J		
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	67-64-1	Acetone	FD1	12	=	ppbv	0.84	0.063			
P-6A	SGAS	CLOSURE2	CP1023	CP1023GS001NS	1/9/2002 14:15	11.5	11.5	GS	TO15	67-64-1	Acetone	NS1	11	=	ppbv	8.4	0.084			
P-6A	SGAS	CLOSURE2	CP1024	CP1024GS001NS	1/9/2002 14:35	12.3	12.3	GS	TO15	67-64-1	Acetone	NS1	26	=	ppbv	21	0.084			max
P-6A	SGAS	CLOSURE2	VEW-6A7	VEW6A7GS001FD	1/8/2002 12:42	5	10	GS	TO15	67-64-1	Acetone	FD1	2.2	=	ppbv	2.1	0.084			
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	71-43-2	Benzene	FD1	0.9	=	ppbv	0.63	0.015			max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	74-83-9	Bromomethane	FD1	0.29	=	ppbv	0.52	0.077	J		max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	75-15-0	Carbon Disulfide	FD1	0.64	=	ppbv	0.64	0.058			max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	74-87-3	Chloromethane	FD1	0.49	=	ppbv	0.97	0.058	J		max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	100-41-4	Ethylbenzene	FD1	0.41	=	ppbv	0.46	0.014	J		max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	XYLMP	m,p-Xylenes	FD1	1.4	=	ppbv	0.46	0.012			max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	95-47-6	o-Xylene	FD1	0.52	=	ppbv	0.46	0.017			max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	1634-04-4	tert-Butyl methyl ether (MTBE)	FD1	1.3	=	ppbv	0.55	0.017			max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	108-88-3	Toluene	FD1	42	=	ppbv	0.53	0.022			
P-6A	SGAS	CLOSURE	CP0848	CP0848GS002DS	12/20/2000 14:05	9.5	9.5	GS	TO14	108-88-3	Toluene	FD1	640	=	ppbv	18	0.076			
P-6A	SGAS	CLOSURE2	CP0939	CP0939GS001FD	1/9/2002 8:19	9.5	9.5	GS	TO15	108-88-3	Toluene	FD1	830	=	ppbv	13	0.053			hi-Risk
P-6A	SGAS	CLOSURE2	CP1023	CP1023GS001NS	1/9/2002 14:15	11.5	11.5	GS	TO15	108-88-3	Toluene	NS1	310	=	ppbv	5.3	0.053			
P-6A	SGAS	CLOSURE2	CP1024	CP1024GS001NS	1/9/2002 14:35	12.3	12.3	GS	TO15	108-88-3	Toluene	NS1	960	=	ppbv	13	0.053			
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	79-01-6	Trichloroethylene	FD1	0.29	=	ppbv	0.37	0.026	J		
P-6A	SGAS	CLOSURE	CP0848	CP0848GS002DS	12/20/2000 14:05	9.5	9.5	GS	TO14	79-01-6	Trichloroethylene	FD1	6.6	=	ppbv	12	0.035	J		
P-6A	SGAS	CLOSURE2	CP1023	CP1023GS001NS	1/9/2002 14:15	11.5	11.5	GS	TO15	79-01-6	Trichloroethylene	NS1	15	=	ppbv	3.7	0.056			
P-6A	SGAS	CLOSURE	VMW-6A3	VMW6A3BGS001NS	12/20/2000 9:53	9.5	10.5	GS	M18MS	79-01-6	Trichloroethylene	NS1	200	=	ppbv	200	100			
P-6A	SGAS	CLOSURE	VEW-6A9	VEW6A9GS001NS	12/20/2000 9:48	5	10	GS	M18MS	79-01-6	Trichloroethylene	NS1	280	=	ppbv	200	100			max
P-6A	SGAS	CLOSURE2	VEW-6A7	VEW6A7GS001FD	1/8/2002 12:42	5	10	GS	TO15	79-01-6	Trichloroethylene	FD1	63	=	ppbv	0.93	0.056			
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	75-69-4	Trichlorofluoromethane	FD1	0.22	=	ppbv	0.36	0.021	J		max
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-1	10/12/1995 16:45	6	6	GS	TO14	71-55-6	1,1,1-Trichloroethane	NS1	2.6	=	ppbv	0.1688	0.27			max
P-8A	OU2IS	OU2IS	SA15-CPT9	SA15CPT9-2	10/13/1995 13:55	13	13	GS	TO14	71-55-6	1,1,1-Trichloroethane	NS1	0.85	=	ppbv	0.1688	0.27			
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-1	10/12/1995 16:45	6	6	GS	TO14	75-35-4	1,1-Dichloroethene	NS1	2.1	=	ppbv	0.2938	0.47			max
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-2	10/13/1995 15:15	13	13	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	2.9	=	ppbv	0.2438	0.39	J+		
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-1	10/13/1995 9:55	6	6	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	0.95	=	ppbv	0.26	0.39			
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-1	10/12/1995 16:45	6	6	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	1.5	=	ppbv	0.2438	0.39			
P-8A	OU2IS	OU2IS	SA15-CPT7	SA15CPT7-1	10/13/1995 12:05	6	6	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	2.2	=	ppbv	0.2786	0.39			hi-Risk
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	2.4	=	ppbv	0.26	0.39			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-2	10/12/1995 8:20	12	12	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	1.9	=	ppbv	0.2294	0.39			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-3	10/13/1995 9:10	17	17	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	2.1	=	ppbv	0.2438	0.39			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-3	10/13/1995 10:20	17	17	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	2.2	=	ppbv	0.1773	0.39			
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-3	10/12/1995 17:05	17.5	17.5	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	1	=	ppbv	0.26	0.39			
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-4	10/13/1995 11:30	20	20	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	6.7	=	ppbv	0.2786	0.39			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-4	10/13/1995 9:30	20	20	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	2	=	ppbv	0.26	0.39			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-4	10/13/1995 10:30	20	20	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	2.4	=	ppbv	0.2294	0.39			
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-1	10/11/1995 12:55	5.5	5.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	0.99	=	ppbv	0.28	0.42	J+		
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-1	10/11/1995 16:05	6	6	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.3	=	ppbv	0.28	0.42	J+		
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-2	10/11/1995 13:05	11	11	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.1	=	ppbv	0.28	0.42	J+		
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-3	10/11/1995 17:00	17	17	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.9	=	ppbv	0.28	0.42	J+		
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-4	10/12/1995 11:00	24	24	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.4	=	ppbv	0.2214	0.31	J+		
P-8A	OU2IS	OU2IS	SA15-CPT13	SA15CPT13-1	10/12/1995 15:35	6	6	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.4	=	ppbv	0.3	0.42			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-1	10/13/1995 9:55	6	6	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.1	=	ppbv	0.2067	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-1	10/12/1995 16:45	6	6	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.1	=	ppbv	0.1938	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-1	10/13/1995 11:05	6	6	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.2	=	ppbv	0.2214	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT7	SA15CPT7-1	10/13/1995 12:05	6	6	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	0.9	=	ppbv	0.2214	0.31			
P-8A	OU2	SRAD	CP0564	CP0564GS001NS	3/12/1997 17:35	7	7.1	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	0.89	=	ppbv	0.86	0.72			
P-8A	OU2IS	OU2IS	SA15-CPT15	SA15CPT15-2	10/12/1995 12:55	12	12	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.2	=	ppbv	0.28	0.42			

Table B17-1. Analytical Data Set, Detected Analytes, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	5	=	ppbv	0.2067	0.31			hi-Risk
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-2	10/12/1995 8:20	12	12	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.5	=	ppbv	0.1824	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-2	10/11/1995 14:50	12.5	12.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.4	=	ppbv	0.2625	0.42			
P-8A	OU2IS	OU2IS	SA15-CPT13	SA15CPT13-2	10/12/1995 15:45	12.5	12.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.2	=	ppbv	0.28	0.42			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-2	10/12/1995 10:30	13	13	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.2	=	ppbv	0.2214	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-2	10/13/1995 10:10	13	13	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.2	=	ppbv	0.3	0.42			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-2	10/13/1995 15:15	13	13	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.4	=	ppbv	0.1938	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT7	SA15CPT7-2	10/13/1995 12:20	13	13	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	0.95	=	ppbv	0.2214	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-3	10/11/1995 15:10	17	17	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.4	=	ppbv	0.2625	0.42			
P-8A	OU2IS	OU2IS	SA15-CPT13	SA15CPT13-3	10/12/1995 15:55	17	17	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.4	=	ppbv	0.28	0.42			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-3	10/12/1995 8:35	17	17	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1	=	ppbv	0.2214	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT14	SA15CPT14-3	10/12/1995 14:55	17	17	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2	=	ppbv	0.28	0.42			
P-8A	OU2IS	OU2IS	SA15-CPT15	SA15CPT15-3	10/12/1995 13:05	17	17	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.4	=	ppbv	0.2625	0.42			
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-3	10/13/1995 11:25	17	17	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.1	=	ppbv	0.2214	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-3	10/13/1995 9:10	17	17	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	3.1	=	ppbv	0.1938	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT7	SA15CPT7-3	10/13/1995 12:30	17	17	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.2	=	ppbv	0.2214	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-3	10/13/1995 10:20	17	17	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.1	=	ppbv	0.1409	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT9	SA15CPT9-3	10/13/1995 14:05	17	17	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.1	=	ppbv	0.2067	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-3	10/12/1995 17:05	17.5	17.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.6	=	ppbv	0.2067	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-3	10/12/1995 10:45	17.5	17.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	0.9	=	ppbv	0.2214	0.31			
P-8A	OU2	SRAD	CP0461	CP0461GS003NS	7/12/1996 14:50	19	19.25	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	7.2	=	ppbv	1.4	1.1			
P-8A	OU2IS	OU2IS	SA15-CPT7	SA15CPT7-4	10/13/1995 12:40	20	20	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.2	=	ppbv	0.2214	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-4	10/13/1995 11:30	20	20	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.1	=	ppbv	0.2214	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-4	10/13/1995 9:30	20	20	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	3.6	=	ppbv	0.2067	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-4	10/13/1995 10:30	20	20	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	4.1	=	ppbv	0.1824	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-4	10/11/1995 15:25	20.5	20.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	3.2	=	ppbv	0.042	0.42		J	
P-8A	OU2IS	OU2IS	SA15-CPT13	SA15CPT13-4	10/12/1995 16:05	20.5	20.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.2	=	ppbv	0.28	0.42			
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-4	10/11/1995 17:20	20.5	20.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.8	=	ppbv	0.28	0.42			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-4	10/12/1995 8:45	20.5	20.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.6	=	ppbv	0.2214	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT9	SA15CPT9-4	10/13/1995 14:30	20.5	20.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	0.82	=	ppbv	0.2067	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT15	SA15CPT15-4	10/12/1995 13:25	21	21	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	0.84	=	ppbv	0.28	0.42			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-4	10/13/1995 15:30	22	22	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1	=	ppbv	0.2067	0.31			
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-1	10/12/1995 16:45	6	6	GS	TO14	95-50-1	1,2-Dichlorobenzene	NS1	0.98	=	ppbv	0.2688	0.43			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	95-50-1	1,2-Dichlorobenzene	NS1	3	=	ppbv	0.2867	0.43			max
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-2	10/12/1995 8:20	12	12	GS	TO14	95-50-1	1,2-Dichlorobenzene	NS1	1.2	=	ppbv	0.2529	0.43			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-2	10/13/1995 15:15	13	13	GS	TO14	95-50-1	1,2-Dichlorobenzene	NS1	1.2	=	ppbv	0.2688	0.43			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-3	10/13/1995 9:10	17	17	GS	TO14	95-50-1	1,2-Dichlorobenzene	NS1	1.7	=	ppbv	0.2688	0.43			
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-4	10/13/1995 11:30	20	20	GS	TO14	95-50-1	1,2-Dichlorobenzene	NS1	1.3	=	ppbv	0.3071	0.43			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-4	10/13/1995 9:30	20	20	GS	TO14	95-50-1	1,2-Dichlorobenzene	NS1	1.1	=	ppbv	0.2867	0.43			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-4	10/13/1995 10:30	20	20	GS	TO14	95-50-1	1,2-Dichlorobenzene	NS1	2.4	=	ppbv	0.2529	0.43			
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-1	10/13/1995 11:05	6	6	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	0.71	=	ppbv	0.1929	0.27			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	2	=	ppbv	0.18	0.27			max
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-2	10/11/1995 14:50	12.5	12.5	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	0.9	=	ppbv	0.2	0.32			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-3	10/13/1995 9:10	17	17	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	1	=	ppbv	0.1688	0.27			
P-8A	OU2	SRAD	CP0461	CP0461GS003NS	7/12/1996 14:50	19	19.25	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	1.7	=	ppbv	1.4	0.8			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-4	10/13/1995 9:30	20	20	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	1.2	=	ppbv	0.18	0.27			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-4	10/13/1995 10:30	20	20	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	1.4	=	ppbv	0.1588	0.27			
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-4	10/11/1995 17:20	20.5	20.5	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	0.76	=	ppbv	0.2133	0.32			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	541-73-1	1,3-Dichlorobenzene	NS1	1.8	=	ppbv	0.22	0.33			max
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-4	10/13/1995 10:30	20	20	GS	TO14	541-73-1	1,3-Dichlorobenzene	NS1	1	=	ppbv	0.1941	0.33			
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-4	10/13/1995 11:30	20	20	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	0.81	=	ppbv	0.2857	0.4	J-		
P-8A	OU2IS	OU2IS	SA15-CPT15	SA15CPT15-2	10/12/1995 12:55	12	12	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	2.4	=	ppbv	0.2667	0.4			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	2.2	=	ppbv	0.2667	0.4			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-3	10/13/1995 9:10	17	17	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	1	=	ppbv	0.25	0.4			
P-8A	OU2	SRAD	CP0461	CP0461GS003NS	7/12/1996 14:50	19	19.25	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	6	=	ppbv	1.4	1.1			max
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-4	10/13/1995 10:30	20	20	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	1.3	=	ppbv	0.2353	0.4			
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	28	=	ppbv	19	6.8	J	J	max
P-8A	OU2	SRAD	CP0564	CP0564GS001NS	3/12/1997 17:35	7	7.1	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	6.1	=	ppbv	3.4	1.8			
P-8A	OU2	SRAD	CP0461	CP0461GS003NS	7/12/1996 14:50	19	19.25	GS	TO14	78-93-3	2-Butanone (MEK)	NS1	7.1	=	ppbv	5.7	2.8			
P-8A	OU2	SRAD	CP0564	CP0564GS001NS	3/12/1997 17:35	7	7.1	GS	TO14	67-64-1	Acetone	NS1	32	=	ppbv	3.4	1.5			
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	67-64-1	Acetone	NS1	74	=	ppbv	19	8.2			max
P-8A	OU2	SRAD	CP0461	CP0461GS003NS	7/12/1996 14:50	19	19.25	GS	TO14	67-64-1	Acetone	NS1	35	=	ppbv	5.7	5			
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	71-43-2	Benzene	NS1	6.8	=	ppbv	4.8	2.3	J	J	max
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-A	10/12/1995 7:50 ?			GS	TO14	71-43-2	Benzene	NS1	0.95	=	ppbv	0.1733	0.26			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-1	10/11/1995 14:40	6	6	GS	TO14	74-83-9	Bromomethane	NS1	3.2	=	ppbv	0.1316	0.25			max
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-2	10/11/1995 14:50	12.5	12.5	GS	TO14	74-83-9	Bromomethane	NS1	1.1	=	ppbv	0.1563	0.25			

Table B17-1. Analytical Data Set, Detected Analytes, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-2	10/13/1995 10:10	13	13	GS	TO14	74-83-9	Bromomethane	NS1	0.87	=	ppbv	0.1786	0.25			
P-8A	OU2IS	OU2IS	SA15-CPT9	SA15CPT9-2	10/13/1995 13:55	13	13	GS	TO14	56-23-5	Carbon tetrachloride	NS1	13	=	ppbv	0.225	0.36			max
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-2	10/11/1995 13:05	11	11	GS	TO14	75-00-3	Chloroethane	NS1	15	=	ppbv	0.22	0.33			max
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-2	10/13/1995 11:15	12.5	12.5	GS	TO14	67-66-3	Chloroform	NS1	0.94	=	ppbv	0.2667	0.4			
P-8A	OU2IS	OU2IS	SA15-CPT9	SA15CPT9-2	10/13/1995 13:55	13	13	GS	TO14	67-66-3	Chloroform	NS1	9.6	=	ppbv	0.25	0.4			max
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-3	10/12/1995 8:35	17	17	GS	TO14	67-66-3	Chloroform	NS1	1.1	=	ppbv	0.2857	0.4			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-3	10/13/1995 15:25	19	19	GS	TO14	67-66-3	Chloroform	NS1	2.4	=	ppbv	0.08	0.4	J		
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-4	10/11/1995 15:25	20.5	20.5	GS	TO14	67-66-3	Chloroform	NS1	2.7	=	ppbv	0.044	0.44	J		
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-4	10/11/1995 17:20	20.5	20.5	GS	TO14	67-66-3	Chloroform	NS1	0.89	=	ppbv	0.2933	0.44			
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-1	10/11/1995 12:55	5.5	5.5	GS	TO14	74-87-3	Chloromethane	NS1	2.3	=	ppbv	0.2733	0.41			max
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-1	10/11/1995 16:05	6	6	GS	TO14	74-87-3	Chloromethane	NS1	1.2	=	ppbv	0.2733	0.41			
P-8A	OU2IS	OU2IS	SA15-CPT13	SA15CPT13-1	10/12/1995 15:35	6	6	GS	TO14	74-87-3	Chloromethane	NS1	1.2	=	ppbv	0.2929	0.41			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-1	10/11/1995 14:40	6	6	GS	TO14	74-87-3	Chloromethane	NS1	1.8	=	ppbv	0.2158	0.41			
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-2	10/11/1995 13:05	11	11	GS	TO14	74-87-3	Chloromethane	NS1	1.7	=	ppbv	0.2733	0.41			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-2	10/12/1995 8:20	12	12	GS	TO14	74-87-3	Chloromethane	NS1	1.6	=	ppbv	0.2824	0.48			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-2	10/11/1995 14:50	12.5	12.5	GS	TO14	74-87-3	Chloromethane	NS1	1.6	=	ppbv	0.2563	0.41			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-3	10/11/1995 15:10	17	17	GS	TO14	74-87-3	Chloromethane	NS1	1.4	=	ppbv	0.2563	0.41			
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-3	10/11/1995 17:00	17	17	GS	TO14	74-87-3	Chloromethane	NS1	0.87	=	ppbv	0.2733	0.41			
P-8A	OU2IS	OU2IS	SA15-CPT14	SA15CPT14-3	10/12/1995 14:55	17	17	GS	TO14	74-87-3	Chloromethane	NS1	1.5	=	ppbv	0.2733	0.41			
P-8A	OU2IS	OU2IS	SA15-CPT9	SA15CPT9-3	10/13/1995 14:05	17	17	GS	TO14	74-87-3	Chloromethane	NS1	1.1	=	ppbv	0.32	0.48			
P-8A	OU2	SRAD	CP0461	CP0461GS003NS	7/12/1996 14:50	19	19.25	GS	TO14	74-87-3	Chloromethane	NS1	1.6	=	ppbv	1.4	0.86			
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-4	10/11/1995 13:30	20	20	GS	TO14	74-87-3	Chloromethane	NS1	1	=	ppbv	0.2563	0.41			
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-4	10/11/1995 17:20	20.5	20.5	GS	TO14	74-87-3	Chloromethane	NS1	1	=	ppbv	0.2733	0.41			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-4	10/12/1995 11:00	24	24	GS	TO14	74-87-3	Chloromethane	NS1	1.6	=	ppbv	0.3429	0.48			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-3	10/13/1995 15:25	19	19	GS	TO14	156-59-2	cis-1,2-Dichloroethene	NS1	3.6	=	ppbv	0.098	0.49			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-4	10/11/1995 15:25	20.5	20.5	GS	TO14	156-59-2	cis-1,2-Dichloroethene	NS1	6.6	=	ppbv	0.02	0.2			max
P-8A	OU2	SRAD	CP0461	CP0461GS003NS	7/12/1996 14:50	19	19.25	GS	TO14	110-82-7	Cyclohexane	NS1	530	=	ppbv	5.7	3.4			max
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-1	10/11/1995 12:55	5.5	5.5	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	0.99	=	ppbv	0.28	0.42	J-		
P-8A	OU2IS	OU2IS	SA15-CPT13	SA15CPT13-1	10/12/1995 15:35	6	6	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	0.98	=	ppbv	0.3	0.42	J-		
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-2	10/11/1995 13:05	11	11	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	0.94	=	ppbv	0.28	0.42	J-		
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-2	10/12/1995 8:20	12	12	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	1.8	=	ppbv	0.1529	0.26	J-		
P-8A	OU2IS	OU2IS	SA15-CPT15	SA15CPT15-1	10/12/1995 12:45	6	6	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	0.82	=	ppbv	0.1625	0.26			
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-1	10/13/1995 11:05	6	6	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	2.7	=	ppbv	0.1857	0.26			max
P-8A	OU2IS	OU2IS	SA15-CPT14	SA15CPT14-2	10/12/1995 14:45	12.5	12.5	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	0.81	=	ppbv	0.1733	0.26			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-2	10/12/1995 10:30	13	13	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	1.2	=	ppbv	0.1857	0.26			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-3	10/12/1995 8:35	17	17	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	1.9	=	ppbv	0.1857	0.26			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-3	10/12/1995 10:45	17.5	17.5	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	0.93	=	ppbv	0.1857	0.26			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-4	10/12/1995 8:45	20.5	20.5	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	2.4	=	ppbv	0.1857	0.26			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-4	10/12/1995 11:00	24	24	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	0.89	=	ppbv	0.1857	0.26			
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	64-17-5	Ethanol	NS1	30	=	ppbv	19	17	J	J	max
P-8A	OU2	SRAD	CP0461	CP0461GS003NS	7/12/1996 14:50	19	19.25	GS	TO14	64-17-5	Ethanol	NS1	14	=	ppbv	5.7	1.3			
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	100-41-4	Ethylbenzene	NS1	18	=	ppbv	4.8	1.6	J	J	
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-1	10/11/1995 16:05	6	6	GS	TO14	100-41-4	Ethylbenzene	NS1	25	=	ppbv	0.1933	0.29			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-1	10/12/1995 10:15	6	6	GS	TO14	100-41-4	Ethylbenzene	NS1	2.4	=	ppbv	0.2867	0.43			
P-8A	OU2IS	OU2IS	SA15-CPT14	SA15CPT14-1	10/12/1995 14:35	6	6	GS	TO14	100-41-4	Ethylbenzene	NS1	2.8	=	ppbv	0.2688	0.43			
P-8A	OU2IS	OU2IS	SA15-CPT13	SA15CPT13-1	10/12/1995 15:35	6	6	GS	TO14	100-41-4	Ethylbenzene	NS1	0.84	=	ppbv	0.2071	0.29			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-1	10/13/1995 8:25	6	6	GS	TO14	100-41-4	Ethylbenzene	NS1	18	=	ppbv	0.2867	0.43			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-1	10/13/1995 9:55	6	6	GS	TO14	100-41-4	Ethylbenzene	NS1	7.7	=	ppbv	0.2867	0.43			
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-1	10/12/1995 16:45	6	6	GS	TO14	100-41-4	Ethylbenzene	NS1	0.88	=	ppbv	0.2688	0.43			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-1	10/12/1995 8:00	6	6	GS	TO14	100-41-4	Ethylbenzene	NS1	30	=	ppbv	0.1933	0.29			max
P-8A	OU2	SRAD	CP0564	CP0564GS001NS	3/12/1997 17:35	7	7.1	GS	TO14	100-41-4	Ethylbenzene	NS1	20	=	ppbv	0.86	0.5			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-2	10/11/1995 14:50	12.5	12.5	GS	TO14	100-41-4	Ethylbenzene	NS1	1.1	=	ppbv	0.1813	0.29			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-3	10/11/1995 15:10	17	17	GS	TO14	100-41-4	Ethylbenzene	NS1	1.8	=	ppbv	0.1813	0.29			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-4	10/11/1995 15:25	20.5	20.5	GS	TO14	100-41-4	Ethylbenzene	NS1	2.1	=	ppbv	0.029	0.29	J		
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-4	10/11/1995 17:20	20.5	20.5	GS	TO14	100-41-4	Ethylbenzene	NS1	1	=	ppbv	0.1933	0.29			
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	142-82-5	Heptane	NS1	31	=	ppbv	19	9.5	J	J	max
P-8A	OU2	SRAD	CP0564	CP0564GS001NS	3/12/1997 17:35	7	7.1	GS	TO14	142-82-5	Heptane	NS1	5.8	=	ppbv	3.4	1.9			
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	110-54-3	Hexane	NS1	2700	=	ppbv	19	12	J	E	max
P-8A	OU2	SRAD	CP0564	CP0564GS001NS	3/12/1997 17:35	7	7.1	GS	TO14	XYLMP	m,p-Xylenes	NS1	89	=	ppbv	0.86	0.77			max
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	XYLMP	m,p-Xylenes	NS1	74	=	ppbv	4.8	3.1			
P-8A	OU2	SRAD	CP0461	CP0461GS003NS	7/12/1996 14:50	19	19.25	GS	TO14	XYLMP	m,p-Xylenes	NS1	2.1	=	ppbv	1.4	1.1			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	75-09-2	Methylene Chloride	NS1	0.8	=	ppbv	0.2533	0.38	J		
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-1	10/11/1995 16:05	6	6	GS	TO14	75-09-2	Methylene Chloride	NS1	2.5	=	ppbv	0.3267	0.49			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-1	10/12/1995 10:15	6	6	GS	TO14	75-09-2	Methylene Chloride	NS1	0.98	=	ppbv	0.2533	0.38			
P-8A	OU2IS	OU2IS	SA15-CPT14	SA15CPT14-1	10/12/1995 14:35	6	6	GS	TO14	75-09-2	Methylene Chloride	NS1	0.93	=	ppbv	0.2375	0.38			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-1	10/13/1995 8:25	6	6	GS	TO14	75-09-2	Methylene Chloride	NS1	16	=	ppbv	0.2533	0.38			max

Table B17-1. Analytical Data Set, Detected Analytes, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-1	10/11/1995 14:40	6	6	GS	TO14	75-09-2	Methylene Chloride	NS1	3	=	ppbv	0.2579	0.49			
P-8A	OU2IS	OU2IS	SA15-CPT15	SA15CPT15-2	10/12/1995 12:55	12	12	GS	TO14	75-09-2	Methylene Chloride	NS1	1.3	=	ppbv	0.3267	0.49			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-2	10/12/1995 8:20	12	12	GS	TO14	75-09-2	Methylene Chloride	NS1	3.6	=	ppbv	0.2235	0.38			
P-8A	OU2IS	OU2IS	SA15-CPT14	SA15CPT14-2	10/12/1995 14:45	12.5	12.5	GS	TO14	75-09-2	Methylene Chloride	NS1	1.1	=	ppbv	0.2533	0.38			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-2	10/13/1995 15:15	13	13	GS	TO14	75-09-2	Methylene Chloride	NS1	2.9	=	ppbv	0.2375	0.38			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-3	10/11/1995 15:10	17	17	GS	TO14	75-09-2	Methylene Chloride	NS1	2.8	=	ppbv	0.3063	0.49			
P-8A	OU2	SRAD	CP0461	CP0461GS003NS	7/12/1996 14:50	19	19.25	GS	TO14	75-09-2	Methylene Chloride	NS1	1.9	=	ppbv	1.4	1.1		U	
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-4	10/11/1995 13:30	20	20	GS	TO14	75-09-2	Methylene Chloride	NS1	0.83	=	ppbv	0.3063	0.49			
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-4	10/13/1995 11:30	20	20	GS	TO14	75-09-2	Methylene Chloride	NS1	9.1	=	ppbv	0.2714	0.38			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-4	10/12/1995 11:00	24	24	GS	TO14	75-09-2	Methylene Chloride	NS1	1.9	=	ppbv	0.2714	0.38			
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-1	10/11/1995 12:55	5.5	5.5	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.5	=	ppbv	0.3067	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-1	10/11/1995 16:05	6	6	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	100	=	ppbv	0.3067	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-1	10/12/1995 10:15	6	6	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	9.7	=	ppbv	0.34	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT14	SA15CPT14-1	10/12/1995 14:35	6	6	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	17	=	ppbv	0.3188	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT13	SA15CPT13-1	10/12/1995 15:35	6	6	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	4.6	=	ppbv	0.3286	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-1	10/13/1995 8:25	6	6	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	84	=	ppbv	0.34	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-1	10/13/1995 9:55	6	6	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	38	=	ppbv	0.34	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-1	10/12/1995 16:45	6	6	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	5.5	=	ppbv	0.3188	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-1	10/13/1995 15:10	6	6	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	13	=	ppbv	0.34	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-1	10/13/1995 11:05	6	6	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	0.93	=	ppbv	0.3643	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT7	SA15CPT7-1	10/13/1995 12:05	6	6	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	6.6	=	ppbv	0.3643	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-1	10/11/1995 14:40	6	6	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	2.8	=	ppbv	0.2421	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-1	10/12/1995 8:00	6	6	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	120	=	ppbv	0.3067	0.46			max
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-2	10/11/1995 13:05	11	11	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.5	=	ppbv	0.3067	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT15	SA15CPT15-2	10/12/1995 12:55	12	12	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.7	=	ppbv	0.3067	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	3	=	ppbv	0.34	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-2	10/12/1995 8:20	12	12	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	2.6	=	ppbv	0.3	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-2	10/11/1995 14:50	12.5	12.5	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	5.6	=	ppbv	0.2875	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-2	10/12/1995 16:55	12.5	12.5	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	0.9	=	ppbv	0.34	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT13	SA15CPT13-2	10/12/1995 15:45	12.5	12.5	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.2	=	ppbv	0.3067	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-2	10/12/1995 10:30	13	13	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.5	=	ppbv	0.3643	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-2	10/13/1995 10:10	13	13	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	2.4	=	ppbv	0.3286	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT7	SA15CPT7-2	10/13/1995 12:20	13	13	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.3	=	ppbv	0.3643	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-3	10/11/1995 13:15	16	16	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.1	=	ppbv	0.2875	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-3	10/11/1995 15:10	17	17	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	6.7	=	ppbv	0.2875	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-3	10/11/1995 17:00	17	17	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	5.1	=	ppbv	0.3067	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT13	SA15CPT13-3	10/12/1995 15:55	17	17	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.4	=	ppbv	0.3067	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-3	10/12/1995 8:35	17	17	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.7	=	ppbv	0.3643	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT14	SA15CPT14-3	10/12/1995 14:55	17	17	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.7	=	ppbv	0.3067	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT15	SA15CPT15-3	10/12/1995 13:05	17	17	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.7	=	ppbv	0.2875	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-3	10/13/1995 11:25	17	17	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	0.93	=	ppbv	0.3643	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-3	10/13/1995 9:10	17	17	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	2.3	=	ppbv	0.3188	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT7	SA15CPT7-3	10/13/1995 12:30	17	17	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.3	=	ppbv	0.3643	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-3	10/13/1995 10:20	17	17	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	2.4	=	ppbv	0.2318	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT9	SA15CPT9-3	10/13/1995 14:05	17	17	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.4	=	ppbv	0.34	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-3	10/12/1995 17:05	17.5	17.5	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.1	=	ppbv	0.34	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-3	10/12/1995 10:45	17.5	17.5	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.1	=	ppbv	0.3643	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT7	SA15CPT7-4	10/13/1995 12:40	20	20	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.2	=	ppbv	0.3643	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-4	10/13/1995 11:30	20	20	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.1	=	ppbv	0.3643	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-4	10/13/1995 9:30	20	20	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	2.8	=	ppbv	0.34	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-4	10/13/1995 10:30	20	20	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.5	=	ppbv	0.3	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-4	10/11/1995 15:25	20.5	20.5	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	8.9	=	ppbv	0.046	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT13	SA15CPT13-4	10/12/1995 16:05	20.5	20.5	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.4	=	ppbv	0.3067	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-4	10/12/1995 17:15	20.5	20.5	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1	=	ppbv	0.34	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-4	10/11/1995 17:20	20.5	20.5	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	4.5	=	ppbv	0.3067	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-4	10/12/1995 8:45	20.5	20.5	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	2	=	ppbv	0.3643	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT9	SA15CPT9-4	10/13/1995 14:30	20.5	20.5	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.6	=	ppbv	0.34	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT15	SA15CPT15-4	10/12/1995 13:25	21	21	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.1	=	ppbv	0.3067	0.46			
P-8A	OU2IS	OU2IS	SA15-CPT14	SA15CPT14-4	10/12/1995 15:05	22	22	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	0.96	=	ppbv	0.34	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-4	10/13/1995 15:30	22	22	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	0.89	=	ppbv	0.34	0.51			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-4	10/12/1995 11:00	24	24	GS	TO14	108-38-3	m-Xylene (1,3-Dimethylbenzene)	NS1	1.4	=	ppbv	0.3643	0.51			
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	95-47-6	o-Xylene	NS1	15	=	ppbv	4.8	2.8	J	J	
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-1	10/11/1995 16:05	6	6	GS	TO14	95-47-6	o-Xylene	NS1	30	=	ppbv	0.1933	0.29			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-1	10/12/1995 10:15	6	6	GS	TO14	95-47-6	o-Xylene	NS1	2.4	=	ppbv	0.3133	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT14	SA15CPT14-1	10/12/1995 14:35	6	6	GS	TO14	95-47-6	o-Xylene	NS1	7.4	=	ppbv	0.2938	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT13	SA15CPT13-1	10/12/1995 15:35	6	6	GS	TO14	95-47-6	o-Xylene	NS1	2.2	=	ppbv	0.2071	0.29			

Table B17-1. Analytical Data Set, Detected Analytes, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-1	10/13/1995 9:55	6	6	GS	TO14	95-47-6	o-Xylene	NS1	15	=	ppbv	0.3133	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-1	10/12/1995 16:45	6	6	GS	TO14	95-47-6	o-Xylene	NS1	2.1	=	ppbv	0.2938	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-1	10/13/1995 15:10	6	6	GS	TO14	95-47-6	o-Xylene	NS1	3.7	=	ppbv	0.3133	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT7	SA15CPT7-1	10/13/1995 12:05	6	6	GS	TO14	95-47-6	o-Xylene	NS1	3.8	=	ppbv	0.3357	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-1	10/11/1995 14:40	6	6	GS	TO14	95-47-6	o-Xylene	NS1	0.99	=	ppbv	0.1526	0.29			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-1	10/12/1995 8:00	6	6	GS	TO14	95-47-6	o-Xylene	NS1	39	=	ppbv	0.1933	0.29			
P-8A	OU2	SRAD	CP0564	CP0564GS001NS	3/12/1997 17:35	7	7.1	GS	TO14	95-47-6	o-Xylene	NS1	59	=	ppbv	0.86	0.41			max
P-8A	OU2IS	OU2IS	SA15-CPT15	SA15CPT15-2	10/12/1995 12:55	12	12	GS	TO14	95-47-6	o-Xylene	NS1	0.81	=	ppbv	0.1933	0.29			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	95-47-6	o-Xylene	NS1	1.4	=	ppbv	0.3133	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-2	10/12/1995 8:20	12	12	GS	TO14	95-47-6	o-Xylene	NS1	1.1	=	ppbv	0.2765	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-2	10/11/1995 14:50	12.5	12.5	GS	TO14	95-47-6	o-Xylene	NS1	2.3	=	ppbv	0.1813	0.29			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-2	10/13/1995 10:10	13	13	GS	TO14	95-47-6	o-Xylene	NS1	1	=	ppbv	0.2071	0.29			
P-8A	OU2IS	OU2IS	SA15-CPT7	SA15CPT7-2	10/13/1995 12:20	13	13	GS	TO14	95-47-6	o-Xylene	NS1	0.75	=	ppbv	0.3357	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-3	10/11/1995 15:10	17	17	GS	TO14	95-47-6	o-Xylene	NS1	2.5	=	ppbv	0.1813	0.29			
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-3	10/11/1995 17:00	17	17	GS	TO14	95-47-6	o-Xylene	NS1	2.1	=	ppbv	0.1933	0.29			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-3	10/12/1995 8:35	17	17	GS	TO14	95-47-6	o-Xylene	NS1	0.88	=	ppbv	0.3357	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-3	10/13/1995 9:10	17	17	GS	TO14	95-47-6	o-Xylene	NS1	1.1	=	ppbv	0.2938	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-3	10/13/1995 10:20	17	17	GS	TO14	95-47-6	o-Xylene	NS1	1.3	=	ppbv	0.2136	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-4	10/11/1995 15:25	20.5	20.5	GS	TO14	95-47-6	o-Xylene	NS1	3.6	=	ppbv	0.029	0.29		J	
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-4	10/11/1995 17:20	20.5	20.5	GS	TO14	95-47-6	o-Xylene	NS1	2	=	ppbv	0.1933	0.29			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-4	10/12/1995 8:45	20.5	20.5	GS	TO14	95-47-6	o-Xylene	NS1	1	=	ppbv	0.3357	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT7	SA15CPT7-1	10/13/1995 12:05	6	6	GS	TO14	100-42-5	Styrene	NS1	1.1	=	ppbv	0.2	0.28			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	100-42-5	Styrene	NS1	2.1	=	ppbv	0.1867	0.28			max
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-2	10/12/1995 8:20	12	12	GS	TO14	100-42-5	Styrene	NS1	1.4	=	ppbv	0.1647	0.28			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-2	10/13/1995 15:15	13	13	GS	TO14	100-42-5	Styrene	NS1	0.89	=	ppbv	0.175	0.28			
P-8A	OU2IS	OU2IS	SA15-CPT7	SA15CPT7-2	10/13/1995 12:20	13	13	GS	TO14	100-42-5	Styrene	NS1	0.82	=	ppbv	0.2	0.28			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-3	10/13/1995 9:10	17	17	GS	TO14	100-42-5	Styrene	NS1	1.4	=	ppbv	0.175	0.28			
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-4	10/13/1995 11:30	20	20	GS	TO14	100-42-5	Styrene	NS1	2.9	=	ppbv	0.2	0.28			
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-4	10/13/1995 9:30	20	20	GS	TO14	100-42-5	Styrene	NS1	2	=	ppbv	0.1867	0.28			
P-8A	OU2	SRAD	CP0564	CP0564GS001NS	3/12/1997 17:35	7	7.1	GS	TO14	127-18-4	Tetrachloroethene	NS1	7.1	=	ppbv	0.86	0.51			hi-Risk
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-2	10/13/1995 11:15	12.5	12.5	GS	TO14	127-18-4	Tetrachloroethene	NS1	3	=	ppbv	0.2933	0.44			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-2	10/13/1995 15:15	13	13	GS	TO14	127-18-4	Tetrachloroethene	NS1	2.7	=	ppbv	0.275	0.44			
P-8A	OU2IS	OU2IS	SA15-CPT9	SA15CPT9-2	10/13/1995 13:55	13	13	GS	TO14	127-18-4	Tetrachloroethene	NS1	5.9	=	ppbv	0.275	0.44			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-3	10/12/1995 8:35	17	17	GS	TO14	127-18-4	Tetrachloroethene	NS1	12	=	ppbv	0.3143	0.44			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-3	10/12/1995 10:45	17.5	17.5	GS	TO14	127-18-4	Tetrachloroethene	NS1	4.6	=	ppbv	0.3143	0.44			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-3	10/13/1995 15:25	19	19	GS	TO14	127-18-4	Tetrachloroethene	NS1	8.4	=	ppbv	0.088	0.44			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-4	10/11/1995 15:25	20.5	20.5	GS	TO14	127-18-4	Tetrachloroethene	NS1	5.7	=	ppbv	0.029	0.29			
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-4	10/11/1995 17:20	20.5	20.5	GS	TO14	127-18-4	Tetrachloroethene	NS1	1.1	=	ppbv	0.1933	0.29			
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-1	10/11/1995 16:05	6	6	GS	TO14	108-88-3	Toluene	NS1	11	=	ppbv	0.18	0.27			
P-8A	OU2IS	OU2IS	SA15-CPT8	SA15CPT8-1	10/13/1995 9:55	6	6	GS	TO14	108-88-3	Toluene	NS1	1.5	=	ppbv	0.1467	0.22			
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-1	10/13/1995 11:05	6	6	GS	TO14	108-88-3	Toluene	NS1	1.8	=	ppbv	0.1571	0.22			
P-8A	OU2	SRAD	CP0564	CP0564GS001NS	3/12/1997 17:35	7	7.1	GS	TO14	108-88-3	Toluene	NS1	1.7	=	ppbv	0.86	0.72			
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	108-88-3	Toluene	NS1	250	=	ppbv	4.8	3.6			max
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-2	10/11/1995 14:50	12.5	12.5	GS	TO14	108-88-3	Toluene	NS1	52	=	ppbv	0.1688	0.27			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-3	10/11/1995 15:10	17	17	GS	TO14	108-88-3	Toluene	NS1	66	=	ppbv	0.1688	0.27			
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-3	10/11/1995 17:00	17	17	GS	TO14	108-88-3	Toluene	NS1	12	=	ppbv	0.18	0.27			
P-8A	OU2	SRAD	CP0461	CP0461GS003NS	7/12/1996 14:50	19	19.25	GS	TO14	108-88-3	Toluene	NS1	4.5	=	ppbv	1.4	0.98			
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-4	10/11/1995 17:20	20.5	20.5	GS	TO14	108-88-3	Toluene	NS1	11	=	ppbv	0.18	0.27			
P-8A	OU2	SRAD	CP0461	CP0461GS003NS	7/12/1996 14:50	19	19.25	GS	TO14	NCH4H	Total Non-Methane Hydrocarbons	NS1	4400	=	ppbv	14				
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	79-01-6	Trichloroethylene	NS1	8.9	=	ppbv	4.8	2.9	J	J	
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-1	10/11/1995 16:05	6	6	GS	TO14	79-01-6	Trichloroethylene	NS1	3.9	=	ppbv	0.14	0.21			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-1	10/13/1995 15:10	6	6	GS	TO14	79-01-6	Trichloroethylene	NS1	2.1	=	ppbv	0.3133	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-1	10/11/1995 14:40	6	6	GS	TO14	79-01-6	Trichloroethylene	NS1	4.1	=	ppbv	0.1105	0.21			
P-8A	OU2	SRAD	CP0564	CP0564GS001NS	3/12/1997 17:35	7	7.1	GS	TO14	79-01-6	Trichloroethylene	NS1	38	=	ppbv	0.86	0.58			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-2	10/13/1995 15:15	13	13	GS	TO14	79-01-6	Trichloroethylene	NS1	190	=	ppbv	0.2938	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT9	SA15CPT9-2	10/13/1995 13:55	13	13	GS	TO14	79-01-6	Trichloroethylene	NS1	1	=	ppbv	0.2938	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-3	10/12/1995 8:35	17	17	GS	TO14	79-01-6	Trichloroethylene	NS1	20	=	ppbv	0.3357	0.47		B	
P-8A	OU2IS	OU2IS	SA15-CPT9	SA15CPT9-3	10/13/1995 14:05	17	17	GS	TO14	79-01-6	Trichloroethylene	NS1	2.4	=	ppbv	0.3133	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT3	SA15CPT3-3	10/12/1995 10:45	17.5	17.5	GS	TO14	79-01-6	Trichloroethylene	NS1	92	=	ppbv	0.3357	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-3	10/13/1995 15:25	19	19	GS	TO14	79-01-6	Trichloroethylene	NS1	840	=	ppbv	0.094	0.47			max
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-4	10/11/1995 13:30	20	20	GS	TO14	79-01-6	Trichloroethylene	NS1	2.8	=	ppbv	0.1313	0.21			
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-4	10/11/1995 15:25	20.5	20.5	GS	TO14	79-01-6	Trichloroethylene	NS1	660	=	ppbv	0.021	0.21			
P-8A	OU2IS	OU2IS	SA15-CPT2	SA15CPT2-4	10/11/1995 17:20	20.5	20.5	GS	TO14	79-01-6	Trichloroethylene	NS1	72	=	ppbv	0.14	0.21			
P-8A	OU2IS	OU2IS	SA15-CPT9	SA15CPT9-4	10/13/1995 14:30	20.5	20.5	GS	TO14	79-01-6	Trichloroethylene	NS1	2.4	=	ppbv	0.3133	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-4	10/13/1995 15:30	22	22	GS	TO14	79-01-6	Trichloroethylene	NS1	5.4	=	ppbv	0.3133	0.47			
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-A	10/12/1995 7:50 ?			GS	TO14	79-01-6	Trichloroethylene	NS1	0.82	=	ppbv	0.14	0.21			

Table B17-2. Analytical Data Set, Site-Specific Exposure Concentrations, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-1A	SGAS	CLOSURE2	CP0946	CP0946GS001FD	1/7/2002 13:05	6	6	GS	TO15	67-64-1	Acetone	FD1	17	=	ppbv	8.4	0.084			max
P-1A	SGAS	CLOSURE2	CP1022	CP1022GS002FD	1/9/2002 12:55	10.5	10.5	GS	TO15	71-43-2	Benzene	FD1	2.1	=	ppbv	1.3	0.025			max
P-1A	SGAS	CLOSURE2	CP0942	CP0942GS003FD	1/7/2002 15:00	13	13	GS	TO15	78-93-3	2-Butanone	FD1	6.4	=	ppbv	4.2	0.1			max
P-1A	SGAS	CLOSURE2	CP1022	CP1022GS002FD	1/9/2002 12:55	10.5	10.5	GS	TO15	75-15-0	Carbon Disulfide	FD1	1.4	=	ppbv	1.3	0.064			max
P-1A	SGAS	CLOSURE2	CP1022	CP1022GS002FD	1/9/2002 12:55	10.5	10.5	GS	TO15	67-66-3	Chloroform	FD1	4.1	=	ppbv	0.82	0.041			max
P-1A	SGAS	CLOSURE2	VEW-1A1	VEW1A1GS001FD	1/7/2002 14:32	5	15	GS	TO15	127-18-4	Tetrachloroethene	FD1	14	=	ppbv	3	0.03			max
P-1A	SGAS	CLOSURE2	CP0944	CP0944GS002FD	1/8/2002 9:08	10	10	GS	TO15	108-88-3	Toluene	FD1	1300	=	ppbv	27	0.053			max
P-1A	SGAS	CLOSURE2	VEW-1A8	VEW1A8GS001NS	1/8/2002 11:09	5	15	GS	M18MS	79-01-6	Trichloroethene	NS1	660	=	ppbv	200	200			max
P-1A	SGAS	CLOSURE2	CP1022	CP1022GS002FD	1/9/2002 12:55	10.5	10.5	GS	TO15	75-69-4	Trichlorofluoromethane	FD1	3.3	=	ppbv	1.4	0.053			max
P-1A	SGAS	CLOSURE2	CP0942	CP0942GS003FD	1/7/2002 15:00	13	13	GS	TO15	1330-20-7	m- & p-Xylenes	FD1	3.3	=	ppbv	2.9	0.046			max
P-1B	SGAS	CLOSURE2	CP0953	CP0953GS001FD	1/8/2002 11:22	6	6	GS	TO15	108-88-3	Toluene	FD1	820	=	ppbv	13	0.053			max
P-1B	SGAS	CLOSURE2	VMW-1B1	VMW1B1GS002NS	1/9/2002 13:38	8.5	9.5	GS	M18MS	79-01-6	Trichloroethene	NS1	800	=	ppbv	200	200			max
P-1C	SGAS	CLOSURE2	VMW-1C1	VMW1C1GS003FD	1/9/2002 12:50	12.5	13.5	GS	TO15	67-64-1	Acetone	FD1	3.1	=	ppbv	0.84	0.084			max
P-1C	SGAS	CLOSURE2	VMW-1C1	VMW1C1GS003FD	1/9/2002 12:50	12.5	13.5	GS	TO15	78-93-3	2-Butanone	FD1	0.87	=	ppbv	0.68	0.1			max
P-1C	SGAS	CLOSURE2	VMW-1C1	VMW1C1GS003FD	1/9/2002 12:50	12.5	13.5	GS	TO15	75-15-0	Carbon Disulfide	FD1	1	=	ppbv	0.64	0.064			max
P-1C	SGAS	CLOSURE2	CP0960	CP0960GS003FD	1/8/2002 14:10	13	13	GS	TO15	108-88-3	Toluene	FD1	1900	=	ppbv	27	0.053			max
P-1C	SGAS	CLOSURE2	VEW-1C2	VEW1C2GS001NS	1/7/2002 13:24	5	12.5	GS	M18MS	79-01-6	Trichloroethene	NS1	800	=	ppbv	200	200			max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	67-64-1	Acetone	NS1	200	=	ppbv	3.7			J+	max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	71-43-2	Benzene	NS1	5.7	=	ppbv	0.94	0.49		J+	max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	78-93-3	2-Butanone	NS1	16	=	ppbv	3.7			J+	max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	74-87-3	Chloromethane	NS1	2.4	=	ppbv	1.2	0.61	J	J	max
P-1D	OU2	SRAD	CP0089	CP0089GS002NS	7/10/1996 16:45	11	11.25	GS	TO14	110-82-7	Cyclohexane	NS1	7	=	ppbv	4.6				max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	541-73-1	1,3-Dichlorobenzene	NS1	9.4	=	ppbv	0.94	0.8		J+	max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	8.8	=	ppbv	0.94	0.75		J+	max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	123-91-1	1,4-Dioxane	NS1	6.4	=	ppbv	3.7			J+	max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	64-17-5	Ethyl Alcohol	NS1	32	=	ppbv	3.7			J+	max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	100-41-4	Ethylbenzene	NS1	7.7	=	ppbv	1.2	0.17			max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	622-96-8	4-Ethyltoluene	NS1	5	=	ppbv	3.7			J+	max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	142-82-5	n-Heptane	NS1	9.1	=	ppbv	4.9	0.9	J	J	max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	110-54-3	Hexane	NS1	710	=	ppbv	4.9	0.93	J	E	max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	74-83-9	Methyl Bromide	NS1	2.7	=	ppbv	1.2	0.39	J	J	max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	75-09-2	Methylene Chloride	NS1	3.2	=	ppbv	1.2	0.32	J	J	max
P-1D	OU2	SRAD	CP0089	CP0089GS002NS	7/10/1996 16:45	11	11.25	GS	TO14	115-07-1	Propylene	NS1	15	=	ppbv	4.6				max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	100-42-5	Styrene	NS1	1.1	=	ppbv	0.94	0.56		J+	max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	127-18-4	Tetrachloroethene	NS1	2.2	=	ppbv	1.2	0.37	J	J	max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	108-88-3	Toluene	NS1	93	=	ppbv	1.2	0.24			max
P-1D	OU2	SRAD	CP0543	CP0543GS001NS	3/13/1997 10:50	4.5	4.6	GS	E18	79-01-6	Trichloroethylene	NS1	160	=	ppbv	130	130			hi-Risk
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	15	=	ppbv	0.94	0.79		J+	max
P-1D	OU2	SRAD	CP0086	CP0086GS001NS	7/11/1996 7:31	6	6.25	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	3.8	=	ppbv	0.94	0.6		J+	max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	95-47-6	o-Xylene	NS1	6	=	ppbv	1.2	0.32			max
P-1D	OU2	SRAD	CP0779	CP0779GS002NS	6/9/1999 11:50	10.1	10.2	GS	TO14	1330-20-7	m- & p-Xylenes	NS1	31	=	ppbv	1.2	0.39			max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	67-64-1	Acetone	FD1	6.2	=	ppbv	0.42	0.1			max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	71-43-2	Benzene	FD1	0.24	=	ppbv	0.31	0.1	J		max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	78-93-3	2-Butanone	FD1	5.2	=	ppbv	0.34	0.088			max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	75-15-0	Carbon Disulfide	FD1	0.86	=	ppbv	0.32	0.093			max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	74-87-3	Chloromethane	FD1	0.42	=	ppbv	0.48	0.11	J		max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	1634-04-4	Methyl tert-Butyl Ether	FD1	0.27	=	ppbv	0.28	0.067	J		max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	100-41-4	Ethylbenzene	FD1	0.14	=	ppbv	0.23	0.079	J		max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	108-88-3	Toluene	FD1	2.1	=	ppbv	0.27	0.076			max
P-1E	SGAS	CLOSURE	VEW-1E1	VEW1E1GS001NS	12/20/2000 10:54	5	17.5	GS	M18MS	79-01-6	Trichloroethene	NS1	320	=	ppbv	200	100			max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	75-69-4	Trichlorofluoromethane	FD1	0.2	=	ppbv	0.18	0.15			max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	95-47-6	o-Xylene	FD1	0.14	=	ppbv	0.23	0.075	J		max
P-1E	SGAS	CLOSURE	CP0921	CP0921GS001DS	12/18/2000 16:00	13	13	GS	TO14	1330-20-7	m- & p-Xylenes	FD1	0.38	=	ppbv	0.23	0.14		U	max
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	67-64-1	Acetone	NS1	170	=	ppbv	6.6	1.8			max
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	71-43-2	Benzene	NS1	6.2	=	ppbv	1.6	0.36	J	J	max
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	78-93-3	2-Butanone	NS1	27	=	ppbv	6.6	1.4			max
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	75-15-0	Carbon Disulfide	NS1	11	=	ppbv	4.7	1.2			max
P-1F	OU2	SRAD	CP0163	CP0163GS001NS	7/10/1996 13:33	7	7.25	GS	TO14	110-82-7	Cyclohexane	NS1	6.8	=	ppbv	5	1.2			max
P-1F	OU2	SRAD	CP0161	CP0161GS001NS	7/10/1996 10:10	9	9.25	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	4.2	=	ppbv	0.86	0.58			max
P-1F	OU2	SRAD	CP0163	CP0163GS001NS	7/10/1996 13:33	7	7.25	GS	TO14	64-17-5	Ethyl Alcohol	NS1	42	=	ppbv	5	5			max

Table B17-2. Analytical Data Set, Site-Specific Exposure Concentrations, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	100-41-4	Ethylbenzene	NS1	28	=	ppbv	1.2	0.68			max
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	142-82-5	n-Heptane	NS1	7.9	=	ppbv	6.6	1.2	J	J	max
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	110-54-3	Hexane	NS1	390	=	ppbv	6.6	1.2			max
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	75-09-2	Methylene Chloride	NS1	4.7	=	ppbv	1.6	0.43	J	J	max
P-1F	OU2	SRAD	CP0163	CP0163GS001NS	7/10/1996 13:33	7	7.25	GS	TO14	67-63-0	2-Propanol	NS1	13	=	ppbv	5	1.1			max
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	100-42-5	Styrene	NS1	1.8	=	ppbv	1.6	0.33	J	J	max
P-1F	OU2	SRAD	CP0782	CP0782GS001NS	6/9/1999 15:37	5.8	5.9	GS	TO14	108-88-3	Toluene	NS1	39	=	ppbv	1.6	0.33			max
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	79-01-6	Trichloroethene	NS1	2.7	=	ppbv	1.2	0.79			max
P-1F	OU2	SRAD	CP0163	CP0163GS001NS	7/10/1996 13:33	7	7.25	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	4.4	=	ppbv	1.3	1.2			max
P-1F	OU2	SRAD	CP0161	CP0161GS001NS	7/10/1996 10:10	9	9.25	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	0.95	=	ppbv	0.86	0.86			max
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	95-47-6	o-Xylene	NS1	83	=	ppbv	1.2	0.56			max
P-1F	OU2	SRAD	CP0545	CP0545GS001NS	3/13/1997 11:30	5	5.1	GS	TO14	1330-20-7	m- & p-Xylenes	NS1	140	=	ppbv	1.2	1			max
P-1G	OU2	SRAD	CP0190	CP0190GS002NS	7/16/1996 10:48	10	10.25	GS	TO14	67-64-1	Acetone	NS1	79	=	ppbv	11	0			max
P-1G	OU2	SRAD	CP0190	CP0190GS002NS	7/16/1996 10:48	10	10.25	GS	TO14	71-43-2	Benzene	NS1	8.4	=	ppbv	2.7	1.4			max
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	106-99-0	1,3-Butadiene	NS1	3.9	=	ppbv	3.5	2.6			max
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	78-93-3	2-Butanone	NS1	9.6	=	ppbv	3.5	1.8			max
P-1G	OU2	SRAD	CP0190	CP0190GS002NS	7/16/1996 10:48	10	10.25	GS	TO14	110-82-7	Cyclohexane	NS1	130	=	ppbv	11	0			max
P-1G	OU2	SRAD	CP0190	CP0190GS002NS	7/16/1996 10:48	10	10.25	GS	TO14	123-91-1	1,4-Dioxane	NS1	22	=	ppbv	11	0			max
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	64-17-5	Ethyl Alcohol	NS1	64	=	ppbv	3.5	3			max
P-1G	OU2	SRAD	CP0574	CP0574GS001NS	6/27/1997 14:10	7		GS	TO14	100-41-4	Ethylbenzene	NS1	17	=	ppbv	5.1	2.9			max
P-1G	OU2	SRAD	CP0574	CP0574GS001NS	6/27/1997 14:10	7		GS	TO14	142-82-5	n-Heptane	NS1	24	=	ppbv	20	11			max
P-1G	OU2	SRAD	CP0785	CP0785GS003NS	6/9/1999 10:35	11.5	11.6	GS	TO14	110-54-3	Hexane	NS1	2000	=	ppbv	16	9.3	J	E	max
P-1G	OU2	SRAD	CP0574	CP0574GS001NS	6/27/1997 14:10	7		GS	TO14	115-07-1	Propylene	NS1	150	=	ppbv	20	15			max
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	108-88-3	Toluene	NS1	8.4	=	ppbv	0.88	0.74			hi-Risk
P-1G	OU2	SRAD	CP0577	CP0577GS002NS	6/3/1997 12:27	8.75	9	GS	E18	79-01-6	Trichloroethene	NS1	1600	=	ppbv	100	100			max
P-1G	OU2	SRAD	CP0572	CP0572GS001NS	4/5/1997 10:55	4.5	4.7	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.5	=	ppbv	0.88	0.74			max
P-1G	OU2	SRAD	CP0574	CP0574GS001NS	6/27/1997 14:10	7		GS	TO14	95-47-6	o-Xylene	NS1	22	=	ppbv	5.1	2.4			max
P-1G	OU2	SRAD	CP0574	CP0574GS001NS	6/27/1997 14:10	7		GS	TO14	1330-20-7	m- & p-Xylenes	NS1	54	=	ppbv	5.1	4.5			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	67-64-1	Acetone	NS1	260	=	ppbv	3.7	3.2			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	71-43-2	Benzene	NS1	2	=	ppbv	0.92	0.59			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	78-93-3	2-Butanone	NS1	53	=	ppbv	3.7	1.8			max
P-2A	OU2	SRAD	CP0239	CP0239GS002NS	7/12/1996 13:50	7.5	7.75	GS	TO14	75-15-0	Carbon Disulfide	NS1	47	=	ppbv	18				max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	74-87-3	Chloromethane	NS1	3.2	=	ppbv	0.92	0.55			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	110-82-7	Cyclohexane	NS1	180	=	ppbv	3.7	2.2			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	2.4	=	ppbv	0.92	0.81			max
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	64-17-5	Ethyl Alcohol	NS1	150	=	ppbv	4.2				max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	142-82-5	n-Heptane	NS1	4	=	ppbv	3.7	1.6			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	67-63-0	2-Propanol	NS1	9.6	=	ppbv	3.7	2.3			max
P-2A	OU2	SRAD	CP0239	CP0239GS002NS	7/12/1996 13:50	7.5	7.75	GS	TO14	115-07-1	Propylene	NS1	19	=	ppbv	18				max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	127-18-4	Tetrachloroethene	NS1	4	=	ppbv	0.92	0.29			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	108-88-3	Toluene	NS1	9.9	=	ppbv	0.92	0.62			max
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	71-55-6	1,1,1-Trichloroethane	NS1	2	=	ppbv	1.1	0.36			max
P-2A	OU2	SRAD	CP0240	CP0240GS001NS	7/15/1996 8:10	5	5.25	GS	M18	79-01-6	Trichloroethene	NS1	1700	=	ppbv	0.2	0.2			max
P-2A	OU2	SRAD	CP0243	CP0243GS001NS	8/1/1996 7:53	5.8	6.05	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.6	=	ppbv	0.92	0.7			max
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	95-47-6	o-Xylene	NS1	1.8	=	ppbv	1.1	0.61			max
P-2A	OU2	SRAD	CP0236	CP0236GS001NS	7/12/1996 12:10	4	4.25	GS	TO14	1330-20-7	m- & p-Xylenes	NS1	3.5	=	ppbv	1.1	0.98			max
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	67-64-1	Acetone	NS1	83	=	ppbv	5.8	5			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	71-43-2	Benzene	NS1	1.4	=	ppbv	0.92	0.59			max
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	78-93-3	2-Butanone	NS1	19	=	ppbv	5.8	2.9			max
P-2B	OU2	SRAD	CP0272	CP0272GS002NS	8/13/1996 9:27	12.5	12.75	GS	M18	56-23-5	Carbon tetrachloride	NS1	430	=	ppbv	0.2	0.2			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	74-87-3	Chloromethane	NS1	1.1	=	ppbv	0.92	0.55			max
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	110-82-7	Cyclohexane	NS1	340	=	ppbv	5.8	3.5			max
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	1.8	=	ppbv	1.5	1.2			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	123-91-1	1,4-Dioxane	NS1	16	=	ppbv	3.7	3			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	64-17-5	Ethyl Alcohol	NS1	24	=	ppbv	3.7	0.86			max
P-2B	OU2	SRAD	CP0789	CP0789GS002NS	6/7/1999 15:18	9	9.1	GS	TO14	110-54-3	Hexane	NS1	290000	=	ppbv	2700	1200	J	E	max
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	67-63-0	2-Propanol	NS1	7.2	=	ppbv	5.8	3.6			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	127-18-4	Tetrachloroethene	NS1	51	=	ppbv	0.92	0.29			max
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	108-88-3	Toluene	NS1	4.7	=	ppbv	1.5	0.99			max
P-2B	OU2	SRAD	CP0265	CP0265GS002NS	7/16/1996 10:15	10	10.25	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	2.2	=	ppbv	1.5	1.2			max

Table B17-2. Analytical Data Set, Site-Specific Exposure Concentrations, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-2B	OU2	SRAD	CP0263	CP0263GS001NS	7/8/1996 8:20	10.25	10.75	GS	M18	79-01-6	Trichloroethene	NS1	520	=	ppbv	0.2	0.2			max
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	1.8	=	ppbv	0.92	0.7			hi-Risk
P-2B	OU2	SRAD	CP0267	CP0267GS001NS	8/1/1996 9:22	6	6.25	GS	TO14	1330-20-7	m- & p-Xylenes	NS1	1.2	=	ppbv	0.92	0.71			max
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	67-64-1	Acetone	NS1	130	=	ppbv	3.6	1.8			max
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	71-43-2	Benzene	NS1	6.3	=	ppbv	0.94	0.6			max
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	78-93-3	2-Butanone	NS1	31	=	ppbv	3.7	1.8			max
P-3A	OU2	SRAD	CP0288	CP0288GS002NS	7/11/1996 8:27	9.5	9.75	GS	TO14	75-15-0	Carbon Disulfide	NS1	78	=	ppbv	27				max
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	74-87-3	Chloromethane	NS1	1.1	=	ppbv	0.92	0.55			max
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	110-82-7	Cyclohexane	NS1	120	=	ppbv	3.7	2.2			max
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	8.7	=	ppbv	0.94	0.82			max
P-3A	OU2	SRAD	CP0551	CP0551GS001NS	3/13/1997 9:03	5.5	5.6	GS	TO14	156-59-2	cis-1,2-Dichloroethene	NS1	3.9	=	ppbv	0.88	0.53			max
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	64-17-5	Ethyl Alcohol	NS1	290	=	ppbv	3.6	3.6		J+	max
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	100-41-4	Ethylbenzene	NS1	12	=	ppbv	0.9	0.55			max
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	108-10-1	4-Methyl-2-pentanone	NS1	3.8	=	ppbv	3.7	3.4			max
P-3A	OU2	SRAD	CP0293	CP0293GS002NS	8/1/1996 11:12	13	13.25	GS	TO14	67-63-0	2-Propanol	NS1	8.9	=	ppbv	3.7	2.3			max
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	127-18-4	Tetrachloroethene	NS1	6.3	=	ppbv	0.9	0.36			max
P-3A	OU2	SRAD	CP0288	CP0288GS002NS	7/11/1996 8:27	9.5	9.75	GS	TO14	108-88-3	Toluene	NS1	11	=	ppbv	6.7	3.6			max
P-3A	OU2	SRAD	CP0289	CP0289GS001NS	7/11/1996 7:48	4.5	4.75	GS	M18	79-01-6	Trichloroethene	NS1	670	=	ppbv	0.2	0.2			max
P-3A	OU2	SRAD	CP0298	CP0298GS001NS	8/12/1996 12:13	6.8	7.05	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.7	=	ppbv	0.94	0.71			hi-Risk
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	1.3	=	ppbv	0.9	0.9			max
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	95-47-6	o-Xylene	NS1	31	=	ppbv	0.9	0.9			max
P-3A	OU2	SRAD	CP0296	CP0296GS002NS	8/8/1996 13:47	11.3	11.55	GS	TO14	1330-20-7	m- & p-Xylenes	NS1	50	=	ppbv	0.9	0.9			max
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	67-64-1	Acetone	NS1	32	=	ppbv	5				max
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	74-87-3	Chloromethane	NS1	2.4	=	ppbv	1.3	1			max
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	64-17-5	Ethyl Alcohol	NS1	160	=	ppbv	5				max
P-4A	OU2	SRAD	CP0794	CP0794GS003NS	6/7/1999 11:37	11	11.1	GS	TO14	142-82-5	n-Heptane	NS1	30	=	ppbv	7.3	3.1	J		max
P-4A	OU2	SRAD	CP0794	CP0794GS003NS	6/7/1999 11:37	11	11.1	GS	TO14	110-54-3	Hexane	NS1	1000	=	ppbv	7.3	3.2	J	E	max
P-4A	OU2	SRAD	CP0794	CP0794GS003NS	6/7/1999 11:37	11	11.1	GS	TO14	75-09-2	Methylene Chloride	NS1	2.2	=	ppbv	1.8	0.51	J	J	max
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	67-63-0	2-Propanol	NS1	8.3	=	ppbv	5				max
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	115-07-1	Propylene	NS1	14	=	ppbv	5				max
P-4A	OU2	SRAD	CP0794	CP0794GS003NS	6/7/1999 11:37	11	11.1	GS	TO14	108-88-3	Toluene	NS1	84	=	ppbv	1.8	0.7			max
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	71-55-6	1,1,1-Trichloroethane	NS1	1.8	=	ppbv	1.3	0.43			max
P-4A	OU2	SRAD	CP0559	CP0559GS001NS	3/11/1997 16:10	7.5	7.6	GS	E18	79-01-6	Trichloroethene	NS1	190	=	ppbv	120	120			max
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	95-47-6	o-Xylene	NS1	1.6	=	ppbv	1.3	0.73			max
P-4A	OU2	SRAD	CP0311	CP0311GS001NS	7/12/1996 10:23	5	5.25	GS	TO14	1330-20-7	m- & p-Xylenes	NS1	3.4	=	ppbv	1.3	1.2			hi-Risk
P-4B	SGAS	P4B	CP0822	CP0822001NS	7/25/2000 9:15	6.5	6.5	GS	TO14	67-64-1	Acetone	NS1	150	=	ppbv	21	16	J		max
P-4B	SGAS	P4B	CP0831	CP0831001NS	7/25/2000 13:56	6.5	6.5	GS	TO14	71-43-2	Benzene	NS1	17	=	ppbv	10	58			max
P-4B	SGAS	P4B	CP0962	CP0962GS001DS	11/1/2000 16:20	8.5	8.5	GS	TO14	78-93-3	2-Butanone	FD1	79	=	ppbv	23	2.6	J+		max
P-4B	SGAS	P4B	CP0838	CP0838001NS	7/25/2000 15:50	8.5	8.5	GS	TO14	75-15-0	Carbon Disulfide	NS1	5.2	=	ppbv	3.6	0.8			max
P-4B	SGAS	P4B	CP0831	CP0831001FD	7/25/2000 13:58	6.5	6.5	GS	TO14	67-66-3	Chloroform	FD1	13	=	ppbv	10	2.1			max
P-4B	SGAS	P4B	CP0822	CP0822002NS	7/25/2000 9:20	8.5	8.5	GS	TO14	74-87-3	Chloromethane	NS1	8	=	ppbv	4.2	1.6			max
P-4B	OU2	SRAD	CP0340	CP0340GS001NS	7/16/1996 8:56	5	5.25	GS	TO14	110-82-7	Cyclohexane	NS1	130	=	ppbv	3.5	0			max
P-4B	OU2	SRAD	CP0340	CP0340GS001NS	7/16/1996 8:56	5	5.25	GS	TO14	123-91-1	1,4-Dioxane	NS1	40	=	ppbv	3.5	0			max
P-4B	OU2	SRAD	CP0342	CP0342GS001NS	8/2/1996 8:37	6.5	6.75	GS	TO14	64-17-5	Ethyl Alcohol	NS1	55	=	ppbv	3.7	0.86			max
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	100-41-4	Ethylbenzene	NS1	560	=	ppbv	3.4	1.1			max
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	622-96-8	4-Ethyltoluene	NS1	28	=	ppbv	13	7.3	J	J	max
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	142-82-5	n-Heptane	NS1	150	=	ppbv	13	6.7			max
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	110-54-3	Hexane	NS1	1400	=	ppbv	13	8.1	J	E	max
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	74-83-9	Methyl Bromide	NS1	4.4	=	ppbv	3.4	3.2	J	J	max
P-4B	SGAS	P4B	CP0831	CP0831001FD	7/25/2000 13:58	6.5	6.5	GS	TO14	75-09-2	Methylene Chloride	FD1	43	=	ppbv	10	2.7			max
P-4B	SGAS	P4B	CP0822	CP0822003NS	7/25/2000 9:40	11.5	11.5	GS	TO14	67-63-0	2-Propanol	NS1	110	=	ppbv	23	7.4			max
P-4B	SGAS	P4B	CP0822	CP0822001NS	7/25/2000 9:15	6.5	6.5	GS	TO14	127-18-4	Tetrachloroethene	NS1	6	=	ppbv	5.2	1.8			max
P-4B	SGAS	P4B	CP0962	CP0962GS001DS	11/1/2000 16:20	8.5	8.5	GS	TO14	109-99-9	Tetrahydrofuran	FD1	67	=	ppbv	23	1.6	J+		max
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	108-88-3	Toluene	NS1	110	=	ppbv	3.4	2.6			max
P-4B	SGAS	P4B	CP0831	CP0831001FD	7/25/2000 13:58	6.5	6.5	GS	TO14	79-01-6	Trichloroethene	FD1	2700	=	ppbv	10	3.3			max
P-4B	SGAS	P4B	CP0831	CP0831001FD	7/25/2000 13:58	6.5	6.5	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	FD1	33	=	ppbv	10	2.7			max
P-4B	OU2	SRAD	CP0555	CP0555GS002NS	3/12/1997 9:35	10	10.1	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	3.9	=	ppbv	0.92	0.64			max
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	95-47-6	o-Xylene	NS1	720	=	ppbv	3.4	1.9			max
P-4B	OU2	SRAD	CP0792	CP0792GS001NS	6/8/1999 16:00	8.5	8.6	GS	TO14	1330-20-7	m- & p-Xylenes	NS1	2000	=	ppbv	3.4	2.2			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	67-64-1	Acetone	NS1	91	=	ppbv	3.7	0			max

Table B17-2. Analytical Data Set, Site-Specific Exposure Concentrations, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	71-43-2	Benzene	NS1	3.3	=	ppbv	0.94	0.49			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	78-93-3	2-Butanone	NS1	16	=	ppbv	3.7	0			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	110-82-7	Cyclohexane	NS1	350	=	ppbv	3.7	0			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	1.3	=	ppbv	0.94	0.75			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	123-91-1	1,4-Dioxane	NS1	11	=	ppbv	3.7	0			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	64-17-5	Ethyl Alcohol	NS1	4.4	=	ppbv	3.7	0			max
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	100-41-4	Ethylbenzene	NS1	6.1	=	ppbv	0.96	0.55			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	67-63-0	2-Propanol	NS1	9.2	=	ppbv	3.7	0			max
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	127-18-4	Tetrachloroethene	NS1	1.8	=	ppbv	0.96	0.57			max
P-4C	OU2	SRAD	CP0365	CP0365GS003NS	7/16/1996 9:43	12.5	12.75	GS	TO14	108-88-3	Toluene	NS1	6.1	=	ppbv	0.94	0.5			max
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	79-01-6	Trichloroethene	NS1	5.8	=	ppbv	0.96	0.65			max
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	2.7	=	ppbv	0.96	0.8			max
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	2	=	ppbv	0.96	0.67			max
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	95-47-6	o-Xylene	NS1	18	=	ppbv	0.96	0.46			max
P-4C	OU2	SRAD	CP0552	CP0552GS002NS	3/12/1997 11:10	9.5	9.6	GS	TO14	1330-20-7	m- & p-Xylenes	NS1	30	=	ppbv	0.96	0.86			max
P-5A	CPT	P5A	SB1108	SB1108GS002NS	7/7/2006 10:05	10.5		GS	TO14A	106-97-8	Butane	NS1	430	=	ppbv	11	0	J	M	max
P-5A	CPT	P5A	SB1108	SB1108GS002NS	7/7/2006 10:05	10.5		GS	TO14A	106-98-9	1-Butene	NS1	5	=	ppbv	4.6	0			max
P-5A	CPT	P5A	SB1108	SB1108GS002NS	7/7/2006 10:05	10.5		GS	TO14A	75-28-5	Isobutane	NS1	2400	=	ppbv	4.6	0			max
P-5A	CPT	P5A	SB1108	SB1108GS002NS	7/7/2006 10:05	10.5		GS	TO14A	74-98-6	Propane	NS1	430	=	ppbv	4.6	0			max
P-5A	CPT	P5A	SB1108	SB1108GS002NS	7/7/2006 10:05	10.5		GS	TO14A	115-07-1	Propylene	NS1	16	=	ppbv	4.6	0			max
P-5A	CPT	P-5A	CP1145	CP1145GS001NS	11/7/2007 13:03	5		GS	TO15	79-01-6	Trichloroethene	NS1	6600	=	ppbv	11	1.2			hi-Risk
P-6A	SGAS	CLOSURE2	CP1024	CP1024GS001NS	1/9/2002 14:35	12.3	12.3	GS	TO15	67-64-1	Acetone	NS1	26	=	ppbv	21	0.084			max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	71-43-2	Benzene	FD1	0.9	=	ppbv	0.63	0.015			max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	78-93-3	2-Butanone	FD1	6.4	=	ppbv	0.68	0.041			max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	75-15-0	Carbon Disulfide	FD1	0.64	=	ppbv	0.64	0.058			max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	74-87-3	Chloromethane	FD1	0.49	=	ppbv	0.97	0.058	J		max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	1634-04-4	Methyl tert-Butyl Ether	FD1	1.3	=	ppbv	0.55	0.017			max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	100-41-4	Ethylbenzene	FD1	0.41	=	ppbv	0.46	0.014	J		max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	74-83-9	Methyl Bromide	FD1	0.29	=	ppbv	0.52	0.077	J		max
P-6A	SGAS	CLOSURE2	CP0939	CP0939GS001FD	1/9/2002 8:19	9.5	9.5	GS	TO15	108-88-3	Toluene	FD1	830	=	ppbv	13	0.053			hi-Risk
P-6A	SGAS	CLOSURE	VEW-6A9	VEW6A9GS001NS	12/20/2000 9:48	5	10	GS	M18MS	79-01-6	Trichloroethene	NS1	280	=	ppbv	200	100			max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	75-69-4	Trichlorofluoromethane	FD1	0.22	=	ppbv	0.36	0.021	J		max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	95-47-6	o-Xylene	FD1	0.52	=	ppbv	0.46	0.017			max
P-6A	SGAS	CLOSURE	CP0840	CP0840GS001DS	12/21/2000 8:55	6.5	6.5	GS	TO14	1330-20-7	m- & p-Xylenes	FD1	1.4	=	ppbv	0.46	0.012			max
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	67-64-1	Acetone	NS1	74	=	ppbv	19	8.2			max
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	71-43-2	Benzene	NS1	6.8	=	ppbv	4.8	2.3	J	J	max
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	78-93-3	2-Butanone	NS1	28	=	ppbv	19	6.8	J	J	max
P-8A	OU2IS	OU2IS	SA15-CPT9	SA15CPT9-2	10/13/1995 13:55	13	13	GS	TO14	56-23-5	Carbon tetrachloride	NS1	13	=	ppbv	0.225	0.36			max
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-2	10/11/1995 13:05	11	11	GS	TO14	75-00-3	Chloroethane	NS1	15	=	ppbv	0.22	0.33			max
P-8A	OU2IS	OU2IS	SA15-CPT9	SA15CPT9-2	10/13/1995 13:55	13	13	GS	TO14	67-66-3	Chloroform	NS1	9.6	=	ppbv	0.25	0.4			max
P-8A	OU2IS	OU2IS	SA15-CPT1	SA15CPT1-1	10/11/1995 12:55	5.5	5.5	GS	TO14	74-87-3	Chloromethane	NS1	2.3	=	ppbv	0.2733	0.41			max
P-8A	OU2	SRAD	CP0461	CP0461GS003NS	7/12/1996 14:50	19	19.25	GS	TO14	110-82-7	Cyclohexane	NS1	530	=	ppbv	5.7	3.4			max
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	95-50-1	1,2-Dichlorobenzene	NS1	3	=	ppbv	0.2867	0.43			max
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	541-73-1	1,3-Dichlorobenzene	NS1	1.8	=	ppbv	0.22	0.33			max
P-8A	OU2	SRAD	CP0461	CP0461GS003NS	7/12/1996 14:50	19	19.25	GS	TO14	106-46-7	1,4-Dichlorobenzene	NS1	6	=	ppbv	1.4	1.1			max
P-8A	OU2IS	OU2IS	SA15-CPT11	SA15CPT11-1	10/13/1995 11:05	6	6	GS	TO14	75-71-8	Dichlorodifluoromethane	NS1	2.7	=	ppbv	0.1857	0.26			max
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-1	10/12/1995 16:45	6	6	GS	TO14	75-35-4	1,1-Dichloroethene	NS1	2.1	=	ppbv	0.2938	0.47			max
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-4	10/11/1995 15:25	20.5	20.5	GS	TO14	156-59-2	cis-1,2-Dichloroethene	NS1	6.6	=	ppbv	0.02	0.2			max
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	64-17-5	Ethyl Alcohol	NS1	30	=	ppbv	19	17	J	J	max
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-1	10/12/1995 8:00	6	6	GS	TO14	100-41-4	Ethylbenzene	NS1	30	=	ppbv	0.1933	0.29			max
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	142-82-5	n-Heptane	NS1	31	=	ppbv	19	9.5	J	J	max
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	110-54-3	Hexane	NS1	2700	=	ppbv	19	12	J	E	max
P-8A	OU2IS	OU2IS	SA15-CPT4	SA15CPT4-1	10/11/1995 14:40	6	6	GS	TO14	74-83-9	Methyl Bromide	NS1	3.2	=	ppbv	0.1316	0.25			max
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-1	10/13/1995 8:25	6	6	GS	TO14	75-09-2	Methylene Chloride	NS1	16	=	ppbv	0.2533	0.38			max
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	100-42-5	Styrene	NS1	2.1	=	ppbv	0.1867	0.28			max
P-8A	OU2	SRAD	CP0564	CP0564GS001NS	3/12/1997 17:35	7	7.1	GS	TO14	127-18-4	Tetrachloroethene	NS1	7.1	=	ppbv	0.86	0.51			hi-Risk
P-8A	OU2	SRAD	CP0797	CP0797GS002NS	6/8/1999 9:35	10.9	11	GS	TO14	108-88-3	Toluene	NS1	250	=	ppbv	4.8	3.6			max
P-8A	OU2IS	OU2IS	SA15-CPT7	SA15CPT7-1	10/13/1995 12:05	6	6	GS	TO14	120-82-1	1,2,4-Trichlorobenzene	NS1	2.2	=	ppbv	0.2786	0.39			hi-Risk
P-8A	OU2IS	OU2IS	SA15-CPT12	SA15CPT12-1	10/12/1995 16:45	6	6	GS	TO14	71-55-6	1,1,1-Trichloroethane	NS1	2.6	=	ppbv	0.1688	0.27			max
P-8A	OU2IS	OU2IS	SA15-CPT6A	SA15CPT6A-3	10/13/1995 15:25	19	19	GS	TO14	79-01-6	Trichloroethene	NS1	840	=	ppbv	0.094	0.47			max

Table B17-2. Analytical Data Set, Site-Specific Exposure Concentrations, TCE Sites, Sharpe Site

Site	PROJID	EVENT	LOCID	SAMPLE NAME	SAMPLE DATE	BEG DEPTH	END DEPTH	MATRIX	METHOD	CAS_NO	ANALYTE NAME	SACODE	RESULT	QUALIFIER	UNIT	REPORTING LIMIT	DETECTION LIMIT	EPA FLAG	DATA FLAG	Retain?
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	95-63-6	1,2,4-Trimethylbenzene	NS1	5	=	ppbv	0.2067	0.31			hi-Risk
P-8A	OU2IS	OU2IS	SA15-CPT10	SA15CPT10-2	10/13/1995 8:45	12	12	GS	TO14	108-67-8	1,3,5-Trimethylbenzene	NS1	2	=	ppbv	0.18	0.27			max
P-8A	OU2	SRAD	CP0564	CP0564GS001NS	3/12/1997 17:35	7	7.1	GS	TO14	95-47-6	o-Xylene	NS1	59	=	ppbv	0.86	0.41			max
P-8A	OU2IS	OU2IS	SA15-CPT5	SA15CPT5-1	10/12/1995 8:00	6	6	GS	TO14	108-38-3	m-Xylene	NS1	120	=	ppbv	0.3067	0.46			max
P-8A	OU2	SRAD	CP0564	CP0564GS001NS	3/12/1997 17:35	7	7.1	GS	TO14	1330-20-7	m- & p-Xylenes	NS1	89	=	ppbv	0.86	0.77			max

APPENDIX C

Addendum to the Real Property Master Plan Digest

ADDENDUM TO THE REAL PROPERTY MASTER PLAN DIGEST

This addendum to the *Defense Distribution Depot San Joaquin Real Property Master Plan Digest* (formerly Installation Master Plan) describes land use controls (LUCs) for eight trichloroethene (TCE) sites (P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A) and five metals (total lead and/or chromium) sites (S-3, S-26, S-30, S-33/29, and S-36) at the Sharpe Site to protect human health. LUCs are part of the selected remedy at these sites because, while the residual concentrations of TCE, total lead, or total chromium in soil permit industrial land use, the residual concentrations do not allow for unlimited use and unrestricted exposure (e.g., residential use). Therefore, LUCs are necessary to prohibit development for uses such as schools, child care facilities, playgrounds, and residential housing at the sites.

The TCE and metals sites requiring LUCs at the Sharpe Site are identified on Figures 1 through 11. For most of the sites, the area of LUCs is larger than the area of the site because the results of samples collected outside of the site boundary (as depicted in the Operable Unit 2 Record of Decision) indicate the need for an expanded LUC area to protect human health and the environment.

PURPOSE OF THIS ADDENDUM

This addendum to the *Defense Distribution Depot San Joaquin Real Property Master Plan Digest* describes the procedures that will be used to ensure that all sites with LUCs are prohibited from development for uses such as residential housing, elementary and secondary schools, child care facilities, and playgrounds, and that signs indicating areas of restricted land use are maintained. If additional information is needed, please contact the Defense Logistics Agency (DLA) Installation Support at San Joaquin Environmental Office Program Manager.

IMPLEMENTATION REQUIREMENTS

This addendum will be incorporated into the *Defense Distribution Depot San Joaquin Real Property Master Plan Digest*. In addition, a DLA Installation Support at San Joaquin Environmental Office Program Manager will review all proposed construction projects, evaluate the proposed project with respect to the land use restriction, and issue a record of environmental consideration with the findings of the evaluation. If any component of a proposed project is inconsistent with the LUC objectives, the requester will be required to modify the project plans to be consistent with the LUCs. In addition, excavation and disposal of any soil associated with the sites will comply with all applicable or relevant and appropriate requirements, including waste characterization and disposal of the soil in accordance with the Sharpe/Tracy Site Waste Management Plan.

DLA will address any activity that is inconsistent with the LUC objective or use restriction, or any other action that may interfere with the effectiveness of the LUCs, as soon as practicable. In no case will the process be initiated later than 10 days after the date DLA becomes aware of the inconsistency.

AGENCY NOTIFICATION REQUIREMENTS

DLA is required to notify the regulatory agencies (United States Environmental Protection Agency [EPA], California Department of Toxic Substances Control [DTSC], and the California Regional Water Quality Control Board–Central Valley Region [CVRWQCB]) regarding discovery of any activity or proposal for a land use change that is inconsistent with the LUCs or transfer or sale of any property subject to the LUCs. Notification requirements include the following:

- DLA will notify EPA, DTSC, and CVRWQCB as soon as practicable, but no later than 10 days after discovery of any activity that is inconsistent with the LUC objective or use restriction, or any other action that may interfere with the effectiveness of the LUCs. Within 10 days of sending the initial

notification related to the inconsistency, DLA will provide notification explaining how the inconsistency was or will be addressed.

- DLA will notify EPA, DTSC, and CVRWQCB at least 45 days in advance of any proposed land use change that is inconsistent with the LUC objective, any anticipated action that may disrupt or interfere with the effectiveness of the LUCs, any action that might alter or negate the need for the LUCs, or any anticipated transfer of the property subject to the LUCs.

- DLA will notify EPA, DTSC, and CVRWQCB at least six months prior to any transfer or sale of any property subject to the LUCs so that the agencies can be involved in discussions to ensure that appropriate provisions are included in the transfer terms or conveyance documents to maintain effective LUCs. If it is not possible for DLA to notify the agencies at least six months prior to any transfer or sale, then DLA will notify the agencies as soon as possible but no later than 60 days prior to transfer or sale of any property subject to LUCs. In addition to these land transfer notice and discussion provisions, DLA will provide the agencies with similar notice, within the same timeframes, for federal-to-federal transfers of property. DLA will provide a copy of the executed deed or transfer assembly to the agencies.

LAND USE CONTROL MAINTENANCE REQUIREMENTS

DLA is required to maintain existing administrative controls (e.g., review of proposed construction projects) while the LUCs are in place. LUCs will be maintained until concentrations of hazardous substances in soil are at such levels that allow for unlimited use and unrestricted exposure. DLA will not modify or terminate the LUCs without approval from EPA, DTSC, and CVRWQCB. DLA will seek prior concurrence before any anticipated action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for the LUCs.

LAND USE CONTROL REPORTING REQUIREMENTS

Monitoring of the environmental use restrictions and controls will be conducted annually by DLA. The monitoring results will be included in the Federal Facility Agreement Annual Progress Report and provided to EPA, DTSC, and CVRWQCB. The Annual Progress Reports will be used in preparation of five-year reviews to evaluate the effectiveness of the remedy. The Annual Progress Report, submitted to the regulatory agencies by DLA, will evaluate the status of the LUCs and how any LUC deficiencies or inconsistent uses have been addressed. The annual evaluation will address whether the use restrictions and controls referenced above were communicated in the deed(s) if a parcel including one of the TCE or metals sites was sold or transferred, whether the owners and state and local agencies were notified of the use restrictions and controls affecting the property, and whether use of the property has conformed to such restrictions and controls.

CHANGES IN LAND USE

Any future land use change for property associated with the eight TCE and five metals sites requires site characterization (prior data may be used) and, at a minimum, an environmental assessment of the property in accordance with the applicable U.S. Department of Defense (DoD) and EPA regulations in place at the time of the change. Many decisions documented in the *Record of Decision, Basewide Remedy for DDRW-Sharpe Site* are based on the current land use (industrial). In general, a change in land use must be evaluated to ensure that contamination left in place will not pose an unacceptable risk to human health or the environment under the new exposure scenario.

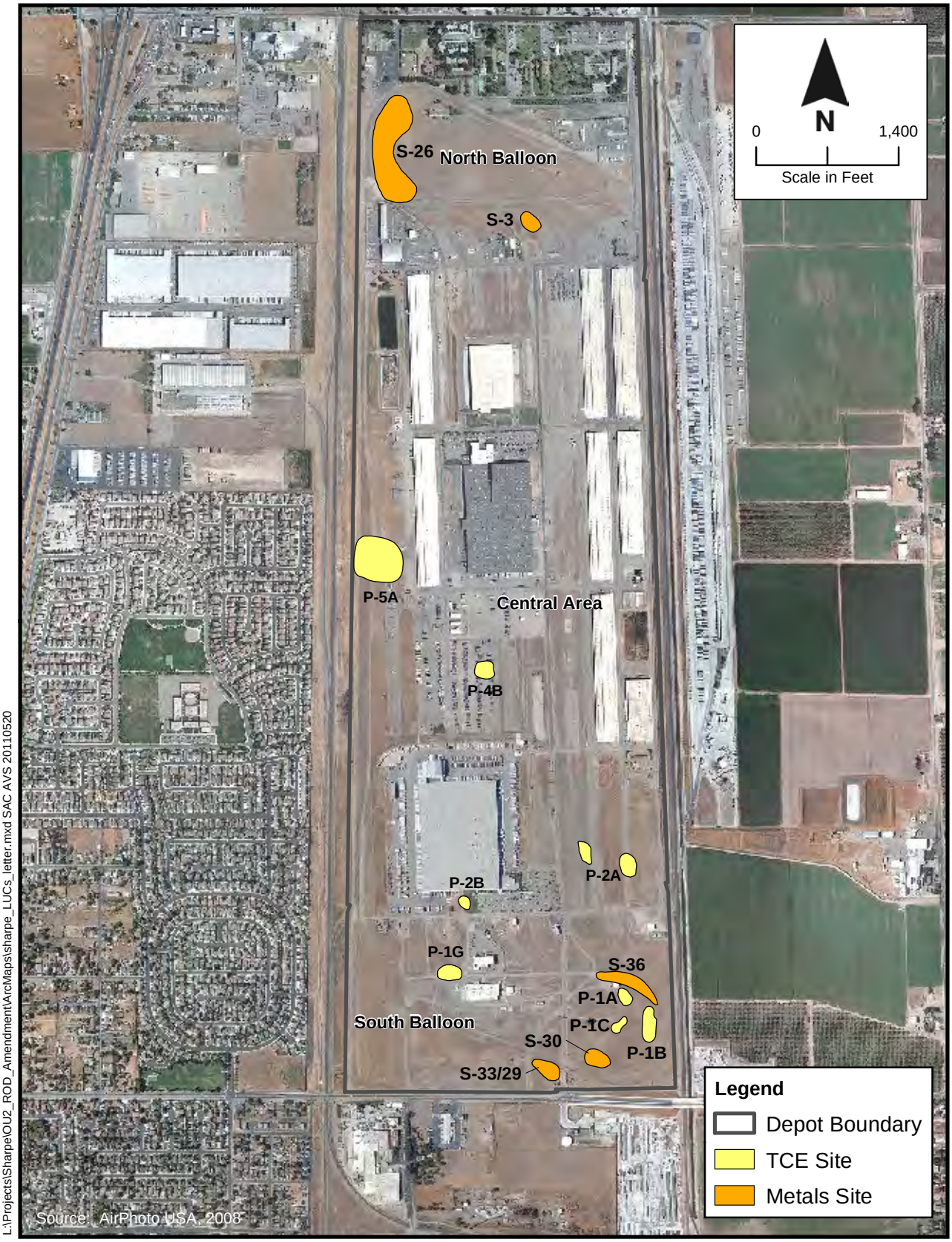
Nonclosure transfers of DoD property are guided by community input on land use, as provided for by the local government land use planning agency. In the event that no community land use plan is available at the time of property transfer, DoD will consider a range of reasonably anticipated future land uses in the transfer process. These assumptions allow the DoD (in conjunction with regulatory agencies) to determine

the need for the LUCs. Environmental process requirements and restrictions (including LUCs) at installations subject to transfer are described in Title 42 United States Code §9620(h) (Comprehensive Environmental Response, Compensation, and Liability Act §120.(h)). This statute establishes hazardous substance notification and deed content requirements. Title 40 Code of Federal Regulations §373 et seq. establishes the regulatory notification and reporting requirements. DoD policy, as set forth in the Base Redevelopment and Realignment Manual, currently requires documenting the environmental condition of the property and a finding of suitability to transfer prior to the transfer of properties subject to the National Oil and Hazardous Substances Pollution Contingency Plan. In accordance with Title 22 California Code of Regulations §67391.1(e)(1), DTSC cannot consider property owned by the federal government to be suitable for transfer to nonfederal entities where hazardous wastes/constituents/ substances remain at levels that are not suitable for unrestricted land use, unless appropriate land use covenants have been executed and recorded with the county of record.

If the depot is closed, DLA will implement the appropriate regulatory process and actions (e.g., legally enforceable restrictions) to ensure continued protection of human health and the environment. In addition, notification of appropriate regulatory agencies will occur at the initiation of the process.

LAND USE CONTROL SITES

The sites requiring LUCs are shown on Figures 1 through 11.

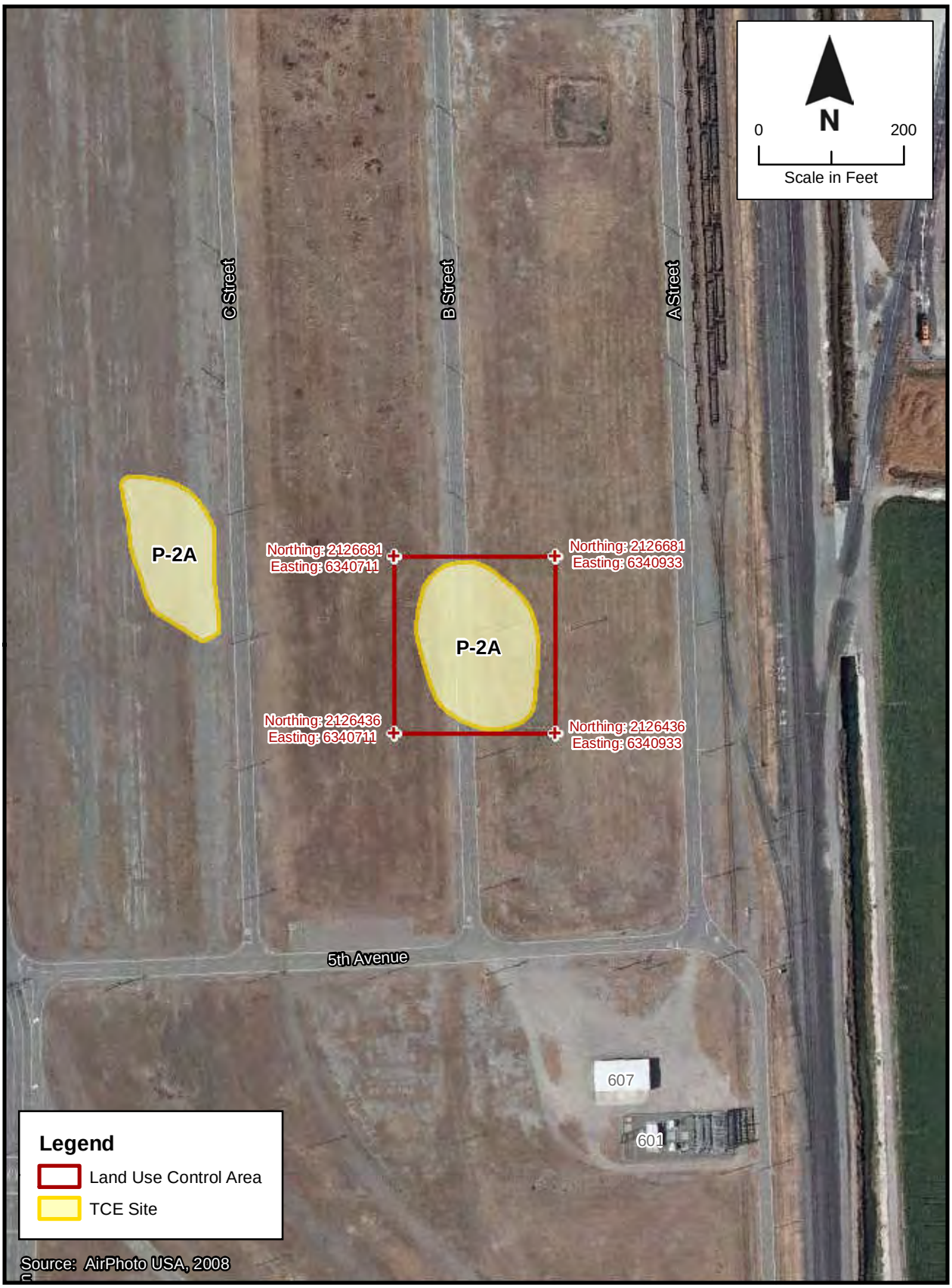


L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\sharpe_LUCs_letter.mxd SAC AVS 20110520

Figure 1. Soil Sites Requiring Land Use Controls, Sharpe Site

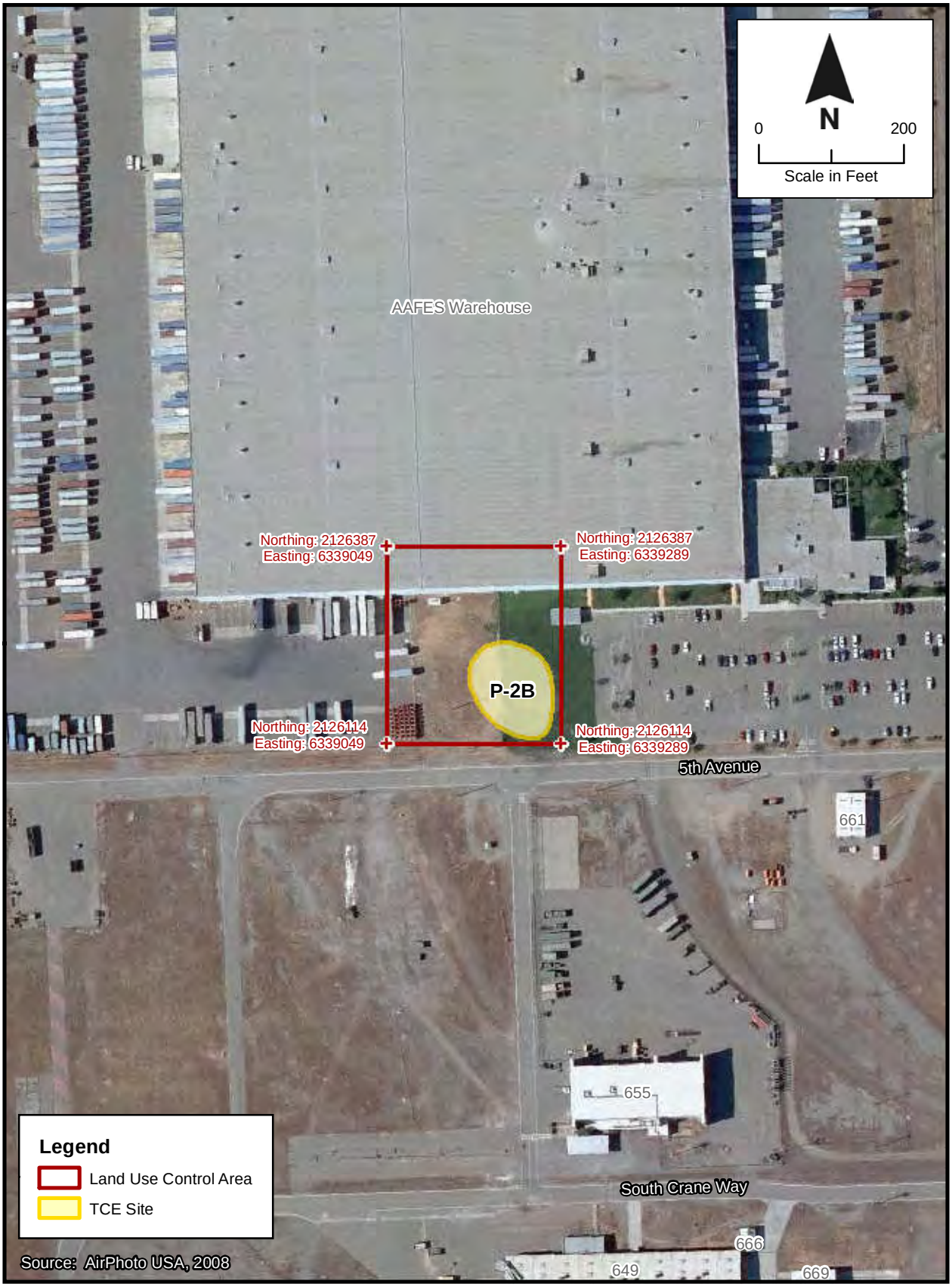
L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\Sharpe_ROD_2008_Sites_Mapbook.mxd AVS 6/10/2011 SAC

Figure 2. Land Use Control Area, Site P-1G, Sharpe Site



L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\Sharpe_ROD_2008_Sites_Mapbook.mxd AVS 6/10/2011 SAC

Figure 3. Land Use Control Area, Site P-2A, Sharpe Site



L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\Sharpe_ROD_2008_Sites_Mapbook.mxd AVS 6/10/2011 SAC

Figure 4. Land Use Control Area, Site P-2B, Sharpe Site

L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\Sharpe_ROD_2008_Sites_Mapbook.mxd AVS 6/10/2011 SAC

Figure 5. Land Use Control Area, Site P-4B, Sharpe Site

L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\Sharpe_ROD_2008_Sites_Mapbook.mxd AVS 6/10/2011 SAC

Figure 6. Land Use Control Area, Site P-5A, Sharpe Site

L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\Sharpe_ROD_2008_Sites_Mapbook.mxd AVS 6/10/2011 SAC

Figure 7. Land Use Control Area, Site S-3, Sharpe Site

L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\Sharpe_ROD_2008_Sites_Mapbook.mxd AVS 6/10/2011 SAC

Figure 8. Land Use Control Area, Site S-26, Sharpe Site

L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\Sharpe_ROD_2008_Sites_Mapbook.mxd AVS 6/10/2011 SAC

Figure 9. Land Use Control Area, Site S-30, Sharpe Site

L:\Projects\Sharpe\OU2_ROD_Amendment\ArcMaps\Sharpe_ROD_2008_Sites_Mapbook.mxd AVS 6/10/2011 SAC

Figure 10. Land Use Control Area, Site S-33/29, Sharpe Site

Figure 11. Land Use Control Area, Sites P-1A, P-1B, P-1C, and S-36, Sharpe Site

APPENDIX D

Responses to Comments

COMMENT RESOLUTION MEETING CHRONOLOGY

Comments on the draft *Amendment to the Record of Decision, Basewide Remedy for Defense Distribution Depot San Joaquin - Sharpe Site (Operable Unit 2 – Soils)* (OU 2 ROD Amendment) were received by Defense Logistics Agency (DLA) Installation Support at San Joaquin on 20 August 2009 from the United States Environmental Protection Agency (EPA) Region 9 and California Environmental Protection Agency, Department of Toxic Substances Control (DTSC). The Regional Water Quality Control Board–Central Valley Region (RWQCB) concurred with comments provided by EPA and DTSC.

Following receipt of the comments on the draft OU 2 ROD Amendment, DLA Installation Support at San Joaquin and the regulatory agencies met on several occasions to clarify the comments and resolve the issues expressed. Additional meetings were held following submittal of the draft final OU 2 ROD Amendment to resolve informal comments received from EPA and comments received from DTSC. RWQCB noted their support of EPA and DTSC in resolving these comments. Additional concerns were raised by EPA regarding burrowing owls that may be present at a trichloroethene (TCE) or metals site or may occupy one of those sites in the future; those concerns were addressed through ecological risk evaluations that also underwent review and comment resolution.

The final OU 2 ROD Amendment reflects the discussions in those meetings, as well as the written comments received from the regulatory agencies. A chronology of the meetings, teleconferences, and document submittals is provided below. In the written responses to comments, DLA Installation Support at San Joaquin refers to these meetings collectively as *comment resolution meetings*. Comment and response tables follow this chronology.

- 16 September 2009 – Comment resolution meeting held at URS office in Sacramento with representatives from DLA Installation Support at San Joaquin, DTSC (remedial project manager [RPM] and technical support), and URS present. The purpose of the meeting was for DLA Installation Support at San Joaquin and URS to gain insight into the nature of and concerns associated with specific comments on the draft OU 2 ROD Amendment. DLA Installation Support at San Joaquin agreed to conduct an investigation in the area of Building 649 and Site P-1E to support the no further action determination for Site P-1E. The results of the investigation were submitted to DTSC on 29 October and are also presented in the responses to comments table in this appendix.

- 24 September 2009 – Comment resolution teleconference held with representatives from DLA Installation Support at San Joaquin, EPA (RPM), and URS. The purpose of the teleconference was for DLA Installation Support at San Joaquin and URS to gain insight into the nature of and concerns associated with specific comments on the draft OU 2 ROD Amendment. DLA Installation Support at San Joaquin agreed to develop and submit methodology for evaluating risk associated with the vapor intrusion pathway, using Site P-5A as an example.

- 29 October 2009 – Comment resolution teleconference held with representatives from DLA Installation Support at San Joaquin, EPA (RPM and risk assessor), and URS. The purpose of the teleconference was to discuss the Site P-5A vapor intrusion pathway risk assessment submitted to EPA on 8 October. During the teleconference, EPA stated their concern for potential vapor intrusion risk related to off-gassing of the A Zone groundwater plumes.

- 17 November 2009 – Comment resolution teleconference held with representatives from DLA Installation Support at San Joaquin, EPA (RPM), and URS to continue the discussion of potential vapor intrusion risk from off-gassing of the A Zone groundwater plumes. As a follow-up to the 29 October and 17 November teleconferences, vapor intrusion pathway risk assessments for each of

the 16 TCE sites plus a preliminary screening evaluation of the potential vapor intrusion risk at TCE sites that overlie plumes in A Zone groundwater were submitted to EPA on 20 November.

- 15 December 2009 – Comment resolution meeting held at EPA office in San Francisco with representatives from DLA Installation Support at San Joaquin, EPA (RPM and risk assessor), and URS present, and with representatives from DTSC (RPM and risk assessor), RWQCB (RPM), and URS participating by telephone. The purpose of the meeting was to discuss the results of the vapor intrusion pathway risk assessments submitted on 20 November and to discuss no further action determinations for 15 of the 16 TCE sites (excluding Site P-5A). At the meeting, DTSC stated their concern for potential vapor intrusion risk of cumulative exposure to multiple volatile organic compounds (VOCs) in soil vapor. As follow-up to the meeting, vapor intrusion pathway risk assessments for each of the 16 TCE sites were submitted to the regulatory agencies on 5 January. These risk assessments evaluate cumulative risk from multiple VOCs, whereas previously submitted risk assessments evaluated risk from TCE only.

- 13 January 2010 – RPM meeting held at URS office in Sacramento with representatives from DLA, DLA Installation Support at San Joaquin, EPA, DTSC, RWQCB, URS, and Booz-Allen Hamilton present. A portion of this meeting was spent discussing the results of the vapor intrusion pathway risk assessments submitted to the regulatory agencies on 5 January. Attendees also discussed no further action or land use control determinations for 15 of the 16 TCE sites (excluding Site P-5A).

- 21 January 2010 – Comment resolution teleconference held with representatives from DTSC (risk assessor) and URS. The purpose of the teleconference was to clarify questions DTSC had regarding the TCE-only and cumulative vapor intrusion pathway risk assessments submitted on 20 November and 5 January, respectively.

- 3 February 2010 – Comment resolution teleconference held with representatives from DLA Installation Support at San Joaquin, EPA (risk assessor), DTSC (risk assessor), and URS. The purpose of the meeting was to discuss the methods and results of the cumulative vapor intrusion pathway risk assessments conducted using three different methods: EPA screening, DTSC screening, and site-specific. No further action or land use control determinations were also discussed for 15 of the 16 TCE sites (excluding Site P-5A).

- 19 March 2010 – Draft final OU 2 ROD Amendment submitted to the regulatory agencies.

- 6 April 2010 – DLA Installation Support at San Joaquin received letter from RWQCB noting their support of EPA and DTSC efforts to resolve comments before finalizing the OU 2 ROD Amendment.

- 14 April 2010 – RPM meeting held at URS office in Sacramento with representatives from DLA, DLA Installation Support at San Joaquin, EPA, DTSC, RWQCB, URS, and Booz-Allen Hamilton present. A portion of this meeting was spent discussing informal comments that EPA was planning to provide to DLA Installation Support at San Joaquin on the draft final OU 2 ROD Amendment. The RPMs agreed that a meeting should be held to discuss EPA's informal comments.

- 22 April 2010 – DLA Installation Support at San Joaquin received informal comments from EPA on the draft final OU 2 ROD Amendment. Because these informal comments resulted in changes to the OU 2 ROD Amendment, revisions to the response to the comments table for the draft OU 2 ROD Amendment were made and are shown as italicized text in a new version of the response to comments table included in this appendix.

- 28 April 2010 – Comment resolution meeting held at EPA office in San Francisco with representatives from DLA Installation Support at San Joaquin, EPA (RPM and risk assessor), and URS present, and with representatives from DTSC (RPM) and RWQCB (RPM) participating by telephone. The purpose of the meeting was to discuss EPA's informal comments on the draft final OU 2 ROD Amendment.

- 22 June 2010 – Comment resolution teleconference held with representatives from DLA Installation Support at San Joaquin, EPA (RPM and risk assessor), DTSC (RPM and risk assessor), and URS. The purpose of the teleconference was to discuss the two TCE site summary examples submitted to the regulatory agencies on 21 May 2010 that were revised in response to EPA's informal comments on the draft final OU 2 ROD Amendment.

- 8 July 2010 – Comment resolution meeting held at the Sharpe Site with representatives from DLA Installation Support at San Joaquin, EPA (RPM), DTSC (RPM and risk assessors), California Department of Fish and Game (DFG), Albion Environmental, and URS. The purpose of the meeting was to view the locations of burrowing owls at the facility and to discuss EPA's concern for the burrowing owls observed at TCE sites P-3A and P-5A.

- 12 and 14 July 2010 – Comment resolution teleconferences held with representatives from DLA Installation Support at San Joaquin, EPA (RPM), DTSC (RPM and risk assessor), and URS. The purpose of the teleconferences was to discuss the revised site summaries for sites recommended for no further action and for land use controls submitted to the regulatory agencies on 1 and 7 July, respectively.

- 13 July 2010 – DLA Installation Support at San Joaquin received comments from DTSC on Appendices A, B, and C of the draft final OU 2 ROD Amendment.

- 22 July 2010 – Pre-final OU 2 ROD Amendment provided to the regulatory agencies at the RPM meeting.

- 13 August 2010 – DLA Installation Support at San Joaquin received an electronic mail from DTSC indicating their concurrence with the pre-final OU 2 ROD Amendment and revised site summaries in Appendix A.

- 16 September 2010 – During monthly scheduling teleconference, the DTSC RPM noted that the DTSC Human and Ecological Risk Office and DFG had prepared an internal memorandum regarding the ecological risk to burrowing owls at Site P-3A, a TCE site. The memorandum was provided to EPA for review on 16 September.

- 21 October 2010 – RPM meeting held at URS office in Sacramento with representatives from DLA, DLA Installation Support at San Joaquin, EPA, DTSC, RWQCB, URS, and Booz-Allen Hamilton present. A portion of this meeting was spent discussing the status of the pre-final OU 2 ROD Amendment provided to the regulatory agencies at the 22 July 2010 RPM meeting and the ecological risk evaluation for burrowing owls that DTSC prepared and provided to EPA in September. Because DLA had not received the ecological risk evaluation, DTSC forwarded the memorandum to DLA on 21 October. EPA did not indicate that they had any additional concerns regarding burrowing owls at Site P-3A, but they did express concern that burrowing owls could occupy the metals sites and be exposed to residual concentrations of lead and chromium. DLA agreed to evaluate the potential ecological hazards to burrowing owls that may result from residual lead and chromium concentrations at the five metals sites.

- 7 December 2010 – Draft *Ecological Risk Evaluation of Burrowing Owls at the Metals Sites* submitted to the regulatory agencies.

- Mid-December 2010 – DTSC ecological risk assessor provided informal comments via electronic mail to URS risk assessor on the draft *Ecological Risk Evaluation of Burrowing Owls at the Metals Sites*.

- 16 December 2010 – Replacement page for the methodology section of the *Ecological Risk Evaluation of Burrowing Owls at the Metals Sites* submitted to the regulatory agencies. The replacement page provided a more complete description of the methodology used to conduct the risk evaluation and did not affect the results or conclusions presented in the draft memorandum submitted on 7 December.

- 27 January 2011 – RPM meeting held at URS office in Sacramento with representatives from DLA, DLA Installation Support at San Joaquin, EPA, DTSC, RWQCB, URS, and Booz-Allen Hamilton present. A portion of this meeting was spent discussing the status of the *Ecological Risk Evaluation of Burrowing Owls at the Metals Sites* submitted to the regulatory agencies in December. EPA provided comments on the memorandum from TechLaw, Inc. to DLA during the discussion.

- 25 February 2011 – Draft final *Ecological Risk Evaluation of Burrowing Owls at the Metals Sites* submitted to the regulatory agencies.

- 9 March 2011 – DLA Installation Support at San Joaquin received comments from DTSC on the draft final *Ecological Risk Evaluation of Burrowing Owls at the Metals Sites*.

- 14 April 2011 – RPM meeting held at URS office in Sacramento with representatives from DLA Installation Support at San Joaquin, EPA, DTSC, RWQCB, URS, and Booz-Allen Hamilton present. A portion of this meeting was spent discussing the status of the draft final *Ecological Risk Evaluation of Burrowing Owls at the Metals Sites* submitted to the regulatory agencies in February. EPA stated that they were satisfied with the results of the ecological risk evaluation but requested clarification on how DLA planned to enforce monitoring for the presence of burrowing owls at Sites S-3 and S-26. The ecological risk evaluation concluded that concentrations of lead at a few individual sample locations at Sites S-3 and S-26 exceed effect-based soil screening levels.

- 22 April 2011 – DLA Installation Support at San Joaquin provided text to the regulatory agencies to be incorporated into the OU 2 ROD Amendment that stated annual inspections would be conducted to ensure that burrowing owls do not inhabit Sites S-3 and S-26.

- 5 May 2011 – DLA Installation Support at San Joaquin provided text to the regulatory agencies to be incorporated into the site risks sections for the TCE and metals sites in the OU 2 ROD Amendment that summarized the conclusions of the ecological risk evaluations.

- 13 May 2011 – Final *Ecological Risk Evaluation of Burrowing Owls at the Metals Sites* submitted to the regulatory agencies.

- 19 May 2011 – DLA Installation Support at San Joaquin received an electronic mail from the DTSC RPM with a comment from the DTSC ecological risk assessor on the text that DLA provided to the regulatory agencies on 22 April. The comment expressed concern about how DLA will prevent burrowing owls from inhabiting Sites S-3 and S-26 and what DLA will do if burrowing owls are found residing at the sites.

- 23 May 2011 – DLA Installation Support at San Joaquin, DTSC (RPM), and URS discussed on the telephone the comment received from DTSC on 19 May. DLA stated that if burrowing owls were observed at Site S-3 or Site S-26, DLA would passively relocate the burrowing owls and collapse the burrows during the non-breeding season to prevent them from being reoccupied. DLA also stated that these actions would be done in accordance with the *Burrowing Owl Management Plan*. DTSC indicated their agreement with the verbal response and clarified that they did not require a written response.

- 2 June 2011 – Teleconference held with representatives from DLA Installation Support at San Joaquin, EPA (RPM and legal), DTSC (RPM), and URS. EPA asked DLA how they will ensure that burrowing owls do not inhabit Site S-3 or Site S-26 per the text provided to them on 22 April. DLA stated that if burrows or burrowing owls are observed at Site S-3 or Site S-26 during annual inspections conducted during the non-breeding season, DLA will passively relocate the burrowing owls and collapse the burrows in accordance with the management recommendations outlined in the *Burrowing Owl Management Plan.* EPA requested that DLA include these actions in the OU 2 ROD Amendment to make them enforceable and specify that the results of the annual inspections will be documented in the Federal Facilities Agreement Annual Progress Reports. DLA Installation Support at San Joaquin agreed to add these actions to the OU 2 ROD Amendment and provided text to the regulatory agencies on 2 June.

- 3 June 2011 – DLA Installation Support at San Joaquin, EPA (RPM), and URS discussed on the telephone the revised text provided to the regulatory agencies on 2 June. EPA requested that DLA separate the text related to the monitoring requirements for burrowing owls from the text related to land use controls and note that the *Burrowing Owl Management Plan* will be updated to incorporate the requirements of the OU 2 ROD Amendment. EPA also requested that DLA state that the post-proposed plan addition of monitoring for burrowing owls at Sites S-3 and S-26 is a minor change per EPA guidance on the preparation of RODs and other decision documents. DLA agreed to make the requested changes, as well as other minor text changes.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		ENCLOSURE 1: U.S. EPA Review of Sharpe Draft OU2 ROD Amendment	
		General Comments	
1.		One of the main purposes of the Sharpe OU2 ROD Amendment is to document the selection of LUCs at the five metals sites (S-3, S-26, S-30, S-33/29, and S-36) where completed remedial action (excavation to commercial/industrial cleanup levels for lead and chromium and off-site disposal) was conducted pursuant to the 1996 ROD. However, the ROD Amendment does not adequately present metals concentration data to document that the 1996 ROD cleanup levels were achieved in support of the ROD Amendment's selection of LUCs. Therefore, please include residual metals data in the ROD Amendment (via figures, tables and/or text) to detail site-specific residual metals concentrations, calculated human health risks, and risk exposure assumptions in support of the selection of LUCs as an expanded protective remedy for these sites.	A site summary for each metals site has been created and includes the conceptual site model, investigation and remediation (where applicable) history, and the current status of the site. Tables and figures of residual lead and chromium concentrations in soil are also included with each site summary. These site summaries are presented in Appendix A of the draft final OU 2 ROD Amendment. In addition, text has been added to Section 3.1 (Section 2.1 in the draft) to describe the site risks and how the cleanup standards were developed as presented in the OU 2 ROD. This additional text combined with the data presented in the site summaries supports the need for LUCs to protect human health and the environment because the remedial decision for the five metals sites was based on industrial land use and not unrestricted land use. Section 3.1 also includes a more detailed discussion of the remedy selected in the OU 2 ROD than presented in the draft OU 2 ROD Amendment.
2.		Similar to General Comment number 1 above, the Sharpe OU2 ROD Amendment does not adequately present site-specific TCE soil concentration data to support the NFA determinations concluded for the 15 TCE sites. Supporting documents referenced in Table 1-1, Status of TCE Sites at DDJC-Sharpe, need to be summarized in the ROD Amendment; therefore, please include analytical data in the ROD Amendment (via figures, tables and/or text) to detail site-specific residual TCE concentrations and calculated human health risks in support of the NFA determinations.	A site summary for each TCE site has been created that includes the conceptual site model, investigation and remediation (where applicable) history, vadose zone and groundwater modeling results, vapor intrusion risk assessment results, and the current status (including contributing lines of evidence for no further action determination, where applicable) of the site. A table and figure of TCE concentrations in the vadose zone are also included with each site

(continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
2. (cont'd)			(continued) summary. These site summaries are presented in Appendix A of the draft final OU 2 ROD Amendment. The OU 2 ROD states that TCE-contaminated soils at DDJC-Sharpe do not pose a risk to human health and the environment. Implementation of the selected remedy, therefore, is to minimize the amount of TCE allowed to migrate from contaminated soils to groundwater through treatment. The soil vapor cleanup level for TCE developed in the OU 2 ROD is for protection of groundwater quality. In determining the TCE soil vapor cleanup level, other potential routes of exposure to VOCs were not considered significant at the time of the 1994 RI/FS risk assessment because VOCs were below ground surface and no structures have ever existed at the TCE sites. However, evolving awareness of the potential for health risks from inhalation of VOCs have raised concerns about risks to occupants of buildings constructed atop contaminated soil and groundwater. Therefore, a risk assessment of the vapor intrusion pathway has been completed for each of the TCE sites. The specific details of the risk assessment methods, calculations, and risk and hazard estimates are presented in Appendix B of the draft final OU 2 ROD Amendment. Vapor intrusion risk assessments were conducted using the results from the most recent soil vapor sampling (which is either post-ROD confirmation sampling or sampling conducted *after* SVE system shutdown [if SVE remediation occurred at a site]), (continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
2. (cont'd)			(continued) although many of these data are more than 10 years old. Estimates of the cancer risks or noncancer health hazards were derived for all detected VOCs, using three methods (EPA screening, DTSC screening, and site-specific) for an assumed "unrestricted" (residential) land use. Evaluating an unrestricted use scenario is necessary because it is the point-of-departure for agency decision-making: if a site is compatible with unlimited use and unrestricted exposure, then measures (such as LUCs or additional remediation) are not necessary. The unrestricted land use scenario assumes that occupied *residences* overlie the sites, which is neither a current nor a reasonably anticipated future land use for the site. DDJC-Sharpe is an actively operating facility, and there are no buildings (residences or otherwise) that currently overlie any of the TCE sites. The cumulative cancer risk estimates for each site vary depending on the risk assessment method. These risk and hazard estimates were used as lines of evidence to assist in determining whether a TCE site requires no further action or whether a TCE site requires LUCs to protect human health and the environment. The risk and hazard estimates for each site, along with the other lines of evidence evaluated, are presented in the TCE site summaries in Appendix A of the draft final OU 2 ROD Amendment. (continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
2. (cont'd)			(continued) Based on the results of the risk assessments, the draft final OU 2 ROD Amendment has been revised to recommend LUCs at four TCE sites (P-1G, P-2A, P-2B, and P-4B). No further action continues to be recommended for eleven of the TCE sites (P-1A, P-1B, P-1C, P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A).
3.		U.S. EPA requests that the Sharp OU2 ROD Amendment include additional text from the 1996 OU2 ROD, to present the original remedy selected in 1996 for the TCE sites and more clearly establish and document the basis and purpose of the OU2 ROD Amendment with regards to these TCE sites. For example, it would helpful to expand the description of the remedy to more clearly indicate that the 1996 ROD selected SVE (referred to at the time as 'In-Situ Volatilization'), and indicate per the 1996 ROD the two site-specific components of the remedy were: * The remediation of seven sites (please list those sites) that had been sufficiently characterized and found to be degrading groundwater; and, * The characterization of seven sites (also please list those sites) that are potentially degrading groundwater. These sites were subject to remediation based on the results of the characterization (according to the 1996 ROD). Utilizing these two categories of TCE sites specified in the 1996 ROD, the ROD Amendment can then chronologically and technically detail how individual sites progressed to achieve an NFA determination.	A new Section 2.0 TCE Sites has been developed to provide text from the OU 2 ROD regarding the site risks, the remedy selected in the OU 2 ROD, and the basis for the ROD Amendment. Section 2.0 presents a list of the seven sites that were classified as remediation sites and the seven sites that were classified as characterization sites in the OU 2 ROD. As stated in the response to EPA General Comment # 2, site summaries have been prepared that detail how individual sites have progressed from the initial RI/FS investigation to their current status (no further action or LUC sites) through implementation of the OU 2 ROD requirements. These site summaries are presented in Appendix A of the draft final OU 2 ROD Amendment. (Note: Section 2.0 Metals Sites in the draft ROD Amendment has been re-numbered as Section 3.0 in the draft final OU 2 ROD Amendment; subsequent sections have also been re-numbered accordingly.)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
4.		U.S. EPA requests that the OU2 ROD Amendment be expanded to include the addition of Land Use Controls (LUCs) for trichloroethene (TCE) Site P-5A. While U.S. EPA notes that Section 10.2 (TCE-Contaminated Soils) in the 1996 ROD states that, "TCE-contaminated soils do not pose a risk to human health and the environment…Implementation of the selected remedy, therefore, is not being recommended to decrease risks to human health and the environment. Rather, the selected remedy will minimize the amount of TCE allowed to migrate from contaminated soils to groundwater through treatment, and is a source removal action…", U.S. EPA requests that short-tem LUCs be established for TCE Site P-5A consistent with the OU2 metals sites. Further, a recently drafted (February 2009) site characterization cone-penetrometer assessment needs to be summarized for Site P-5A, which likely establish increased human health risks and support the conservative selection of LUCs for this site. As informally discussed with DLA during a July 15, 2009, quarterly project managers meeting, U.S. EPA generally require LUCs to restrict residential reuse until soils remedial actions have decreased site contamination to unrestricted levels. Given that the OU2 ROD Amendment documents the initiation of SVE at Site P-5A (due to elevated TCE vapors), and documents the selection of LUCs at metals sites with residual contamination exceeding residential cleanup concentrations, U.S. EPA requests that similar LUCs be established for TCE Site P-5A as well, until cleanup levels of organic vapors is achieved.	SVE will be implemented at Site P-5A during 2010 in accordance with the OU 2 ROD remedy for TCE sites. DLA will not consider establishing LUCs at Site P-5A until the OU 2 ROD remedy for TCE sites has been implemented and allowed to remediate soil vapor at the site to concentrations at or less than the established cleanup standard. A site summary for Site P-5A is included in Appendix A of the draft final OU 2 ROD Amendment that details site characterization efforts, including results of the 2006 and 2007 CPT investigations and results of a site-specific cumulative risk assessment.
5.		Introduction, Section 1.0.2 and Table 1-1, Status of TCE Sites at DDJC-Sharpe: For TCE Site P-5A, the Draft OU2 ROD Amendment documents the initiation of SVE to address ongoing impacts to groundwater from vapor migration. Given that the 1996 ROD had documented this action, some clarification is needed in the ROD Amendment to explain why the remedial action selected in 1996 is just now being initiated. Consistent with General Comment numbers 2 and 3 above, Table 1-1, referenced in Section 1.0.2 of the ROD Amendment and/or text should be modified to provide a site-specific description, history, and 1996 ROD requirement (remedial action versus additional investigation).	As noted in the response to EPA General Comment #3, a new Section 2.0 TCE Sites has been developed to provide text from the OU 2 ROD regarding the site risks and the remedy selected in the OU 2 ROD for the TCE sites. In addition, a site summary for Site P-5A is included in Appendix A of the draft final OU 2 ROD Amendment that describes the conceptual site model, investigation history, including why SVE has not yet been implemented at Site P-5A, and the plan for remediation at the site.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
6.		Land Use Control language has been agreed upon by U.S. EPA and DLA (see DoD Memorandum dated January 16, 2004; Comprehensive Environmental Response, Compensation, and Liability Act ROD and post-ROD Policy, Attachment 1 – Principles and Procedures for Specifying, Monitoring, and Enforcement of Land Use Controls and Other Post-ROD Actions). Required LUC text must be consistent with U.S EPA's October 2006, Institutional Control (IC) Checklist. A copy of IC Checklist is enclosed (see Enclosure 2) that provides specific comments related to the individual checklist items. Please note that many of the item-specific comments are related to the need to include LUCs for TCE Site P-5A.	With a few exceptions, the comments on the institutional control (IC) checklist items are solely related to the request to add LUCs at Site P-5A. As noted in the response to EPA General Comment #4, LUCs will not be established for Site P-5A in this OU 2 ROD Amendment. However, LUCs will be established at TCE sites P-1G, P-2A, P-2B, and P-4B. Therefore, the IC checklist has been applied, as appropriate, to those sites. See responses to each IC checklist item comment in Enclosure 2.
		Specific Comments	
1.		Please update the ROD Amendment signature block for Michael Montgomery as follows: Michael Montgomery Assistant Director Federal Facilities and Site Cleanup Branch	The title block has been updated.
2.	Sec. 4.0, Sub-section 4.3	Public Participation Compliance: Text indicates that "[t]he final decision regarding the amendment will not be made until after consideration of public comments"; however, the Draft ROD Amendment was issued after the completion of the public comment period. While subsequent text indicates that the Final ROD Amendment will provide the Responsiveness Summary, please indicate in this section if DLA received any public comments on the OUR ROD Amendment as there were no public members in attendance at the March 19 2009, Proposed Plan Public Meeting.	DLA did not receive any comments from the public on the Proposed Plan, and no members of the public attended the Proposed Plan public meeting held on 19 March 2009. Therefore, a responsiveness summary was not prepared. The last paragraph in Section 5.0 states: "Comments were not received from the public during the public comment period; therefore, a responsiveness summary was not prepared."

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		ENCLOSURE 2: HQ IC Checklist for Sharpe OU 2 Draft Rod Amendment	
		Sharpe OU2 ROD Background: The OU2 ROD Amendment, dated April 10, 2009, applies Institutional Controls (referred to in the ROD as Land Use Controls or LUCs) at five sites with elevated metals concentrations (lead and chromium) that exceed concentrations that are protective for future residential/unrestricted reuse. The five metals sites include: S-3; S-26; S-30; S-33/29; and S-36. The OU2 ROD Amendment also documents the initiation of Soil Vapor Extraction at one trichloroethylene (TCE) Site P-5A that had been selected in the 1996 OU2 ROD and documents a No Further Action Determination at the fifteen remaining TCE sites. The ROD Amendment does not propose LUCs for Site P-5A for residential reuse restrictions. As a result of the ROD Amendment absence of LUCs for Site P-5A, many of the IC check list items were determined to be incomplete.	See responses to each IC checklist item comment below. As noted in the response to EPA General Comment #4, LUCs will not be established for Site P-5A in this OU 2 ROD Amendment. To avoid redundancy, this statement is not repeated for each IC checklist item to which it applies. LUCs will be established, however, at TCE sites P-1G, P-2A, P-2B, and P-4B; therefore, the EPA comments related to P-5A are relevant for those TCE sites, and the IC checklist has been applied, as appropriate, to those sites in the draft final OU 2 ROD Amendment.
1.		Map/Figure showing boundaries of the land use controls. **For the five metals sites proposed for LUCs, the Defense Logistics Agency (DLA) has included maps illustrating the LUC boundaries (see ROD Amendment Figures 1 through 6); however, for the one TCE site (Site P-5A) proposed for SVE, no proposal has been made to establish LUCs and no map identifying the LUC boundary has been presented. Also, the figures presented for the metals sites do not illustrate residual metals concentration remaining in shallow soils to support the industrial cleanup goals. Therefore, please include a map illustrating residual metals (lead and chromium) concentrations remaining at the five metals sites. Also, as U.S. EPA believes that LUCs should be established for the one proposed TCE SVE site (Site P-5A), please include a LUC boundary/soil vapor concentration map for this area.**	The figures prepared for the site summaries of the five metals sites show residual lead and chromium concentrations. These maps are included in Appendix A of the draft final OU 2 ROD Amendment. Figures 6 through 10 (Figures 2 through 6 in the draft) in Appendix C Addendum to the Installation Master Plan, DDJC-Sharpe (Appendix A in the draft) were not modified. LUCs will be established at TCE sites P-1G, P-2A, P-2B, and P-4B. Therefore, LUC boundary maps have been prepared for the Addendum to the Installation Master Plan, DDJC-Sharpe in Appendix C, and maps showing residual TCE concentrations have been prepared for each site summary included in Appendix A.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
2.		Document risk exposure assumptions and reasonably anticipated land uses, as well as any known prohibited uses which might not be obvious based on the reasonably anticipated land uses. (For example, where "unrestricted industrial" use is anticipated, list prohibited uses such as on-site company day-**care** centers, recreation areas, etc.) **ROD Amendment Sections 2.3.2 and 2.3.3, adequately addressed this checklist item for the five metals sites. Sections 2.3.2 of the ROD Amendment provide a general description of the land use assumptions and Section 2.3.3 indicates, "[t]he objective of the LUCs is to prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and playgrounds." However, the ROD Amendment does not propose LUCs for Site P-5A and does not document risk exposure assumptions or reasonably anticipated land uses for Site P- 5A. Therefore, while the ROD Amendment documents risk exposure assumptions and reasonably anticipated land use for the five metals sites, it does not provide this information for Site P-5A; please provide this information for Site P-5A.**	Section 2.1.1 Site Risks and Section 2.4 Land Use Controls provide risk exposure assumptions, reasonably anticipated land uses, and prohibited uses for the four TCE sites (P-1G, P-2A, P-2B, and P-4B) at which LUCs will be established.
3.		Describe the risks necessitating the LUCs. **While Sections 2.1, Site History, Contamination, and Selected ROD Remedy, Section 2.1.1, Sites S-30, S-33/29, and S-36 , through Section 2.1.3, S-26 provide some general qualitative description of residual metals concentrations and adequacy of cleanup, the ROD Amendment does not provide sufficient documentation of metals and TCE site risks. Therefore, please include additional text and table(s) to present current site risks which are addressed by the risk exposure assumptions.**	Documentation of the risks necessitating LUCs at the four TCE sites (P-1G, P-2A, P-2B, and P-4B) and five metals sites (S-3, S-26, S-30, S-33/29, and S-36) are described in Section 2.1.1 Site Risks and Section 3.1.1 Site Risks, respectively. In addition, the individual site summaries in Appendix A describe the risks necessitating LUCs at these sites.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
4.		State the LUC performance objectives. We have had comments on these because several of the objectives have not been clear. The following are some examples of what we have been looking for: 1. Prevent access or use of the groundwater until cleanup levels are met. 2. Maintain the integrity of any current or future remedial or monitoring system such as monitoring wells, impermeable reactive barriers. 3. Maintain the 12 inch vegetative soil layer to limit ecological contact. 4. Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities and playgrounds. **As indicated under checklist item #2, text under Section 2.3.3 indicates, "[t]he objective of the LUC is to prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and playgrounds." While the LUC performance objectives are correctly presented for the metals sites, the same objectives are not presented for TCE Site P-5A. Therefore, please include TCE Site P-5A with regards to the application of LUC performance objectives.**	The objective of the LUCs at the metals sites as stated in Section 3.3 Land Use Controls (2.3.3 in the draft) has been revised as follows: "The objective of the LUCs at Sites S-3, S-26, S-30, S-33/29, and S-36 is to protect human health and the environment in accordance with CERCLA by limiting human exposure to residual metals contamination in soil at concentrations that are greater than residential use levels." For the TCE sites, the objective of the LUCs as stated in Section 2.4 Land Use Controls is: "The objective of the LUCs at Sites P-1G, P-2A, P-2B, and P-4B is to protect human health and the environment in accordance with CERCLA by limiting human exposure to VOCs through the vapor intrusion pathway."
5.		Generally describe the LUC, the logic for its selection and any related deed restrictions/**notifications**. (See also #16, below) **With regards to the five metals sites, the eight bullets that are provided in Section 2.3.4, on page 2-3 generally describe the LUCs, the logic, and the mechanism for deed restrictions in the even of site transfer. While the information is adequately presented for the metals sites, this same information is not presented for TCE site P-5A. Therefore, please include TCE Site P-5A with regards to general description of LUC, the logic of its selection and any related deed restrictions/notifications.**	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the four TCE sites (P-1G, P-2A, P-2B, and P-4B) at which LUCs will be established.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
6.		Duration language: "Land Use Controls will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure." **Section 2.3.4, third bullet from the top of page 2-4 states: [t]he LUCs will be maintained until the concentration of hazardous substances in the soil is at such levels as to allow for unlimited use and unrestricted exposure (e.g., if future excavations resulted in cleanup to residential use levels, the LUCs would no longer be needed)." While the information/text is adequately presented for the metals sites, this same text is not presented for TCE site P-5A. Therefore, please expand the required LUC duration language to also include TCE Site P-5A.**	With a few modifications, text similar to that noted in the comment for metals sites has been incorporated into Section 2.4 Land Use Controls for the four TCE sites (P-1G, P-2A, P-2B, and P-4B) at which LUCs will be established. Specifically, the text states: "The LUCs will be maintained at the four TCE sites until the concentration of hazardous substances in the soil is at such levels as to allow for unlimited use and unrestricted exposure. For example, if VOC soil vapor concentrations reported from a future investigation are compatible with residential use (i.e., no potential risk associated with inhalation of VOCs through the vapor intrusion pathway), the LUCs will no longer be needed, and a memorandum to the site file will be prepared to terminate the LUCs."
7.		Include language that the [federal agency] is responsible for implementing, maintaining, reporting on, and enforcing the land use controls. This may be modified to include another party should the site-specific circumstances warrant it. **With regards to the metals sites, Section 2.3.4, "DLA will implement, monitor, maintain, and enforce LUCs…" and elaborates appropriately in a series of detailed bullets described in subsequent checklist items. While this statement is correctly presented for the metals sites, this statement does not apply to TCE site P-5A. Therefore, please expand the required statement that DLA is responsible for implementing, maintaining, reporting on, and enforcing LUCS to also include TCE Site P-5A.**	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the four TCE sites (P-1G, P-2A, P-2B, and P-4B) at which LUCs will be established.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
8.		Where someone else will or the federal agency plans that someone else will ultimately be implementing, maintaining, reporting on, and enforcing land use controls, the following language should be included: "Although the [federal agency] may later transfer [has transferred] these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the [federal agency] shall retain ultimate responsibility for remedy integrity." **Section 2.3.5, page 2-4 states; "[a]lthough DLA may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, DLA will retain ultimate responsibility for remedy integrity." While this statement is correctly presented for the metals sites, the statement does not apply to TCE Site P-5A. Therefore, please expand the required statement regarding transferring procedural responsibilities to another party to include TCE Site P-5A.**	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the four TCE sites (P-1G, P-2A, P-2B, and P-4B) at which LUCs will be established.
9.		[**ONLY INCLUDE IN NON-AF RODS**] Refer to the remedial design (RD) or remedial action work plan (RAWP) for the implementation actions. Because this is a new idea (i.e., including the LUC implementation actions in either or both of these two primary documents), to ensure that the requirement is clear and enforceable, we developed the following language where it makes sense: "A LUC Remedial Design will be prepared as the land use component of the Remedial Design. Within 90 days of ROD signature, the [federal agency] shall prepare and submit to EPA for review and approval a LUC remedial design that shall contain implementation and maintenance actions, including periodic inspections." Another option is to refer to the enforceable schedule in the IAG for the RD or RAWP." **DLA utilizes Air Force (AFCEE) contract support; therefore it follows Air Force guidance** and **does not provide this reference to a LUC-RD.**	No response required.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
10.		Commitment by federal agency to address any situation that may interfere with the effectiveness of LUC: "Any activity that is inconsistent with the IC objectives or use restrictions, or any other action that may interfere with the effectiveness of the ICs will be addressed by the [federal agency] as soon as practicable, but in no case will the process be initiated later than___ days [10 days suggested] after the [federal agency] becomes aware of the breach." **Section 2.3.4, third bullet on page 2-3 states, "DLA will address any activity that is inconsistent with the LUC objective or use restriction, or any other action that may interfere with the effectiveness of the LUCs, as soon as practicable. In no case will the process be initiated later than 10 days after the date DLA becomes aware of the inconsistency." While this statement is adequately presented for the metals sites, the statement does not apply to TCE Site P-5A. Therefore, please expand the required statement regarding addressing any activity inconsistent with LUCs to include TCE Site P-5A.**	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the four TCE sites (P-1G, P-2A, P-2B, and P-4B) at which LUCs will be established.
11.		Commitment by federal agency to notify EPA of and address any situation that may interfere with the effectiveness of LUC: "The [federal agency] will notify EPA and [the state] as soon a practicable but no longer than ten days after discovery of any activity that is inconsistent with the IC objectives or use restrictions, or any other action that may interfere with the effectiveness of the ICs The [federal agency] will notify EPA and [the state] regarding how the [federal agency] has addressed or will address the breach within 10 days of sending EPA and [the state] notification of the breach." **Section 2.3.4, on page 2-4, first bullet states, "DLA will notify EPA, DTSC, and RWQCB as soon a practicable but no longer than ten days after discovery of any activity that is inconsistent with the LUC objectives or use restrictions, or any other action that may interfere with the effectiveness of the LUCs. Within 10 days of sending the initial notification related to the inconsistency, DLA will provide notification explaining how the** (continued)	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the four TCE sites (P-1G, P-2A, P-2B, and P-4B) at which LUCs will be established.

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
11. (cont'd)		(continued) **inconsistency has or will be addressed." While this statement is adequately presented for the metals sites, the statement does not apply to TCE Site P-5A. Therefore, please expand the required statement regarding regulatory notification for an activity inconsistent with LUCs to include TCE Site P-5A.**	
12.		Notification to EPA and the state regarding land use changes: [For closing base]:[We are seeing in federal agency RODs language requiring the property transferee to notify EPA and the state prior to notifying the federal agency about possible land use changes. We have switched that around so that the federal agency reviews the proposal first. This should save EPA some resources.] "Prior to seeking approval from the EPA and [the state] the recipient of the property must notify and obtain approval from the [federal agency] of any proposals for a land use change at a site inconsistent with the use restrictions and assumptions described in this ROD." **[For active base]:** "The [federal agency] shall notify EPA and state ____ days [45 days suggested] in advance of any proposed land use changes that are inconsistent with land use control objectives or the selected remedy." **Section 2.3.4, page 2-4, second bullet states, " DLA will notify EPA, DTSC, and RWQCB at least 45 days in advance of any proposed land use change that is inconsistent with the LUC objective, any anticipated action that may disrupt or interfere with the effectiveness of the LUCs, any action that might alter or negate the need for the LUCs, or any anticipated transfer of the property subject to the LUCs." While this statement is adequately presented for the metals sites, the statement does not apply to TCE Site P-5A. Therefore, please expand the required statement regarding regulatory notification for any proposed land use change inconsistent with LUCs to include TCE Site P-5A.**	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the four TCE sites (P-1G, P-2A, P-2B, and P-4B) at which LUCs will be established.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
13.		Notification regarding transfers and federal-to-federal transfers: "The [federal agency] will provide notice to EPA and [the state] at least six (6) months prior to any transfer or sale of [OUs at issue] so that EPA and [the state] can be involved in discussions to ensure that appropriate provisions are included in the transfer terms or conveyance documents to maintain effective ICs. If it is not possible for the facility to notify EPA and [the state] at least six months prior to any transfer or sale, then the facility will notify EPA and [the state] as soon as possible but no later than 60 days prior to the transfer or sale of any property subject to ICs. In addition to the land transfer notice and discussion provisions above, the [federal agency] further agrees to provide EPA and [the state] with similar notice, within the same time frames, as to federal-to-federal transfer of property. The [federal agency] shall provide a copy of executed deed or transfer assembly to EPA and [the state]." **Section 2.3.4, last (fifth) bullet on page 2-4, states**, **"DLA will notify to EPA, DTSC, and RWQCB at least six (6) months prior to any transfer or sale of any property subject to the LUCs so that the agencies can be involved in discussions to ensure that appropriate provisions are included in the transfer terms or conveyance documents to maintain effective LUCs. If it is not possible for the facility to notify the agencies at least six months prior to any transfer or sale, then the facility will notify the agencies as soon as possible but no later than 60 days prior to the transfer or sale of any property subject to LUCs. In addition to the land transfer notice and discussion provisions, the DLA further agrees to provide the agencies with similar notice, within the same timeframes (sic), as to federal-to-federal transfers of property. The DLA will provide a copy of executed deed or transfer assembly to the agencies." While this statement is adequately presented for the metals sites, the statement does not apply to TCE Site P-5A. Therefore, please expand the required statement regarding regulatory notification for (private) transfers and federal - to - federal transfers to include TCE Site P-5A.**	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the four TCE sites (P-1G, P-2A, P-2B, and P-4B) at which LUCs will be established.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
14.		Concurrence language: "The [federal agency] shall not modify or terminate Land Use Controls, implementation actions, or modify land use without approval by EPA and the [state]. The [federal agency] shall seek prior concurrence before any anticipated action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for LUCs." **Section 2.3.4, on page 2-4 (portion of third bullet) states: "DLA will not modify or terminate the LUCs, implement actions, or modify land use without approval by EPA, DTSC, and RWQCB. DLA will seek prior concurrence before any anticipated action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for LUCs." While this statement is adequately presented for the metals sites, the statement does not apply to TCE Site P-5A. Therefore, please expand the required statement regarding regulatory notification/approval for modifying or terminating LUCs to include TCE Site P-5A.**	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the four TCE sites (P-1G, P-2A, P-2B, and P-4B) at which LUCs will be established.
15.		Monitoring and reporting language. Note that Regions may alter the monitoring frequency based on site-specific needs. "Monitoring of the environmental use restrictions and controls will be conducted annually by the [federal agency]. The monitoring results will be included in a separate report or as a section of another environmental report, if appropriate, and provided to the USEPA and the [the state]. The annual monitoring reports will be used in preparation of the Five Year Review to evaluate the effectiveness of the remedy. The annual monitoring report, submitted to the regulatory agencies by the [federal agency], will evaluate the status of the ICs and how any IC deficiencies or inconsistent uses have been addressed. The annual evaluation will address whether the use restrictions and controls referenced above were communicated in the deed(s), whether the owners and state and local agencies were notified of the use restrictions and controls affecting the property, and whether use of the property has conformed with such restrictions and controls." **Section 2.3.4, forth bullet** (continued)	The proposed text changes have been incorporated into Section 3.3 (Section 2.3 in the draft) of the draft final OU 2 ROD Amendment as requested. In addition, text similar to that noted in the comment for the metals sites with the proposed changes has been incorporated into Section 2.4 Land Use Controls for the four TCE sites (P-1G, P-2A, P-2B, and P-4B) at which LUCs will be established.

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
15. (cont'd)		(continued) **on page 2-4 states, "DLA will conduct annual monitoring and take prompt action to restore, repair, or correct any deficiencies or failures identified with the LUCs. A different monitoring schedule may be agreed upon, according to the schedule provisions of the Federal Facilities agreement (FFA), if all parties agree and if the change reasonably reflects the risk presented by the site. Monitoring will include evaluating LUC implementation, updating a list of personnel responsible for the LUCs, contacting these personnel to ensure they have access to the Addendum to the [Installation Master Plan], documenting that no change in land use has occurred, and contacting all parties of the FFA if the monitoring effort discovers a change in land use. Text in Section 2.3.5, continues, "…to assure the regulatory agencies and the public that DLA will fully comply with and be accountable for the performance measures identified herein, it will submit in a timely manner to EPA, DTSC, and RWQCB, an annual monitoring report on the status of the LUCs, including the operation, maintenance, and monitoring thereof, and how any LUC deficiencies or inconsistent uses have been addressed. The annual report will be included in the DDJC-Sharpe FFA Annual Progress Report (or a separate report, if appropriate), which is filed in the Administrative Record, and will be used in preparation of the five–year reviews to evaluate LUC effectiveness." Please utilize language per EPA/DoD guidance which specifies the following:** "**Monitoring of the environmental use restrictions and controls will be conducted annually by DLA. The monitoring results will be included in a separate report or as a section of another environmental report, if appropriate, and provided to the USEPA , DTSC, and RWQCB. The annual monitoring reports will be used in preparation of the Five Year Review to evaluate the effectiveness of the remedy.** (continued)	

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
15. (cont'd)		(continued) **The annual monitoring report, submitted to the regulatory agencies by DLA, will evaluate the status of the ICs and how any IC deficiencies or inconsistent uses have been addressed. The annual evaluation will address whether the use restrictions and controls referenced above were communicated in the deed(s), whether the owners and state and local agencies were notified of the use restrictions and controls affecting the property, and whether use of the property has conformed with such restrictions and controls."**	
16.		A comprehensive list of LUCs. The LUC should not be confused with the LUC objectives. The term LUC refers to the actual LUC instrument which is used to accomplish the objectives. The LUCs are likely to be a legal mechanism or administrative measure used to impose use restrictions (e.g. permits, orders, restrictive covenants, zoning), but they may also include measures such as fences and guards. If the description of the LUCs in #5 above is comprehensive, it could substitute for #16's listing of LUCs. A **comprehensive list of LUCs is not provided. Please include a comprehensive list of LUCs that apply to the OU2 ROD Amendment.**	A list of the LUCs is provided in Section 3.3 (Section 2.3 in the draft) of the draft final OU 2 ROD Amendment. In addition, the objective (Section 2.3.3 in the draft) of the LUCs was revised. The text states: "The objective of the LUCs at Sites S-3, S-26, S-30, S-33/29, and S-36 is to protect human health and the environment in accordance with CERCLA by limiting human exposure to residual metals contamination in soil at concentrations that are greater than residential use levels. The LUC objective for these sites will be achieved by: • Modifying the DDJC-Sharpe/Tracy IMP to prohibit residential development. • Reviewing proposed construction projects to ensure that they are consistent with the LUC objective, ARARs, and the DDJC-Sharpe/Tracy Waste Management Plan. • Establishing environmental restrictions at the time of real property transfer in order to publicly record LUCs." (continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
16. (cont'd)			(continued) Similar text has been incorporated into Section 2.4 Land Use Controls for the four TCE sites (P-1G, P-2A, P-2B, and P-4B) at which LUCs will be established. Specifically, the text states: "The objective of the LUCs at Sites P-1G, P-2A, P-2B, and P-4B is to protect human health and the environment in accordance with CERCLA by limiting human exposure to VOCs through the vapor intrusion pathway. The LUC objective for these sites will be achieved by: • Modifying the DDJC-Sharpe/Tracy Installation Master Plan (IMP) to prohibit residential development. • Reviewing proposed construction projects to ensure that they are consistent with the LUC objective, applicable or relevant and appropriate requirements (ARARs), and the DDJC-Sharpe/Tracy Waste Management Plan. • Establishing environmental restrictions at the time of real property transfer in order to publicly record LUCs."

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
17.		For active facilities, a description of the internal procedures for implementing the LUCs (e.g., orders, instructions, Base Master Plan) and a commitment by the [federal agency] to notify EPA in advance of any changes to the internal procedures that would affect the LUCs. **Section 2.3.4, first bullet on page 2-3 indicates, "The Installation Master Plan (IMP) will be modified to include maps that show the five metals sites with LUCs that prohibit residential development (figures 1 through 6 in Appendix A). The Addendum to the IMP (Appendix A of this ROD Amendment) indicates that the five metals sites are specifically restricted from development of the property for uses such as schools, child care facilities, playgrounds, and residential housing. The Addendum to the IMP also refers to the Defense Enterprise Support San Joaquin California (DESJC) Environmental Program Manager if more information is needed. The Addendum to the IMP will be incorporated into the IMP within 90 days of the final signature on this ROD Amendment." While this statement is adequate for the metals sites, the statement does not apply to TCE Site P-5A. Therefore, please expand the required statement regarding internal procedures for implementing LUCs (i.e. IMP Addendum) to include TCE Site P-5A. Also, please modify the statement to indicate a DLA commitment to notify regulators in advance of any changes to the internal procedures that would affect the LUCs."**	Text has been added to the end of the bullet referenced in the comment that states: "DLA will notify EPA, DTSC, and RWQCB in advance of any changes to internal procedures that affect the LUCs." The bullet referenced in the comment plus the text addition are also included in Section 2.4 Land Use Controls for the four TCE sites (P-1G, P-2A, P-2B, and P-4B) at which LUCs will be established. The text in the referenced bullet has been updated to reflect the change from Appendix A in the draft to Appendix C in the draft final OU 2 ROD Amendment for the Addendum to the Installation Master Plan, DDJC-Sharpe. The referenced figure numbers have also been revised to reflect the addition of four TCE sites to the list of sites with LUCs.
		Generally, #s 18 and 19 apply at a BRAC installation, but they may have application elsewhere.	
18.		Other property transfer language: a. "Deed Restrictions: "Each transfer of fee title from the United States will include a CERCLA 120(h)(3) covenant which will have a description of the residual contamination on the property and the environmental use restrictions, expressly prohibiting activities inconsistent with the performance measure goals and objectives. (continued)	No response required.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
18. (cont'd)		(continued) The environmental restrictions are included in a section of the CERCLA 120(h)(3) covenant that the United States is required to include in the deed for any property that has had hazardous substances stored for one year or more, known to have been released or disposed of on the property. Each deed will also contain a reservation of access to the property for the [federal agency], USEPA, and [the State], and their respective officials, agents, employees, contractors, and subcontractors for purposes consistent with the [federal agency] Installation Restoration Program ("IRP") or the Federal Facility Agreement ("FFA"). The deed will contain appropriate provisions to ensure that the restrictions continue to run with the land and are enforceable by the [federal agency]." b. "Lease Restrictions: " During the time between the adoption of this ROD and deeding of the property, equivalent restrictions are being implemented by lease terms, which are no less restrictive than the use restrictions and controls described above, in this ROD. These lease terms shall remain in place until the property is transferred by deed, at which time they will be superceded by the institutional controls described in this ROD." c. "Notice: "Concurrent with the transfer of fee title from the [federal agency] to transferee, information regarding the environmental use restrictions and controls will be communicated in writing to the property owners and to appropriate state and local agencies to ensure such agencies can factor such conditions into their oversight and decision-making activities regarding the property."	
19.		Ensure that the document adequately describes pre-transfer LUCs, not just post-transfer LUCs. **Section 2.3.6, 2.3.7, and 2.3.8, all on page 2-5 appear to address this item.**	Text similar to the sections noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the four TCE sites (P-1G, P-2A, P-2B, and P-4B) at which LUCs will be established.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Peter MacNicholl, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
1.	Declaration Page 5	DTSC Signature Block: the position title for Mr. Anthony J. Landis should be modified to read Anthony J. Landis, P.E., Chief, Sacramento Cleanup Branch.	Based on information provided to DESJC on 2 February 2010, the DTSC signature block in the Declaration has been updated to Allen Wolfenden, Brownfields and Environmental Restoration Performance Manager.
2.	Pg. 1-1, Sec. 1.0.2	Site P-5A is mentioned as a site needing further SVE, and should mention that Integrated Carbon and Zero Valent Iron (EHC) innovative technology is currently being implemented in the saturated zone soils to remediate volatile organic compound (VOC) mass responsible for the offsite trichloroethene (TCE) plume west of DDJC-Sharpe. The report should mention the currently active remedial technologies being implemented in the South Balloon (solid potassium permanganate), Central Area (EHC – Integrated Carbon and Zero Valent Iron), and North Balloon (Emulsified Oil Substrate) in an attempt to remediate the persistent source areas.	Two OUs have been established to facilitate environmental cleanup at DDJC-Sharpe. OU 1 encompasses groundwater contaminated primarily with VOCs, and OU 2 consists of contaminated soil and soil vapor above the water table (vadose zone). It is DESJC's opinion that continuing remedial efforts for groundwater should not preclude no further action determinations for unsaturated soil and soil gas where the soil has been remediated or did not require remediation. DESJC respectfully disagrees with DTSC's preference to wait for the results of the groundwater technology pilot studies before making no further action determinations at Sites P-1G and P-8A (see DTSC Comment #5). Based on the differences in physical parameters and contaminated media between the groundwater technology pilot test sites and the OU 2 ROD Amendment TCE sites, DESJC believes that the groundwater technology pilot studies are more appropriately discussed in the forthcoming OU 1 Feasibility Study and OU 1 ROD Amendment and are not directly applicable in the OU 2 ROD Amendment that addresses contaminated soil. Site P-8A/North Balloon: Site P-8A, which was remediated between 1993 and 1995 with a pilot- (continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Peter MacNicholl, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
2. (cont'd)	Pg. 1-1, Sec. 1.0.2		(continued) scale SVE system to address contamination in the upper 17 feet of the vadose zone, is over 600 feet east of the groundwater EOS pilot test area. The EOS pilot test in the North Balloon addresses VOC contamination in groundwater from 50 to 60 feet bgs. Site P-1G/South Balloon: Site P-1G is approximately 350 feet west of the South Balloon pilot test area and does not contain concentrations of TCE in soil vapor greater than the cleanup standard at depths below 10 feet bgs. In addition, vadose zone modeling predicted Site P-1G will not pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause exceedance of the ACL). The solid potassium permanganate pilot test in the South Balloon addresses VOC contamination in groundwater from 40 to 75 feet bgs. Although regional groundwater flows from areas upgradient of the solid potassium permanganate pilot test area and through Site P-1G, results of the 12-month, post-injection groundwater monitoring of wells installed to evaluate this pilot test have not recorded any evidence of potassium permanganate or its anticipated affect on TCE concentrations in groundwater 30 feet downgradient of the injection area (URS, 2010). Site P-5A/Central Area: As a point of clarification, Site P-5A is not presented in the OU 2 ROD Amendment as a no further action site. The Site P-5A SVE system planned for installation and (continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Peter MacNicholl, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
2. (cont'd)	Pg. 1-1, Sec. 1.0.2		(continued) operation by mid-2010 is approximately 150 feet east of the groundwater EHC pilot test area and will extract vadose zone contaminants from approximately 9 to 15 feet bgs. The EHC pilot study focuses on groundwater contaminants from 44 to 56 feet bgs. Although it is conceivable that a relatively small portion of the Site P-5A shallow groundwater plume may come into contact with the EHC pilot test area, there is little to no expectation for that contact to affect upgradient, shallow TCE mass in the vadose zone estimated at less than 1 pound and 150 feet away. During the 13 January 2010 RPM meeting, DLA, EPA, and DTSC agreed to a no further action decision for Site P-8A and establishment of LUCs at Site P-1G to protect human health from the potential risk associated with inhalation of VOCs via the vapor intrusion pathway. As noted above, SVE will be implemented at Site P-5A by mid-2010. Reference: URS, 2010. *DDJC-Sharpe Potassium Permanganate Pilot Study Results Report*. January.
3.	Pg. 1-1, Sec. 1.0.3	The section discusses the five metal sites recommended for no-further action including the land use control (LUC) remedy for waste left in place above unrestricted use levels. While the analytical data supporting the No-Further Action (NFA) determinations for each respective metal site was thought to be included in previous Remedial Action Reports, the OU2 ROD (continued)	During the 16 September 2009 comment resolution meeting, DESJC clarified that the five metals sites are not recommended for no further action in the OU 2 ROD Amendment. DESJC agreed to develop an appendix to the OU 2 ROD Amendment that (continued)

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
3. (cont'd)	Pg. 1-1, Sec. 1.0.3	(continued) Amendment should be all encompassing and include the sampling confirmation data and figures showing that the cleanup objectives have been achieved at each "metals" site recommended for NFA. DTSC requests that supporting figures and data be provided for each site recommended for NFA as Appendices to the report and identified in the Introduction section. It is inappropriate to recommend a NFA determination for the metals sites with contamination remaining in place above unrestricted use/unrestricted exposure levels. LUCs are necessary for the metal sites and therefore constitute an action of implementing, maintaining, monitoring, and enforcing the controls to prevent unacceptable exposure pathway to human and ecological receptors. DTSC cannot concur with the determination of NFA when in reality implementing LUCs constitute a remedial action.	(continued) includes the additional information requested by DTSC and EPA for each metals site presented in the OU 2 ROD Amendment. Consequently, a site summary for each metals site has been created and includes the conceptual site model, investigation and remediation (where applicable) history, and the current status of the site (including contributing lines of evidence for no further action determination, where applicable). Tables and figures of residual lead and chromium concentrations in soil are also included with each site summary. These site summaries are presented in Appendix A of the draft final OU 2 ROD Amendment. Analytical data presented in the OU 2 Metals RARs for Sites S-3 and S-26 (Radian International, 2000; URS, 2008) and the OU 2 NFA RAR (Radian International, 2000) indicate that the lead and chromium cleanup standards, which are based on current and potential future *industrial* use, were achieved at the five metals sites. However, because the OU 2 ROD did not consider potential future *residential* use, LUCs are necessary to ensure protection of human health and the environment and are considered an additional action for these sites. References: Radian International, 2000. *DDJC-Sharpe OU 2 No Further Action Remedial Action Report*. December. URS, 2002. *OU 2 Soil Vapor Extraction Remedial Action Report*. May. URS, 2008. *Operable Unit 2 Metals Remedial Action Report, Sites S-26, Area 6.* January.

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
4.	Pg. 1-2, Sec. 1.0.6	This section does an excellent job of discussing the ROD Amendment, Administrative Record requirements, and provides a clear understanding for the public of how one obtains access to documents related to the Installation Program at DDJC-Sharpe.	No response required.
5.	Pg. 1-3, Fig. 1-1	Status of Soil Sites, DDJC-Sharpe: the figure depicts sixteen TCE sites at DDJC-Sharpe "Requiring No Further Action." While most of the TCE sites recommended for NFA are currently inactive and do not appear to be acting as a persistent source of VOC contamination to groundwater, a set of sites at DDJC-Sharpe do not meet this criteria. Specifically, Sites P-1E, P-1G, P-8A, and P-5A currently have innovative technologies in place in an attempt to remediate existing VOC persistent source mass in the saturated soil and groundwater interface.	As stated in the response to DTSC Comment #2, the technology pilot tests are addressing residual mass trapped within saturated deposits well below (40 feet or greater) the groundwater interface. The technologies are not being tested at Site P-1E in the South Balloon or Site P-8A in the North Balloon. The soil in the vadose zone at each of those areas was remediated with SVE. At Site P-5A, SVE will be implemented by mid-2010. Detailed responses to DTSC comments for each site are provided in the following paragraphs.
		Sites P-1G and P-1E VOC groundwater plumes appear to be co-mingled according to figure 8-1a of the comprehensive cone penetrometer test (CPT) report. Groundwater data and the cross-section provided in Figure 8-4 of the CPT report suggest that further delineation of the 530 µg/L TCE plume underneath Building 649 is warranted. Site P-1E groundwater data taken immediately south of Building 649 reported TCE at 530 µg/L at 63.5 feet below ground surface with attenuating concentrations measured with depth indicating that a potential source may still be present in either the vadose zone or at the groundwater interface. Groundwater flow gradients in the vicinity of sites P-1E and P-1G indicate a northwesterly groundwater flow direction and would cause TCE detected directly south of Building 649 to migrate underneath. The TCE plume that appears to originate south of Building 649 has not been delineated laterally or vertically and needs further delineation work before a NFA determination can be approved for P-1E.	Site P-1E: Site P-1E overlies an A Zone groundwater plume in the South Balloon and is approximately 400 feet southeast (upgradient) of the solid potassium permanganate pilot test area. Based on results recently presented in the solid potassium permanganate pilot study report, there is no reasonable expectation for potassium permanganate to migrate horizontally and vertically upgradient into the vadose zone thereby affecting any remaining TCE mass that may act as a "persistent source of VOC contamination to groundwater." DESJC agrees that the Site P-1E and Site P-1G plumes have commingled beneath the South Balloon. The source of the Site P-1E plume was a sump at Building 669 and potentially several wash racks that were located east of Building 649. During the RI of the South Balloon, samples were collected at each of the solvent waste and waste oil tanks located around

(continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Peter MacNicholl, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
5. (cont'd)	Pg. 1-3, Fig. 1-1		(continued) Building 649; soil at five of the tank locations contained total petroleum hydrocarbon contamination, but chlorinated hydrocarbons were not detected (detection limit for TCE was 47 parts per billion) (Environmental Science and Engineering, Inc. [ESE], 1990). Vertical migration of the mixture of water, petroleum hydrocarbons, and VOCs from the Site P-1E sump and wash racks could have migrated vertically to the B Zone (50 to 80 feet below surface) where the mixture encountered silts and clays. The pre-extraction hydraulic gradient caused slow horizontal migration from Site P-1E to the northwest and under Building 649 until extraction wells EWB1 and EWC1 began operating in 1987. At that time, EWB1 created a southerly gradient in the B Zone beneath the Site P-1E area, and EWC1 created an easterly gradient in the C Zone. TCE concentrations greater than 500 μg/L east and south of Building 649 can be explained by migration from Site P-1E and the hydraulic influences of the extraction wells. During the 16 September 2009 comment resolution meeting, DESJC agreed to complete additional soil gas, soil, and groundwater sampling in and adjacent to Building 649 to address DTSC's concerns. DTSC and DESJC agreed on specific investigation locations, depths, and media during the meeting. Soil gas samples were collected from two locations at Site P-1E south and southeast of Building 649 to address potential data gaps in the historical site data. The results are presented in the table following (continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Peter MacNicholl, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
5. (cont'd)	Pg. 1-3, Fig. 1-1		(continued) this paragraph. No concentrations of TCE greater than the OU 2 ROD cleanup standard (350 ppbv) were detected. Soil samples were also collected to address the potential for organic material (diesel, motor oil) trapped in soil as a result of previous discharge to subsurface materials from the Site P-1E wash rack to mask concentrations of volatile contaminants that exceed the cleanup standard in the vadose zone by reducing their volatility. Diesel, motor oil, gasoline and total organic carbon were not detected. The detection of TCE in a single soil gas sample collected 15.5 feet bgs at the southeast sampling location is consistent with volatilization of TCE from the upper surface of groundwater where the A Zone is thought to have TCE concentrations exceeding 25 μg/L. Absence of detections in samples from the sampling location south of the Building 649 footprint indicates no effects of volatilization because the A Zone plume there is less than 25 μg/L. Recent evaluation of the cumulative residential risk to human health at Site P-1E estimates that there is a 1.7E-06 cancer risk associated with exposure to VOCs through the vapor intrusion pathway at the site. Based on the results of the soil and soil gas sampling completed at Site P-1E at DTSC's request, discussions with DTSC and EPA during the 13 January 2010 RPM meeting, and the teleconference with DTSC and EPA risk assessors on 3 February 2010, DESJC continues to recommend no further action for Site P-1E. (continued)

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Peter MacNicholl, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
5. (cont'd)	Pg. 1-3, Fig. 1-1	Figure 8-4 of the CPT report identifies 500 µg/L and 1,000 µg/L TCE isopleths underneath Building 649's foundation shaped as a triskelion (three lobes). The upper lobe of the triskelion seems to emanate from the groundwater interface beneath Building 649 foundation. Increasing TCE concentrations with decreased depth appear to indicate a shallower release near the former locations of underground storage tanks. A total of eight (8) former USTs, five (5) on the south side and three (3) on the north side of Building 649 were labeled as either solvent waste or waste oil and likely containing solvent rinseate, a mixture of water and solvents combined with petroleum hydrocarbons derived from maintenance operations. The combination of solvent with waste oil can both enhance the mobility of the combination during the initial spill, and act as a solvent stabilizer that hampers remediation, as shown by repeated contaminant rebounds after implementation of remedial measures more than 20 years after releases occurred.	(continued) **Site P-1E Sample Results, October 2009** Borehole / Sample Depth (feet bgs) / Matrix / Concentration DP0059: 8, soil gas, ND PCE, TCE 14.5, soil gas, ND PCE, TCE 10, soil, ND TPH, TOC DP0060: 7.5, soil gas, ND PCE, TCE 15.5, soil gas, ND PCE 190 ppbv TCE 9.5, soil, ND TPH, TOC bgs = below ground surface ND = not detected PCE = tetrachloroethene ppbv = parts per billion by volume TCE = trichloroethene TOC = total organic carbon TPH = total petroleum hydrocarbons (gasoline, diesel, and motor oil) Soil gas, soil, and groundwater samples were collected at two locations inside Building 649 to address DTSC's concern regarding the presence of a vadose zone source for groundwater contamination beneath the building. The groundwater samples were collected to address the perceived data gap in the delineation of the A and B Zone groundwater plumes in this portion of the South Balloon. The two sampling locations inside Building 649 were selected during the 16 September 2009 comment resolution meeting. The results are presented in the table following this paragraph. No concentrations of TCE in soil gas greater than the OU 2 ROD cleanup standard were detected at these two locations. Diesel, motor oil, and gasoline (continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Peter MacNicholl, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
5. (cont'd)	Pg. 1-3, Fig. 1-1		(continued) concentrations in shallow soil (16 feet bgs) beneath the central western half of the building are consistent with contaminant conditions expected below the building with respect to historical use. Soil gas sample results indicate that there is no VOC source beneath this portion of the building. Neither the fuel hydrocarbon concentrations nor other evidence of hydrocarbon concentrations are great enough to suggest that masking of VOC vapor concentrations is occurring beneath Building 649. Similar to the results for Site P-1E, the detection of TCE in the soil gas samples from beneath the northeastern portion of Building 649 suggests that volatilization from the A Zone plume is occurring, whereas the absence of detections in soil gas beneath the central western half of the Building 649 footprint suggests the groundwater plume there has a concentration of 25 μg/L or less. This is consistent with the absence of a VOC source in Building 649. Concentrations of TCE in groundwater samples collected at the two sampling locations beneath Building 649 are consistent with the current conceptual model for A and B Zone VOC concentrations in this portion of the South Balloon. (continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Peter MacNicholl, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
5. (cont'd)	Pg. 1-3, Fig. 1-1	Site P-1G is the approximate location of In-situ technology (Solid Potassium Permanganate) currently in operation in the South Balloon in an attempt to remediate the persistent source responsible for TCE concentrations of 1,600 µg/L in groundwater. It is premature to eliminate or preclude additional remedial actions for both saturated and unsaturated soil when current technologies are still in operation and uncertainties still exist in the successfulness of their efforts, including contaminant mass locations remaining after completion. DTSC cannot support a NFA determination for Site P-1G when active in-situ technologies are ongoing (continued)	(continued) **Building 649 Sample Results, October 2009** Borehole / Sample Depth (feet bgs) / Matrix / Concentration DP0061 / 11.5 / soil gas / 16 ppbv PCE, 38 ppbv TCE DP0061 / 15.5 / soil gas / ND PCE, TCE DP0061 / 12 / soil / ND TPH, TOC DP0061 / 40 / groundwater / ND PCE, 69 µg/L TCE DP0062 / 9.5 / soil gas / ND PCE, TCE DP0062 / 17 / soil gas / ND PCE, TCE DP0062 / 16 / soil / 210 mg/kg diesel, 35 mg/kg motor oil, 5.1 mg/kg gasoline DP0062 / 60 / groundwater / ND PCE, 190 µg/L TCE bgs = below ground surface mg/kg = milligrams per kilogram ND = not detected PCE = tetrachloroethene ppbv = parts per billion by volume TCE = trichloroethene TOC = total organic carbon TPH = total petroleum hydrocarbons (gasoline, diesel, and motor oil) µg/L = micrograms per liter Site P-1G: As stated in the response to DTSC Comment #2, Site P-1G in the South Balloon is 350 feet west of the solid potassium permanganate pilot test for groundwater. Soil vapor at Site P-1G does not contain TCE at concentrations greater than the cleanup standard below 10 feet bgs, and vadose zone modeling predicted Site P-1G will not pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause exceedance of (continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Peter MacNicholl, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
5. (cont'd)	Pg. 1-3, Fig. 1-1	(continued) and uncertainties still remain on the levels of contaminants that exist in the C-zone aquifer and that may remain in both saturated and unsaturated soil after the innovative technology is completed.	(continued) the ACL). The estimated 0.25 pounds of TCE remaining in soil vapor at the site will not be affected by the solid potassium permanganate pilot test in groundwater. Soil gas data collected at Site P-1G during post-ROD investigations from 1996 to 1999 indicated that concentrations in soil gas were less than they were during the RI conducted in 1987; the post-ROD samples were collected at the same locations as the RI samples and at multiple depths. The horizontal and vertical extents of TCE concentrations in soil gas exceeding the OU 2 ROD cleanup standard were defined by the post-ROD investigation samples. A TEFA for VOCs in soil gas at Site P-1G concluded that an SVE system would not provide an economically feasible alternative to groundwater extraction at the site (Radian International, 2000). Groundwater contamination beneath Site P-1G is being remediated under the OU 1 ROD (ESE, 1993). During the 16 September 2009 comment resolution meeting, DTSC requested that DESJC review available lithologic logs from soil borings and well installations completed in the general vicinity of Site P-1G for evidence of organic material and other related petroleum products that may potentially mask VOC vapor concentrations by reducing their volatility. The logs from EWA6; EWA7; MW418AR, B and C; MW474A; MW302; and MW312 were reviewed in detail for evidence of organic material or petroleum products, including documentation of odors typical of petroleum products (diesel, gasoline, (continued)

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
5. (cont'd)	Pg. 1-3, Fig. 1-1	Site P-8A is in the vicinity of the Emulsified Oil Substrate innovative technology currently in operation in the North Balloon. The in-situ pilot study will be in operation for a couple more months, followed by monitoring to observe the response of the system after shutdown. Post monitoring data from unsaturated and saturated soil and groundwater will help determine whether additional remedial actions are warranted to meet cleanup objectives and the protection of soil and groundwater from possible persistent sources. DTSC cannot support a NFA determination for Site P-8A until the in-situ technology has finished in the North Balloon and subsequent monitoring data from both unsaturated/saturated soil and groundwater demonstrate that no further remedial action is warranted for this area.	(continued) etc.). No such evidence or notations were included on the boring logs reviewed. However, as stated in the response to DTSC Comment #2, LUCs will be established at Site P-1G to protect human health from the potential risk associated with inhalation of VOCs via the vapor intrusion pathway. Site P-8A: The location of the former SVE system at Site P-8A was over 600 feet east of the EOS pilot test area. The estimated 0.003 pounds of TCE remaining in soil vapor in the vadose zone will not be affected by the EOS pilot test that is treating groundwater 50 to 60 feet bgs. Vadose zone modeling predicted Site P-8A will not pose an unacceptable threat to groundwater (i.e., concentrations in soil vapor will not cause exceedance of the ACL), and as recently as third quarter 2009, VOC contaminants of concern were not detected in A Zone groundwater beneath the site at concentrations greater than their respective ACLs, indicating Site P-8A is not a "persistent source of VOC contamination to groundwater". As stated in the response to DTSC Comment #2, a no further action decision for Site P-8A was made during the 13 January 2010 RPM meeting. References: ESE, 1990. *Remedial Investigation/Feasibility Study at DDRW-Sharpe Site*. September. ESE, 1993. *Remedial Investigation/Feasibility Study at DDRW-Sharpe Site Record of Decision, Operable Unit 1*. January. Radian International, 2000. *DDJC-Sharpe OU 2 No Further Action Remedial Action Report*. December.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Peter MacNicholl, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
6.	Pg. 1-3, Fig. 1-1	Status of Soil Sites, DDJC-Sharpe: similar to comment #2, DSC recommends including the sampling confirmation data and relevant figures to show that the cleanup standards have been met at each TCE site recommended for NFA as Appendices to the report. DTSC cannot concur with a NFA determination at TCE sites with contaminant concentrations above the unrestricted use/unrestricted exposure levels and would require land use controls as part of the selected remedy if those standards are not achieved.	During the 16 September 2009 comment resolution meeting, DESJC agreed to develop an appendix to the OU 2 ROD Amendment that includes the additional information requested by DTSC and EPA for each TCE site presented in the ROD Amendment. Consequently, a site summary for each TCE site has been created that includes the conceptual site model, investigation and remediation (where applicable) history, vadose zone and groundwater modeling results, vapor intrusion pathway risk assessment results, and the current status of the site (including contributing lines of evidence for no further action determination, where applicable). A table and figure of TCE concentrations in the vadose zone are also included with each site summary. These site summaries are included in Appendix A of the draft final OU 2 ROD Amendment. The vapor intrusion pathway risk assessment results presented with the TCE site summaries in Appendix A have been provided because the vapor intrusion pathway was not considered in the OU 2 ROD. The OU 2 ROD concluded that TCE-contaminated soils did not pose a risk to human health and the environment. The soil vapor cleanup level for TCE developed in the OU 2 ROD is for protection of groundwater quality. In determining the TCE soil vapor cleanup level, other potential routes of exposure to VOCs were not considered significant at the time of the 1994 RI/FS risk assessment because VOCs were below ground surface and no structures have ever existed at the TCE sites. Evolving awareness of the potential for health risks from (continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Peter MacNicholl, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
6. (cont'd)	Pg. 1-3, Fig. 1-1		(continued) inhalation of VOCs have raised concerns about risks to occupants of buildings constructed atop contaminated soil and groundwater. Therefore, a risk assessment of the vapor intrusion pathway has been completed for each of the TCE sites. The specific details of the risk assessment methods, calculations, and risk and hazard estimates are presented in Appendix B of the draft final OU 2 ROD Amendment. Based on the results of the risk assessments, the draft final OU 2 ROD Amendment has been revised to recommend LUCs at four TCE sites (P-1G, P-2A, P-2B, and P-4B). No further action continues to be recommended for eleven of the TCE sites (P-1A, P-1B, P-1C, P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A).
7.	Pg. 2-1, Sec. 1.0.1	Metal Sites: the Section implies that current industrial use cleanup standards for lead and chromium in soil are 1,000 mg/kg and 300 mg/kg respectively. The industrial cleanup standard for lead has changed to 800 mg/kg and should be identified in the report as the current cleanup standard.	A description of how the cleanup standards for solid and soluble concentrations of lead and chromium were developed as presented in the OU 2 ROD is included in Section 3.1.1 Site Risks in the draft final OU 2 ROD Amendment. As noted in the comment, the current EPA Industrial Regional Screening Level (formerly Preliminary Remediation Goal) for lead is 800 mg/kg. Therefore, the following text is included in the fourth paragraph of Section 3.1.1: "At the time of the BRA, the cleanup standard for lead was confirmed as protective of an industrial adult worker based on results from the DTSC's Lead Spreadsheet Model default exposure scenarios (ESE, 1994a). This cleanup standard was also (continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Peter MacNicholl, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
7. (cont'd)	Pg. 2-1, Sec. 1.0.1		(continued) inclusive of the range of 500 mg/kg to 1,000 mg/kg, which EPA recommended as an interim cleanup standard (ESE, 1994a). The concentration of lead that is considered health protective under commercial and industrial land use has since been revised to 800 mg/kg based on EPA's Adult Lead Model (ALM)."
		Conclusions	
		DTSC recommends that the Sharpe OU-2 ROD Amendment is modified to include figures and analytical data supporting DESJC's determination that soil cleanup objectives have been achieved at each of the metal and VOC sites.	See responses to DTSC Comments #3 and #6.
		The ROD Amendment should identify that the soil sites with metal contamination over the unrestricted use/unrestricted exposure levels will require institutional controls in the forms of LUCs. The LUCs are necessary for the metal sites and constitute an action of implementing, maintaining, monitoring, and enforcing the controls to prevent unacceptable risks and exposure pathways to human and ecological receptors. DTSC cannot concur with the determination of NFA when in reality implementing LUCs constitute a remedial action. The ROD Amendment should clarify the difference between the IC remedy and NFA in terms of additional remedial actions required for one versus the other.	See response to DTSC Comment #3.
		DTSC cannot concur with a no further remedial action planned determination for soil sites P-1G, P-1E, and P-8A for reasons cited below. Currently innovative technologies are in operation in the south balloon, central area and north balloon to remediate the persistent VOC sources related to P-5A and those above-mentioned sites.	See responses to DTSC Comments #5 and #6.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Peter MacNicholl, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		In particular, DTSC cannot support a NFA determination for Sites P-1G/ P-1E when active in-site technologies are ongoing and uncertainties still remain on the levels of contaminants that currently exist in both saturated (C-zone) and unsaturated soil, especially after the completion of the innovative technology. DTSC will reserve its approval of the NFA determination for these sites until the technologies are completed and confirmation sampling in the vicinity of former USTs adjacent to Building 649 collaborated with the Department to address the data gaps and discrepancies presented in the CPT report.	See response to DTSC Comment #5.
		Finally, DTSC cannot support a NFA determination for Site P-8A until the in-situ technology is completed in the North Balloon and subsequent monitoring and confirmation data from both unsaturated/saturated soil and groundwater demonstrate that the cleanup objectives have been achieved and no-further source remains in the saturated or unsaturated vadose zone.	See response to DTSC Comment #5.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 20 August 2009
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME James Brownell, RWQCB
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		Central Valley Water Board will not be providing a review letter for the Draft Amendment document, but concur with review comments provided by the U.S. Environmental Protection Agency and California Department of Toxic Substances Control.	No response required.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		ENCLOSURE 1: U.S. EPA Review of Sharpe Draft OU2 ROD Amendment	
		General Comments	
1.		One of the main purposes of the Sharpe OU2 ROD Amendment is to document the selection of LUCs at the five metals sites (S-3, S-26, S-30, S-33/29, and S-36) where completed remedial action (excavation to commercial/industrial cleanup levels for lead and chromium and off-site disposal) was conducted pursuant to the 1996 ROD. However, the ROD Amendment does not adequately present metals concentration data to document that the 1996 ROD cleanup levels were achieved in support of the ROD Amendment's selection of LUCs. Therefore, please include residual metals data in the ROD Amendment (via figures, tables and/or text) to detail site-specific residual metals concentrations, calculated human health risks, and risk exposure assumptions in support of the selection of LUCs as an expanded protective remedy for these sites.	**(DESJC received informal comments from EPA on the draft final OU 2 ROD Amendment. These comments resulted in changes to the text and appendices of the OU 2 ROD Amendment. Therefore, revisions to this response to comments table were made to reflect those changes to the text and appendices and are shown in this new version of the response to comments table as *italicized* text.)** A site summary for each metals site has been created and includes the conceptual site model, investigation and remediation (where applicable) history, and *a recommendation to add LUCs for each* site. Tables and figures of residual lead and chromium concentrations in soil are also included with each site summary. These site summaries are presented in Appendix A of the OU 2 ROD Amendment. In addition, text has been added to Section 3.1 (Section 2.1 in the draft) to describe the site risks and how the cleanup standards were developed as presented in the OU 2 ROD. This additional text combined with the data presented in the site summaries supports the need for LUCs to protect human health and the environment because the remedial decision for the five metals sites was based on industrial land use and not unrestricted land use. Section 3.1 also includes a more detailed discussion of the remedy selected in the OU 2 ROD than presented in the draft OU 2 ROD Amendment.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
2.		Similar to General Comment number 1 above, the Sharpe OU2 ROD Amendment does not adequately present site-specific TCE soil concentration data to support the NFA determinations concluded for the 15 TCE sites. Supporting documents referenced in Table 1-1, Status of TCE Sites at DDJC-Sharpe, need to be summarized in the ROD Amendment; therefore, please include analytical data in the ROD Amendment (via figures, tables and/or text) to detail site-specific residual TCE concentrations and calculated human health risks in support of the NFA determinations.	A site summary for each TCE site has been created that includes the conceptual site model, investigation and remediation (where applicable) history, *including vadose zone and groundwater data,* vadose zone and groundwater modeling results, *and* vapor intrusion risk assessment results, and *a recommendation of no further action or addition of LUCs for each* site. A table and figure of TCE concentrations in the vadose zone *and A Zone groundwater* are also included with each site summary. These site summaries are presented in Appendix A of the OU 2 ROD Amendment. The OU 2 ROD states that TCE-contaminated soils at DDJC-Sharpe do not pose a risk to human health and the environment. Implementation of the selected remedy, therefore, was to minimize the amount of TCE allowed to migrate from contaminated soils to groundwater through treatment. The soil vapor cleanup level for TCE developed in the OU 2 ROD is for protection of groundwater quality. In determining the TCE soil vapor cleanup level, other potential routes of exposure to VOCs were not considered significant at the time of the 1994 RI/FS risk assessment because VOCs were below ground surface and no structures have ever existed at the TCE sites. However, evolving awareness of the potential for health risks from inhalation of VOCs have raised concerns about risks to occupants of buildings constructed atop contaminated soil and groundwater. Therefore, a risk assessment of the vapor intrusion pathway has been completed for (continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
2. (cont'd)			(continued) each of the TCE sites. The specific details of the risk assessment methods, calculations, risk and hazard estimates*, and method limitations* are presented in Appendix B of the OU 2 ROD Amendment. Vapor intrusion risk assessments were conducted using the results from the most recent soil vapor sampling (which is either post-ROD sampling or sampling conducted *after* SVE system shutdown [if SVE remediation occurred at a site]), although many of these data are more than 10 years old. Estimates of the cancer risks or noncancer health hazards were derived for all detected VOCs, using three methods (EPA screening, DTSC screening, and site-specific) for an assumed "unrestricted" (*e.g.,* residential) land use. Evaluating an unrestricted use scenario is necessary because it is the point-of-departure for agency decision-making: if a site is compatible with unlimited use and unrestricted exposure, then measures (such as LUCs or additional remediation) are not necessary. The unrestricted land use scenario assumes that occupied residences overlie the sites, which is neither a current nor a reasonably anticipated future land use for the site. DDJC-Sharpe is an actively operating facility, and there are no buildings (residences or otherwise) that currently overlie any of the TCE sites*, except for the southeast corner of Building 649, which overlies a small portion of Site P-1E, and a small portion of the southern end of the AAFES warehouse, which overlies the northern quarter of Site P-2B*. (continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
2. (cont'd)			(continued) The cumulative cancer risk estimates for each site vary depending on the risk assessment method. These risk and hazard estimates were used as lines of evidence to assist in determining whether a TCE site requires no further action or whether a TCE site requires LUCs to protect human health and the environment. The risk and hazard estimates for each site, along with the other lines of evidence evaluated, are presented in the TCE site summaries in Appendix A of the OU 2 ROD Amendment. Based on the results of the risk assessments *in combination with other lines of evidence*, the OU 2 ROD Amendment has been revised to recommend LUCs at *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*). No further action continues to be recommended for *the other eight* TCE sites (P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A).

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
3.		U.S. EPA requests that the Sharp OU2 ROD Amendment include additional text from the 1996 OU2 ROD, to present the original remedy selected in 1996 for the TCE sites and more clearly establish and document the basis and purpose of the OU2 ROD Amendment with regards to these TCE sites. For example, it would helpful to expand the description of the remedy to more clearly indicate that the 1996 ROD selected SVE (referred to at the time as 'In-Situ Volatilization'), and indicate per the 1996 ROD the two site-specific components of the remedy were: * The remediation of seven sites (please list those sites) that had been sufficiently characterized and found to be degrading groundwater; and, * The characterization of seven sites (also please list those sites) that are potentially degrading groundwater. These sites were subject to remediation based on the results of the characterization (according to the 1996 ROD). Utilizing these two categories of TCE sites specified in the 1996 ROD, the ROD Amendment can then chronologically and technically detail how individual sites progressed to achieve an NFA determination.	A new Section 2.0 TCE Sites has been developed to provide text from the OU 2 ROD regarding the site risks, the remedy selected in the OU 2 ROD, and the basis for the ROD Amendment. Section 2.0 presents a list of the seven sites that were classified as remediation sites and the seven sites that were classified as characterization sites in the OU 2 ROD. As stated in the response to EPA General Comment # 2, site summaries have been prepared that detail how individual sites progressed from the initial RI/FS investigation to their current status (no further action or LUC sites) through implementation of the OU 2 ROD requirements. These site summaries are presented in Appendix A of the OU 2 ROD Amendment. (Note: Section 2.0 Metals Sites in the draft ROD Amendment has been re-numbered as Section 3.0; subsequent sections have also been re-numbered accordingly.)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
4.		U.S. EPA requests that the OU2 ROD Amendment be expanded to include the addition of Land Use Controls (LUCs) for trichloroethene (TCE) Site P-5A. While U.S. EPA notes that Section 10.2 (TCE-Contaminated Soils) in the 1996 ROD states that, "TCE-contaminated soils do not pose a risk to human health and the environment…Implementation of the selected remedy, therefore, is not being recommended to decrease risks to human health and the environment. Rather, the selected remedy will minimize the amount of TCE allowed to migrate from contaminated soils to groundwater through treatment, and is a source removal action…", U.S. EPA requests that short-tem LUCs be established for TCE Site P-5A consistent with the OU2 metals sites. Further, a recently drafted (February 2009) site characterization cone-penetrometer assessment needs to be summarized for Site P-5A, which likely establish increased human health risks and support the conservative selection of LUCs for this site. As informally discussed with DLA during a July 15, 2009, quarterly project managers meeting, U.S. EPA generally require LUCs to restrict residential reuse until soils remedial actions have decreased site contamination to unrestricted levels. Given that the OU2 ROD Amendment documents the initiation of SVE at Site P-5A (due to elevated TCE vapors), and documents the selection of LUCs at metals sites with residual contamination exceeding residential cleanup concentrations, U.S. EPA requests that similar LUCs be established for TCE Site P-5A as well, until cleanup levels of organic vapors is achieved.	*As of April 2010, Site P-5A is being remediated using SVE in accordance with OU 2 ROD requirements for TCE sites. DLA will also establish LUCs at Site P-5A through this OU 2 ROD Amendment. However, the need for LUCs will be re-evaluated following completion of the SVE remedial action.* A site summary for Site P-5A is included in Appendix A of the OU 2 ROD Amendment that details site characterization efforts, including results of the 2006 and 2007 CPT investigations, results of cumulative risk assessments*, current status of SVE operations, and a recommendation to establish LUCs at Site P-5A.*
5.		Introduction, Section 1.0.2 and Table 1-1, Status of TCE Sites at DDJC-Sharpe: For TCE Site P-5A, the Draft OU2 ROD Amendment documents the initiation of SVE to address ongoing impacts to groundwater from vapor migration. Given that the 1996 ROD had documented this action, some clarification is needed in the ROD Amendment to explain why the remedial action selected in 1996 is just now being initiated. Consistent with General Comment numbers 2 and 3 above, Table 1-1, referenced in Section 1.0.2 of the ROD Amendment and/or text should be modified to provide a site-specific description, history, and 1996 ROD requirement (remedial action versus additional investigation).	As noted in the response to EPA General Comment #3, a new Section 2.0 TCE Sites has been developed to provide text from the OU 2 ROD regarding the site risks and the remedy selected in the OU 2 ROD for the TCE sites. In addition, a site summary for Site P-5A is included in Appendix A of the OU 2 ROD Amendment to describe the conceptual site model, investigation history, including why SVE had not yet been implemented at Site P-5A *prior to April 2010, and current status of SVE operations.*

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
6.		Land Use Control language has been agreed upon by U.S. EPA and DLA (see DoD Memorandum dated January 16, 2004; Comprehensive Environmental Response, Compensation, and Liability Act ROD and post-ROD Policy, Attachment 1 – Principles and Procedures for Specifying, Monitoring, and Enforcement of Land Use Controls and Other Post-ROD Actions). Required LUC text must be consistent with U.S EPA's October 2006, Institutional Control (IC) Checklist. A copy of IC Checklist is enclosed (see Enclosure 2) that provides specific comments related to the individual checklist items. Please note that many of the item-specific comments are related to the need to include LUCs for TCE Site P-5A.	With a few exceptions, the comments on the institutional control (IC) checklist items are solely related to the request to add LUCs at Site P-5A. *In addition to Site P-5A,* LUCs will be established at TCE sites *P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, and P-4B. Therefore, the IC checklist has been applied, as appropriate, to those sites. See responses to each IC checklist item comment in Enclosure 2.
		Specific Comments	
1.		Please update the ROD Amendment signature block for Michael Montgomery as follows: Michael Montgomery Assistant Director Federal Facilities and Site Cleanup Branch	The title block has been updated.
2.	Sec. 4.0, Sub-section 4.3	Public Participation Compliance: Text indicates that "[t]he final decision regarding the amendment will not be made until after consideration of public comments"; however, the Draft ROD Amendment was issued after the completion of the public comment period. While subsequent text indicates that the Final ROD Amendment will provide the Responsiveness Summary, please indicate in this section if DLA received any public comments on the OUR ROD Amendment as there were no public members in attendance at the March 19 2009, Proposed Plan Public Meeting.	DLA did not receive any comments from the public on the Proposed Plan, and no members of the public attended the Proposed Plan public meeting held on 19 March 2009. Therefore, a responsiveness summary was not prepared. The last paragraph in Section 5.0 states: "Comments were not received from the public during the public comment period; therefore, a responsiveness summary was not prepared."

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		ENCLOSURE 2: HQ IC Checklist for Sharpe OU 2 Draft Rod Amendment	
		Sharpe OU2 ROD Background: The OU2 ROD Amendment, dated April 10, 2009, applies Institutional Controls (referred to in the ROD as Land Use Controls or LUCs) at five sites with elevated metals concentrations (lead and chromium) that exceed concentrations that are protective for future residential/unrestricted reuse. The five metals sites include: S-3; S-26; S-30; S-33/29; and S-36. The OU2 ROD Amendment also documents the initiation of Soil Vapor Extraction at one trichloroethylene (TCE) Site P-5A that had been selected in the 1996 OU2 ROD and documents a No Further Action Determination at the fifteen remaining TCE sites. The ROD Amendment does not propose LUCs for Site P-5A for residential reuse restrictions. As a result of the ROD Amendment absence of LUCs for Site P-5A, many of the IC check list items were determined to be incomplete.	See responses to each IC checklist item comment below. LUCs will be established at TCE sites *P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, as well as P-5A*; therefore, the EPA comments related to Site P-5A are *also* relevant for those TCE sites, and the IC checklist has been applied, as appropriate, to those sites in the OU 2 ROD Amendment.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
1.		Map/Figure showing boundaries of the land use controls. **For the five metals sites proposed for LUCs, the Defense Logistics Agency (DLA) has included maps illustrating the LUC boundaries (see ROD Amendment Figures 1 through 6); however, for the one TCE site (Site P-5A) proposed for SVE, no proposal has been made to establish LUCs and no map identifying the LUC boundary has been presented. Also, the figures presented for the metals sites do not illustrate residual metals concentration remaining in shallow soils to support the industrial cleanup goals. Therefore, please include a map illustrating residual metals (lead and chromium) concentrations remaining at the five metals sites. Also, as U.S. EPA believes that LUCs should be established for the one proposed TCE SVE site (Site P-5A), please include a LUC boundary/soil vapor concentration map for this area.**	The figures prepared for the site summaries of the five metals sites show residual lead and chromium concentrations*, site boundaries, and LUC boundaries*. These maps are included in Appendix A of the OU 2 ROD Amendment. Figures *7* through *11* (Figures 2 through 6 in the draft) in Appendix C Addendum to the Installation Master Plan, DDJC-Sharpe (Appendix A in the draft) *show site boundaries and LUC boundaries with northing and easting coordinates*. LUCs will be established at TCE sites *P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*. Therefore, maps have been prepared for the Addendum to the Installation Master Plan, DDJC-Sharpe in Appendix C *showing site boundaries and LUC boundaries with northing and easting coordinates. M*aps showing residual TCE concentrations*, site boundaries, and LUC boundaries* have been prepared for each site summary included in Appendix A.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
2.		Document risk exposure assumptions and reasonably anticipated land uses, as well as any known prohibited uses which might not be obvious based on the reasonably anticipated land uses. (For example, where "unrestricted industrial" use is anticipated, list prohibited uses such as on-site company day-**care** centers, recreation areas, etc.) **ROD Amendment Sections 2.3.2 and 2.3.3, adequately addressed this checklist item for the five metals sites. Sections 2.3.2 of the ROD Amendment provide a general description of the land use assumptions and Section 2.3.3 indicates, "[t]he objective of the LUCs is to prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and playgrounds." However, the ROD Amendment does not propose LUCs for Site P-5A and does not document risk exposure assumptions or reasonably anticipated land uses for Site P- 5A. Therefore, while the ROD Amendment documents risk exposure assumptions and reasonably anticipated land use for the five metals sites, it does not provide this information for Site P-5A; please provide this information for Site P-5A.**	Section 2.1.1 Site Risks and Section 2.4 Land Use Controls provide risk exposure assumptions, reasonably anticipated land uses, and prohibited uses for the *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*) at which LUCs will be established.
3.		Describe the risks necessitating the LUCs. **While Sections 2.1, Site History, Contamination, and Selected ROD Remedy, Section 2.1.1, Sites S-30, S-33/29, and S-36 , through Section 2.1.3, S-26 provide some general qualitative description of residual metals concentrations and adequacy of cleanup, the ROD Amendment does not provide sufficient documentation of metals and TCE site risks. Therefore, please include additional text and table(s) to present current site risks which are addressed by the risk exposure assumptions.**	Documentation of the risks necessitating LUCs at the *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*) and five metals sites (S-3, S-26, S-30, S-33/29, and S-36) are described in Section 2.1.1 Site Risks and Section 3.1.1 Site Risks, respectively. In addition, the individual site summaries in Appendix A describe the risks necessitating LUCs at these sites.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
4.		State the LUC performance objectives. We have had comments on these because several of the objectives have not been clear. The following are some examples of what we have been looking for: 1. Prevent access or use of the groundwater until cleanup levels are met. 2. Maintain the integrity of any current or future remedial or monitoring system such as monitoring wells, impermeable reactive barriers. 3. Maintain the 12 inch vegetative soil layer to limit ecological contact. 4. Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities and playgrounds. **As indicated under checklist item #2, text under Section 2.3.3 indicates, "[t]he objective of the LUC is to prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and playgrounds." While the LUC performance objectives are correctly presented for the metals sites, the same objectives are not presented for TCE Site P-5A. Therefore, please include TCE Site P-5A with regards to the application of LUC performance objectives.**	The objective of the LUCs at the metals sites as stated in Section 3.3 Land Use Controls (2.3.3 in the draft) has been revised as follows: "The objective of the LUCs at Sites S-3, S-26, S-30, S-33/29, and S-36 is to protect human health and the environment in accordance with CERCLA by limiting human exposure to residual metals contamination in soil at concentrations that are *not compatible with unlimited use and unrestricted exposure*." For the TCE sites, the objective of the LUCs as stated in Section 2.4 Land Use Controls is: "The objective of the LUCs at Sites *P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B, *and P-5A* is to protect human health and the environment in accordance with CERCLA by limiting human exposure to VOCs through the vapor intrusion pathway."
5.		Generally describe the LUC, the logic for its selection and any related deed restrictions/**notifications**. (See also #16, below) **With regards to the five metals sites, the eight bullets that are provided in Section 2.3.4, on page 2-3 generally describe the LUCs, the logic, and the mechanism for deed restrictions in the even of site transfer. While the information is adequately presented for the metals sites, this same information is not presented for TCE site P-5A. Therefore, please include TCE Site P-5A with regards to general description of LUC, the logic of its selection and any related deed restrictions/notifications.**	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*) at which LUCs will be established.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
6.		Duration language: "Land Use Controls will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure." **Section 2.3.4, third bullet from the top of page 2-4 states: [t]he LUCs will be maintained until the concentration of hazardous substances in the soil is at such levels as to allow for unlimited use and unrestricted exposure (e.g., if future excavations resulted in cleanup to residential use levels, the LUCs would no longer be needed)." While the information/text is adequately presented for the metals sites, this same text is not presented for TCE site P-5A. Therefore, please expand the required LUC duration language to also include TCE Site P-5A.**	With a few modifications, text similar to that noted in the comment for metals sites has been incorporated into Section 2.4 Land Use Controls for the *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B, *and P-5A*) at which LUCs will be established. Specifically, the text states: "The LUCs will be maintained at the *eight* TCE sites until the concentrations of hazardous substances in the soil are at such levels as to allow for unlimited use and unrestricted exposure. For example, if VOC soil vapor concentrations reported from a future investigation are compatible with *unlimited use and unrestricted exposure* (i.e., *concentrations do not pose an unacceptable risk to human health* associated with inhalation of VOCs through the vapor intrusion pathway), the LUCs will no longer be needed, and a memorandum to the site file will be prepared to terminate the LUCs."
7.		Include language that the [federal agency] is responsible for implementing, maintaining, reporting on, and enforcing the land use controls. This may be modified to include another party should the site-specific circumstances warrant it. **With regards to the metals sites, Section 2.3.4, "DLA will implement, monitor, maintain, and enforce LUCs…" and elaborates appropriately in a series of detailed bullets described in subsequent checklist items. While this statement is correctly presented for the metals sites, this statement does not apply to TCE site P-5A. Therefore, please expand the required statement that DLA is responsible for implementing, maintaining, reporting on, and enforcing LUCS to also include TCE Site P-5A.**	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*) at which LUCs will be established.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
8.		Where someone else will or the federal agency plans that someone else will ultimately be implementing, maintaining, reporting on, and enforcing land use controls, the following language should be included: "Although the [federal agency] may later transfer [has transferred] these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the [federal agency] shall retain ultimate responsibility for remedy integrity." **Section 2.3.5, page 2-4 states; "[a]lthough DLA may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, DLA will retain ultimate responsibility for remedy integrity." While this statement is correctly presented for the metals sites, the statement does not apply to TCE Site P-5A. Therefore, please expand the required statement regarding transferring procedural responsibilities to another party to include TCE Site P-5A.**	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*) at which LUCs will be established.
9.		[**ONLY INCLUDE IN NON-AF RODS**] Refer to the remedial design (RD) or remedial action work plan (RAWP) for the implementation actions. Because this is a new idea (i.e., including the LUC implementation actions in either or both of these two primary documents), to ensure that the requirement is clear and enforceable, we developed the following language where it makes sense: "A LUC Remedial Design will be prepared as the land use component of the Remedial Design. Within 90 days of ROD signature, the [federal agency] shall prepare and submit to EPA for review and approval a LUC remedial design that shall contain implementation and maintenance actions, including periodic inspections." Another option is to refer to the enforceable schedule in the IAG for the RD or RAWP." **DLA utilizes Air Force (AFCEE) contract support; therefore it follows Air Force guidance** and **does not provide this reference to a LUC-RD.**	No response required.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
10.		Commitment by federal agency to address any situation that may interfere with the effectiveness of LUC: "Any activity that is inconsistent with the IC objectives or use restrictions, or any other action that may interfere with the effectiveness of the ICs will be addressed by the [federal agency] as soon as practicable, but in no case will the process be initiated later than___ days [10 days suggested] after the [federal agency] becomes aware of the breach." **Section 2.3.4, third bullet on page 2-3 states, "DLA will address any activity that is inconsistent with the LUC objective or use restriction, or any other action that may interfere with the effectiveness of the LUCs, as soon as practicable. In no case will the process be initiated later than 10 days after the date DLA becomes aware of the inconsistency." While this statement is adequately presented for the metals sites, the statement does not apply to TCE Site P-5A. Therefore, please expand the required statement regarding addressing any activity inconsistent with LUCs to include TCE Site P-5A.**	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*) at which LUCs will be established.
11.		Commitment by federal agency to notify EPA of and address any situation that may interfere with the effectiveness of LUC: "The [federal agency] will notify EPA and [the state] as soon a practicable but no longer than ten days after discovery of any activity that is inconsistent with the IC objectives or use restrictions, or any other action that may interfere with the effectiveness of the ICs The [federal agency] will notify EPA and [the state] regarding how the [federal agency] has addressed or will address the breach within 10 days of sending EPA and [the state] notification of the breach." **Section 2.3.4, on page 2-4, first bullet states, "DLA will notify EPA, DTSC, and RWQCB as soon a practicable but no longer than ten days after discovery of any activity that is inconsistent with the LUC objectives or use restrictions, or any other action that may interfere with the effectiveness of the LUCs. Within 10 days of sending the initial notification related to the inconsistency, DLA will provide notification explaining how the** (continued)	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*) at which LUCs will be established.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
11. (cont'd)		(continued) **inconsistency has or will be addressed." While this statement is adequately presented for the metals sites, the statement does not apply to TCE Site P-5A. Therefore, please expand the required statement regarding regulatory notification for an activity inconsistent with LUCs to include TCE Site P-5A.**	
12.		Notification to EPA and the state regarding land use changes: [For closing base]:[We are seeing in federal agency RODs language requiring the property transferee to notify EPA and the state prior to notifying the federal agency about possible land use changes. We have switched that around so that the federal agency reviews the proposal first. This should save EPA some resources.] "Prior to seeking approval from the EPA and [the state] the recipient of the property must notify and obtain approval from the [federal agency] of any proposals for a land use change at a site inconsistent with the use restrictions and assumptions described in this ROD." **[For active base]:** "The [federal agency] shall notify EPA and state ____ days [45 days suggested] in advance of any proposed land use changes that are inconsistent with land use control objectives or the selected remedy." **Section 2.3.4, page 2-4, second bullet states, " DLA will notify EPA, DTSC, and RWQCB at least 45 days in advance of any proposed land use change that is inconsistent with the LUC objective, any anticipated action that may disrupt or interfere with the effectiveness of the LUCs, any action that might alter or negate the need for the LUCs, or any anticipated transfer of the property subject to the LUCs." While this statement is adequately presented for the metals sites, the statement does not apply to TCE Site P-5A. Therefore, please expand the required statement regarding regulatory notification for any proposed land use change inconsistent with LUCs to include TCE Site P-5A.**	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*) at which LUCs will be established.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
13.		Notification regarding transfers and federal-to-federal transfers: "The [federal agency] will provide notice to EPA and [the state] at least six (6) months prior to any transfer or sale of [OUs at issue] so that EPA and [the state] can be involved in discussions to ensure that appropriate provisions are included in the transfer terms or conveyance documents to maintain effective ICs. If it is not possible for the facility to notify EPA and [the state] at least six months prior to any transfer or sale, then the facility will notify EPA and [the state] as soon as possible but no later than 60 days prior to the transfer or sale of any property subject to ICs. In addition to the land transfer notice and discussion provisions above, the [federal agency] further agrees to provide EPA and [the state] with similar notice, within the same time frames, as to federal-to-federal transfer of property. The [federal agency] shall provide a copy of executed deed or transfer assembly to EPA and [the state]." **Section 2.3.4, last (fifth) bullet on page 2-4, states**, **"DLA will notify to EPA, DTSC, and RWQCB at least six (6) months prior to any transfer or sale of any property subject to the LUCs so that the agencies can be involved in discussions to ensure that appropriate provisions are included in the transfer terms or conveyance documents to maintain effective LUCs. If it is not possible for the facility to notify the agencies at least six months prior to any transfer or sale, then the facility will notify the agencies as soon as possible but no later than 60 days prior to the transfer or sale of any property subject to LUCs. In addition to the land transfer notice and discussion provisions, the DLA further agrees to provide the agencies with similar notice, within the same timeframes (sic), as to federal-to-federal transfers of property. The DLA will provide a copy of executed deed or transfer assembly to the agencies." While this statement is adequately presented for the metals sites, the statement does not apply to TCE Site P-5A. Therefore, please expand the required statement regarding regulatory notification for (private) transfers and federal - to - federal transfers to include TCE Site P-5A.**	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*) at which LUCs will be established.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
14.		Concurrence language: "The [federal agency] shall not modify or terminate Land Use Controls, implementation actions, or modify land use without approval by EPA and the [state]. The [federal agency] shall seek prior concurrence before any anticipated action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for LUCs." **Section 2.3.4, on page 2-4 (portion of third bullet) states: "DLA will not modify or terminate the LUCs, implement actions, or modify land use without approval by EPA, DTSC, and RWQCB. DLA will seek prior concurrence before any anticipated action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for LUCs." While this statement is adequately presented for the metals sites, the statement does not apply to TCE Site P-5A. Therefore, please expand the required statement regarding regulatory notification/approval for modifying or terminating LUCs to include TCE Site P-5A.**	Text similar to that noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*) at which LUCs will be established.
15.		Monitoring and reporting language. Note that Regions may alter the monitoring frequency based on site-specific needs. "Monitoring of the environmental use restrictions and controls will be conducted annually by the [federal agency]. The monitoring results will be included in a separate report or as a section of another environmental report, if appropriate, and provided to the USEPA and the [the state]. The annual monitoring reports will be used in preparation of the Five Year Review to evaluate the effectiveness of the remedy. The annual monitoring report, submitted to the regulatory agencies by the [federal agency], will evaluate the status of the ICs and how any IC deficiencies or inconsistent uses have been addressed. The annual evaluation will address whether the use restrictions and controls referenced above were communicated in the deed(s), whether the owners and state and local agencies were notified of the use restrictions and controls affecting the property, and whether use of the property has conformed with such restrictions and controls." **Section 2.3.4, forth bullet** (continued)	The proposed text changes have been incorporated into Section 3.3 (Section 2.3 in the draft) of the OU 2 ROD Amendment as requested. In addition, text similar to that noted in the comment for the metals sites with the proposed changes has been incorporated into Section 2.4 Land Use Controls for the *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*) at which LUCs will be established.

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
15. (cont'd)		(continued) **on page 2-4 states, "DLA will conduct annual monitoring and take prompt action to restore, repair, or correct any deficiencies or failures identified with the LUCs. A different monitoring schedule may be agreed upon, according to the schedule provisions of the Federal Facilities agreement (FFA), if all parties agree and if the change reasonably reflects the risk presented by the site. Monitoring will include evaluating LUC implementation, updating a list of personnel responsible for the LUCs, contacting these personnel to ensure they have access to the Addendum to the [Installation Master Plan], documenting that no change in land use has occurred, and contacting all parties of the FFA if the monitoring effort discovers a change in land use. Text in Section 2.3.5, continues, "…to assure the regulatory agencies and the public that DLA will fully comply with and be accountable for the performance measures identified herein, it will submit in a timely manner to EPA, DTSC, and RWQCB, an annual monitoring report on the status of the LUCs, including the operation, maintenance, and monitoring thereof, and how any LUC deficiencies or inconsistent uses have been addressed. The annual report will be included in the DDJC-Sharpe FFA Annual Progress Report (or a separate report, if appropriate), which is filed in the Administrative Record, and will be used in preparation of the five–year reviews to evaluate LUC effectiveness." Please utilize language per EPA/DoD guidance which specifies the following:** "**Monitoring of the environmental use restrictions and controls will be conducted annually by DLA. The monitoring results will be included in a separate report or as a section of another environmental report, if appropriate, and provided to the USEPA , DTSC, and RWQCB. The annual monitoring reports will be used in preparation of the Five Year Review to evaluate the effectiveness of the remedy.** (continued)	

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
15. (cont'd)		(continued) **The annual monitoring report, submitted to the regulatory agencies by DLA, will evaluate the status of the ICs and how any IC deficiencies or inconsistent uses have been addressed. The annual evaluation will address whether the use restrictions and controls referenced above were communicated in the deed(s), whether the owners and state and local agencies were notified of the use restrictions and controls affecting the property, and whether use of the property has conformed with such restrictions and controls."**	
16.		A comprehensive list of LUCs. The LUC should not be confused with the LUC objectives. The term LUC refers to the actual LUC instrument which is used to accomplish the objectives. The LUCs are likely to be a legal mechanism or administrative measure used to impose use restrictions (e.g. permits, orders, restrictive covenants, zoning), but they may also include measures such as fences and guards. If the description of the LUCs in #5 above is comprehensive, it could substitute for #16's listing of LUCs. A **comprehensive list of LUCs is not provided. Please include a comprehensive list of LUCs that apply to the OU2 ROD Amendment.**	A list of the LUCs is provided in Section 3.3 (Section 2.3 in the draft) of the OU 2 ROD Amendment. In addition, the objective (Section 2.3.3 in the draft) of the LUCs was revised. The text states: "The objective of the LUCs at Sites S-3, S-26, S-30, S-33/29, and S-36 is to protect human health and the environment in accordance with CERCLA by limiting human exposure to residual metals contamination in soil at concentrations that are *not compatible with unlimited use and unrestricted exposure*. The LUC objective for these sites will be achieved by: • Modifying the DDJC-Sharpe/Tracy IMP to prohibit development *for uses such as schools, child care facilities, playgrounds, and residential housing*. • Reviewing proposed construction projects to ensure that they are consistent with the LUC objective, ARARs, and the DDJC-Sharpe/Tracy Waste Management Plan. • Establishing environmental restrictions at the time of real property transfer in order to publicly record LUCs." (continued)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
16. (cont'd)			(continued) Similar text has been incorporated into Section 2.4 Land Use Controls for the *eight* TCE sites at which LUCs will be established. Specifically, the text states: "The objective of the LUCs at Sites *P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A* is to protect human health and the environment in accordance with CERCLA by limiting human exposure to VOCs through the vapor intrusion pathway. The LUC objective for these sites will be achieved by: • Modifying the DDJC-Sharpe/Tracy Installation Master Plan (IMP) to prohibit development *for uses such as schools, child care facilities, playgrounds, and residential housing*. • Reviewing proposed construction projects to ensure that they are consistent with the LUC objective, applicable or relevant and appropriate requirements (ARARs), and the DDJC-Sharpe/Tracy Waste Management Plan. • Establishing environmental restrictions at the time of real property transfer in order to publicly record LUCs."

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
17.		For active facilities, a description of the internal procedures for implementing the LUCs (e.g., orders, instructions, Base Master Plan) and a commitment by the [federal agency] to notify EPA in advance of any changes to the internal procedures that would affect the LUCs. **Section 2.3.4, first bullet on page 2-3 indicates, "The Installation Master Plan (IMP) will be modified to include maps that show the five metals sites with LUCs that prohibit residential development (figures 1 through 6 in Appendix A). The Addendum to the IMP (Appendix A of this ROD Amendment) indicates that the five metals sites are specifically restricted from development of the property for uses such as schools, child care facilities, playgrounds, and residential housing. The Addendum to the IMP also refers to the Defense Enterprise Support San Joaquin California (DESJC) Environmental Program Manager if more information is needed. The Addendum to the IMP will be incorporated into the IMP within 90 days of the final signature on this ROD Amendment." While this statement is adequate for the metals sites, the statement does not apply to TCE Site P-5A. Therefore, please expand the required statement regarding internal procedures for implementing LUCs (i.e. IMP Addendum) to include TCE Site P-5A. Also, please modify the statement to indicate a DLA commitment to notify regulators in advance of any changes to the internal procedures that would affect the LUCs."**	Text has been added to the end of the bullet referenced in the comment that states: "DLA will notify EPA, DTSC, and RWQCB in advance of any changes to internal procedures that affect the LUCs." The bullet referenced in the comment plus the text addition are also included in Section 2.4 Land Use Controls for the *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*) at which LUCs will be established. The text in the referenced bullet has been updated to reflect the change from Appendix A in the draft to Appendix C in the draft final OU 2 ROD Amendment for the Addendum to the Installation Master Plan, DDJC-Sharpe. The referenced figure numbers have also been revised to reflect the addition of *eight* TCE sites to the list of sites with LUCs.
		Generally, #s 18 and 19 apply at a BRAC installation, but they may have application elsewhere.	
18.		Other property transfer language: a. "Deed Restrictions: "Each transfer of fee title from the United States will include a CERCLA 120(h)(3) covenant which will have a description of the residual contamination on the property and the environmental use restrictions, expressly prohibiting activities inconsistent with the performance measure goals and objectives. (continued)	No response required.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final (Informal Comments)
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	22 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Phillip Ramsey, EPA
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
18. (cont'd)		(continued) The environmental restrictions are included in a section of the CERCLA 120(h)(3) covenant that the United States is required to include in the deed for any property that has had hazardous substances stored for one year or more, known to have been released or disposed of on the property. Each deed will also contain a reservation of access to the property for the [federal agency], USEPA, and [the State], and their respective officials, agents, employees, contractors, and subcontractors for purposes consistent with the [federal agency] Installation Restoration Program ("IRP") or the Federal Facility Agreement ("FFA"). The deed will contain appropriate provisions to ensure that the restrictions continue to run with the land and are enforceable by the [federal agency]." b. "Lease Restrictions: " During the time between the adoption of this ROD and deeding of the property, equivalent restrictions are being implemented by lease terms, which are no less restrictive than the use restrictions and controls described above, in this ROD. These lease terms shall remain in place until the property is transferred by deed, at which time they will be superceded by the institutional controls described in this ROD." c. "Notice: "Concurrent with the transfer of fee title from the [federal agency] to transferee, information regarding the environmental use restrictions and controls will be communicated in writing to the property owners and to appropriate state and local agencies to ensure such agencies can factor such conditions into their oversight and decision-making activities regarding the property."	
19.		Ensure that the document adequately describes pre-transfer LUCs, not just post-transfer LUCs. **Section 2.3.6, 2.3.7, and 2.3.8, all on page 2-5 appear to address this item.**	Text similar to the sections noted in the comment for the metals sites has been incorporated into Section 2.4 Land Use Controls for the *eight* TCE sites (*P-1A, P-1B, P-1C,* P-1G, P-2A, P-2B, P-4B*, and P-5A*) at which LUCs will be established.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft Final
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 13 July 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME Kimberly Day, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		General Comments – Human Health Risk Assessment	
		Appendix A – Site Summaries	
1.		HERO reviewed the site summaries for the following seven proposed sites with no further action (NFA): P-1D, P-1E, P-1F, P-3A, P-4A, P-4C, P-6A, and P-8A. HERO also reviewed the site summaries for the following eight sites recommended to have land use controls (LUCs): P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A. HERO's comments regarding these site summaries are stated below.	
2.		Site P-1D. TCE contributes approximately 68% of the risk from the vapor intrusion pathway (VIP) and the remaining 32% of risk is due mainly to 1,4-diochlorobenzene, 1,4-dioxane, benzene, tetrachloroethene, and ethylbenzene. The multiple lines of evidence presented by DLA for NFA at site P-1D relates to TCE contamination. HERO requests that the DLA also include a discussion as to the potential risk associated with 1,4-diochlorobenzene, 1,4-dioxane, benzene, tetrachloroethene, and ethylbenzene, which also contribute to risk from the VIP at Site P-1D, since the DLA is recommending NFA at the site.	Text has been added to the site summary for Site P-1D to discuss the potential risk associated with other VOCs from the VIP. In addition, text has been added and/or revised to discuss whether the VOCs other than TCE are present in groundwater at the site and whether the residual VOC mass in soil vapor poses an unacceptable threat to future industrial or residential receptors. Reference to sample locations where these other VOCs were detected is also provided as appropriate.
3.		Site P-1E. HERO acknowledges that the OU 2 ROD only deals with the soil medium and that groundwater will be addressed under OU 1. However, with respect to the recommendation for Site P-1E, HERO requests that the DLA (Defense Logistics Agency) include the word "soil" in the following sentence, "***No further action is recommended for Site P-1E based on the following lines of evidence***" to further clarify that the no further action (NFA) is for the soil medium and not groundwater. The third bullet under the recommendation states that "***A plume of TCE groundwater contamination is present under this site.***"	The requested change has been made. The sentence now states: "No further action is recommended for soil at Site P-1E based on the following lines of evidence."

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	13 July 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Kimberly Day, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
4.		Site P-1F a. Under the subheading, *Groundwater*, the DLA reports that "***the groundwater in the A Zone beneath the site probably contains TCE concentrations; concentrations in the nearest A Zone piezometer, P5A, are less than the aquifer cleanup level of 5 microgram per liter.***" HERO recommends that the DLA provide further evidence as to why the DLA believes that TCE contaminated groundwater is "*probably*" beneath the site. HERO acknowledges that the OU2 ROD addresses the soil medium, however, the OU2 ROD should be a stand alone document and referring to groundwater contamination as "probably" is vague and does not provide the reader with any tangible information.	The text under *Groundwater* has been revised to state: "It can be assumed that volatile organic compound (VOC) contamination is present in A Zone groundwater beneath the site, even though there are no monitoring wells at the site. At A Zone piezometer P5A cross-gradient to the southwest of Site P-1F, the TCE concentration was 3.2 micro-grams per liter (μg/L) in the third quarter of 2009 (Figure 4-1). This concentration is less than the TCE aquifer cleanup level of 5 μg/L. No other VOC contaminants of concern were detected in groundwater at piezometer P5A in the third quarter of 2009." In addition, a map showing the VOC plumes present in the A Zone is included at the beginning of the appendix in which the site summaries are contained.
		b. TCE only contributes approximately 5% of the risk from the vapor intrusion pathway (VIP) and the remaining 95% of risk is due mainly to 1,4-diochlorobenzene and ethylbenzene. The multiple lines of evidence presented by DLA for NFA at Site P-1F relates to TCE contamination. HERO requests that the DLA also include a discussion as to the potential risk associated with 1,4-diochlorobenzene and ethylbenzene, the main contributors to risk from the VIP at Site P-1F, since the DLA is recommending NFA at the site.	Text has been added to the site summary for Site P-1F to discuss the potential risk associated with other VOCs from the VIP. In addition, text has been added and/or revised to discuss whether the VOCs other than TCE are present in groundwater at the site and whether the residual VOC mass in soil vapor poses an unacceptable threat to future industrial or residential receptors. Reference to sample locations where these other VOCs were detected is also provided as appropriate.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	13 July 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Kimberly Day, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
5.		Site P-6A – Post-SVE Shutdown Sampling. a. *The northern SVE system.* HERO is unsure when the northern SVE system was shutdown and when the confirmation/rebound sampling was conducted. HERO requests clarification from the DLA.	For clarification, the following sentence has been added as the first sentence under *SVE Operation*: "The first two phases of SVE operation were conducted from July 1998 through December 1999 until operational data at the northern and southern circuits indicated that vapor concentrations were less than the OU 2 ROD cleanup standard." In addition, in the first sentence of the second paragraph under *SVE Operation*, the date of the confirmation sampling (December 2000) at the northern SVE circuit has been added.
		b. *The southern SVE system.* The southern SVE system was shutdown in December of 2001 and confirmation sampling occurred 3 weeks later in January 2002. The Site P-6A summary indicates that all of the confirmation soil gas results were less than the cleanup standard. However, please note that HERO feels 3 weeks may not be enough time for equilibration and there is a potential data gap due to rebounding of TCE and other COCs. HERO defers to the DTSC geologist regarding whether 3 weeks in enough time for equilibration and collecting confirmation samples that adequately represent site conditions.	Comment noted.
6.		Site P-8A. TCE concentrations in the soil contribute approximately 60% of the risk from the vapor intrusion pathway (VIP), while the remaining 40% of risk is from carbon tetrachloride, chloroform, 1,4-diochlorobenzene, ethylbenzene, and tetrachloroethene. The multiple lines of evidence presented by DLA for NFA at Site P-8A relates to the TCE contamination only. HERO requests that the DLA also include a discussion as to the potential risk associated with other COCs since the DLA is recommending NFA at the site and the estimated risk from the VIP, 5.2E-05, 1.0E-05, and 1.3E-06, (US EPA, DTSC, and Site-Specific, respectively) are within the risk management range of 1E-04 to 1E-06.	Text has been added to the site summary for Site P-8A to discuss the potential risk associated with other VOCs from the VIP. In addition, text has been added and/or revised to discuss whether the VOCs other than TCE are present in groundwater at the site and whether the residual VOC mass in soil vapor poses an unacceptable threat to future industrial or residential receptors. Reference to sample locations where these other VOCs were detected is also provided as appropriate.

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	13 July 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Kimberly Day, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
7.		For all sites recommended for NFA, HERO requests that the DLA revise the following statement in the site summaries to read, "***No further action is recommended <u>for soil</u> at Site P-**[XX]* **based on the following lines of evidence:***".	For clarification, the requested change has been made to all sites recommended for no further action, as well as the sites recommended for land use controls.
8.		<u>Site P-1G.</u> HERO requests that the DLA include a statement under the Recommendation Section that concentrations of trichloroethene (TCE) in soil vapor at site P-1G are greater than the ROD-specified cleanup standard (350 ppbv); as another line of evidence for implementing LUCs.	The following statement has been added as a bullet under the *Recommendation* section: "Soil vapor samples collected in 1997 had TCE concentrations greater than the ROD-specified 350 ppbv cleanup standard."
9.		<u>Site P-2A</u> a. *SVE Decision Section.* HERO requests further clarification regarding the reference to an existing groundwater extraction and treatment system that is in place at Site P-2A. In the Groundwater Section above, the DLA reports that no trichloroethene (TCE) or any other volatile organic compounds (VOCs) have been detected in A Zone monitoring well MW441A, located in Site P-2A during sampling that was conducted between 1997 through 2003. From the information provided in this site summary, it is HERO's understanding that no contaminated groundwater lies beneath Site P-2A.	The reference to the groundwater extraction and treatment system was not intended to imply there was such a system in place at Site P-2A. Rather, the reference was intended to note the existence of a groundwater extraction and treatment system already in place at DDJC-Sharpe, which could be used to cleanup groundwater at Site P-2A, if it were to become contaminated. However, there was no need for groundwater extraction and treatment, as VOCs were not detected between third quarter 1997 and 2003, when groundwater was last sampled at Site P-2A.
		b. HERO requests that the DLA include a statement under the Recommendation section that concentrations of TCE in soil vapor in the eastern portion of Site P-2A are greater than the ROD-specified cleanup standard (350 ppbv); as another line of evidence for implementing LUCs.	The following statement has been added as a bullet under the *Recommendation* section: "Soil vapor samples collected in 1996 had TCE concentrations greater than the ROD-specified 350 ppbv cleanup standard; however, there is no evidence those concentrations are impacting groundwater."

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	13 July 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Kimberly Day, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
10.		Site P-2B a. According to the first bullet under the Recommendation Section of the Site P-2B summary, it is unknown whether the TCE plume and/or other VOCs such as carbon tetrachloride extend under the Army and Air Force Exchange Service (AAFES) warehouse; built in 2000 in the northern one-quarter of the site. Based on the limited information presented in this site summary, HERO feels that the soil gas plume has not been fully characterized. There is a potential risk to employees that work in the warehouse due to the vapor intrusion pathway (VIP). HERO acknowledges that the Defense Logistics Agency Enterprise Support San Joaquin California (DESJC) collected an indoor air sample in the warehouse to ensure employees were not being exposed to VOCs from soil vapor beneath the building, and that VOCs were not detected. Please note that according to both DTSC and US EPA guidance, risk assessment cannot be based off of one indoor air sample. Furthermore, HERO was not aware that indoor air sampling was conducted and did not review the work plan or QA/QC procedures. Furthermore, the DLA did not provide any supporting information and/or a reference for the indoor air sampling event in the site-specific summary. Also, the DLA did not provide any supporting information and/or reference as to the location of soil gas samples with detected concentrations of carbon tetrachloride, tetrachloroethene, and 1,4-dioxane. In particular, HERO would like to know the location of theses detected VOCs and their proximity to the warehouse. Please note that these compounds contribute to approximately 87% of the risk associated with the VIP, and when HERO reviewed the cumulative risk estimate table (Table B9-1), carbon tetrachloride contributed to approximately 83% of the total risk. HERO requests that the DLA provide the supporting documentation and/or please provide the references for this information.	A paragraph has been added under Potential Site Risk to describe the rationale for collecting an indoor air sample at the AAFES warehouse, where the sample was collected, the duration of sample collection, and the analytical results from the sample. Text has been added to the site summary for Site P-2B to discuss the potential risk associated with other VOCs from the VIP. In addition, text has been added and/or revised to discuss whether the VOCs other than TCE are present in groundwater at the site and whether the residual VOC mass in soil vapor poses an unacceptable threat to future industrial or residential receptors. Reference to sample locations where these other VOCs were detected is also provided as appropriate.
		b. HERO requests that the DLA include a statement under the Recommendation section that concentrations of TCE in soil vapor at Site P-2B are greater than the ROD-specified cleanup standard (350 ppbv); as another line of evidence for implementing LUCs.	The following statement has been added as a bullet under the *Recommendation* section: “Soil vapor samples collected in 1996 had TCE concentrations greater than the ROD-specified 350 ppbv cleanup standard.”

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW	Draft Final
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE	13 July 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME	Kimberly Day, DTSC
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS			

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		Appendix B – Risk and Hazard Estimates for the Vapor Intrusion Pathway at the TCE Sites	
1.		Toxicity Criteria. The hierarchy for toxicity criteria should specify that the more health-protective of the Cal/EPA OEHHA toxicity criteria and USEPA IRIS value is used rather than "giving priority first to the EPA Integrated Risk Assessment Information System (IRIS), then EPA provisional peer-reviewed toxicity reference values (PPRTV), the Office of Environmental Health Hazard Assessment (OEHHA) values, then ATSDR minimal risk level (MRL) values, and lastly EPA health effects assessment summary table (HEAST) values." Furthermore, on US EPA's website under the toxicity hierarchy subheading it states that "*It should be noted that Cal/EPA's Office of Environmental Health Hazard Assessment (OEHHA) also derives peer-reviewed toxicity values that should be used in California, particularly if they are more stringent than EPA's toxicity values.*" (http://www.epa.gov/region9/superfund/prg/rsl-table.html)	The referenced text in Appendix B has been revised. Please note that toxicity data used in the site-specific risk assessments were current during the time of preparation (December 2009 – March 2010) of the draft final document. Online information is generally subject to frequent change; information from EPA has been modified as recently as June 2010 and new Regional Screening Level (RSL) tables were released in May 2010. However, the changes in the RSL values and methodology published in May (relative to the previous December 2009 version) would not alter the computations presented in the site-specific assessments.
		Appendix C – Addendum to the Installation Master Plan	
1.		In the first paragraph of Appendix C, DLA says that land use controls (LUCs) will be at four trichloroethene (TCE) sites. Please ensure that the text is updated and revised to include Sites P-1A, P-1B, P-1C and P-5A, and please revise the text to say that LUCs will be placed on eight TCE sites.	The text has been updated to include eight TCE sites with LUCs (Sites P-1A, P-1B, P-1C, P-1G, P-2A, P-2B, P-4B, and P-5A).
2.		Please ensure that Sites P-1A, P-1B, P-1C and P-5A are added onto Figure 1, and also include a site map of these sites as figures.	Sites P-1A, P-1B, P-1C, and P-5A have been added to Figure 1, and a site map showing the LUC boundaries has been added for each of the sites. (Note: TCE sites P-1A, P-1B, and P-1C, and metals site S-36 are shown together on one figure due to their proximity to each other.)

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT (AFCEE)

DESIGN REVIEW COMMENTS Project: OU 2 ROD Amendment, Basewide Remedy for Defense Distribution Depot San Joaquin–Sharpe Site

☒ SITE DEV & GEO	☐ MECHANICAL	☐ SAFETY	☐ SYSTEMS ENG	REVIEW Draft Final
☐ ENVIR PROT & UTIL	☐ MFG TECHNOLOGY	☐ ADV TECH	☐ VALUE ENG	DATE 6 April 2010
☐ ARCHITECTURAL	☐ ELECTRICAL	☐ ESTIMATING	☐ OTHER	NAME James Brownell, RWQCB
☐ STRUCTURAL	☐ INST & CONTROLS	☐ SPECIFICATIONS		

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		Central Valley Water Board staff notes that DESJC did not agree with certain comments on the April 2009 Draft Amendment presented in the August 2009 review letters from the U.S. Environmental Protection Agency (EPA) and the California Department of Toxic Substances Control (DTSC). As a result, DESJC did not incorporate some of the changes to the Draft Amendment requested by EPA or DTSC in the Draft Final Amendment. These changes include EPA's request for the establishment of short-term land use controls for trichloroethene at Site P5-A while SVE is implemented. Central Valley Water Board staff supports EPA and DTSC efforts to resolve these differences before DESJC finalizes the amendment.	No response required.

APPENDIX E

Proposed Plan

March 2009

Defense Distribution Depot San Joaquin California (DDJC)
Sharpe Site

Proposed Plan for Amendment to the Record of Decision, Basewide Remedy for DDJC-Sharpe Soil Sites

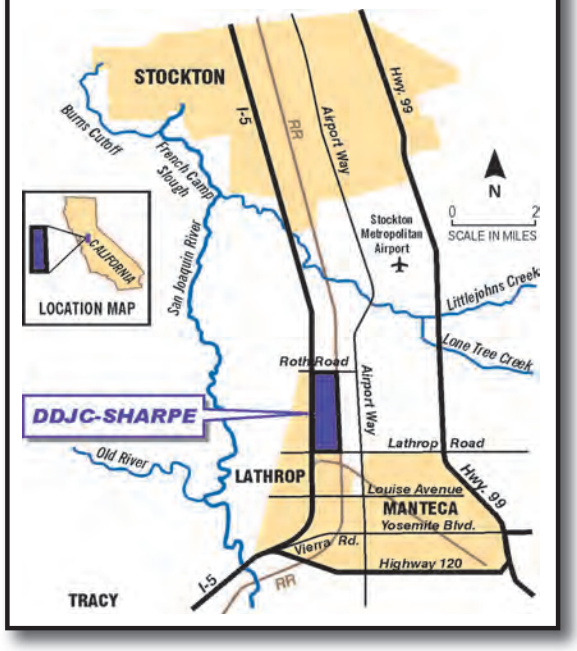
INTRODUCTION TO THE PROPOSED PLAN

The Defense Logistics Agency (DLA) is issuing this **Proposed Plan**[1] to present a proposed amendment to the ***Record of Decision (ROD)***, *Basewide Remedy for DDRW-Sharpe Site*, which requires DLA to perform investigations and/or **cleanup** actions for specific soil sites. This Proposed Plan is designed to inform the community about the proposed amendment to add **land use controls (LUCs)** to five soil sites at what is now known as the Defense Distribution Depot San Joaquin, Sharpe site (DDJC-Sharpe). The Proposed Plan describes additional actions that the Defense Logistics Agency Enterprise Support San Joaquin California (DESJC) and the **United States Environmental Protection Agency (EPA)** in concurrence with the **California Department of Toxic Substances Control (DTSC)** and the **California Regional Water Quality Control Board-Central Valley Region (RWQCB-CVR)** are proposing to ensure proper land use and cleanup of the environment.

Because the cleanup standards in the ROD for five **metals** sites were based on industrial land use and do not allow for residential use, further action in the form of LUCs is necessary to protect human health and the environment. Therefore, an amendment to the previously published ROD is required to add LUCs as part of the **remedial action** for these sites. A no-action alternative was also assessed. However, a no-action alternative does not ensure protection of human health and the environment and so was not selected as the proposed alternative.

The DLA and the DESJC invite you to read the Proposed Plan, submit comments during the formal comment period, and participate in an open discussion at a public meeting *(described below).*

Location of DDJC-Sharpe



[1] *Key terms in **bold** are defined in the Glossary/Acronyms section beginning on page 6.*

PUBLIC COMMENT PERIOD AND PUBLIC MEETING

PUBLIC COMMENT PERIOD

March 4 - April 9, 2009

We consider and respond to all public comments received during the public comment period. Written comments may be forwarded on the enclosed form and sent to:

Defense Distribution Depot San Joaquin California, Sharpe Site
Office of Command Affairs
Ms. Annette Silva
P.O. Box 960001, Stockton, CA 95297-0002

Or e-mail your comments to: *Annette.Silva@dla.mil*

Comments must be received by close of business (5 p.m.) on April 6, 2009. After the close of the public comment period, DLA will provide a response to comments received and select the final remedies that will be presented in the ROD Amendment document.

PUBLIC MEETING

Thursday, March 19, 2009, 7:00 p.m.
Lathrop Senior Center - Multi-purpose Room
15707 Fifth Street, Lathrop, CA 95330

You are invited to attend a public meeting on Thursday, March 19.

DDJC-Sharpe will present a summary and host a discussion on the investigation/cleanup alternatives. Members of the public will be able to ask questions and provide input on the alternatives presented. DDJC-Sharpe will record oral comments and respond to them in the final ROD amendment.

For additional information, call DDJC-Sharpe at: (209) 839-4226.

*This Proposed Plan is issued pursuant to **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**, Section 117(a), as amended by **Superfund Amendments and Reauthorization Act (SARA)** and **National Contingency Plan (NCP)**, Section 300.430(f)(2) to facilitate public participation in the selection of remedies for DDJC-Sharpe.*

CONTENTS OF THIS PROPOSED PLAN

Introduction to the Proposed Plan	1
Location of DDJC-Sharpe	1
Public Comment Period	1
Public Meeting	1
Overview of the Proposed Plan	2-5
Location and Status of DDJC-Sharpe Soil Sites	2
Key DDJC-Sharpe Milestones	3
National Contingency Plan Criteria	4
Changes Proposed in the ROD Amendment	6
Glossary of Terms/Acronyms	6-7
Community Participation	5, 8
Comment Form Mailer	INSERT

OVERVIEW OF THE PROPOSED PLAN

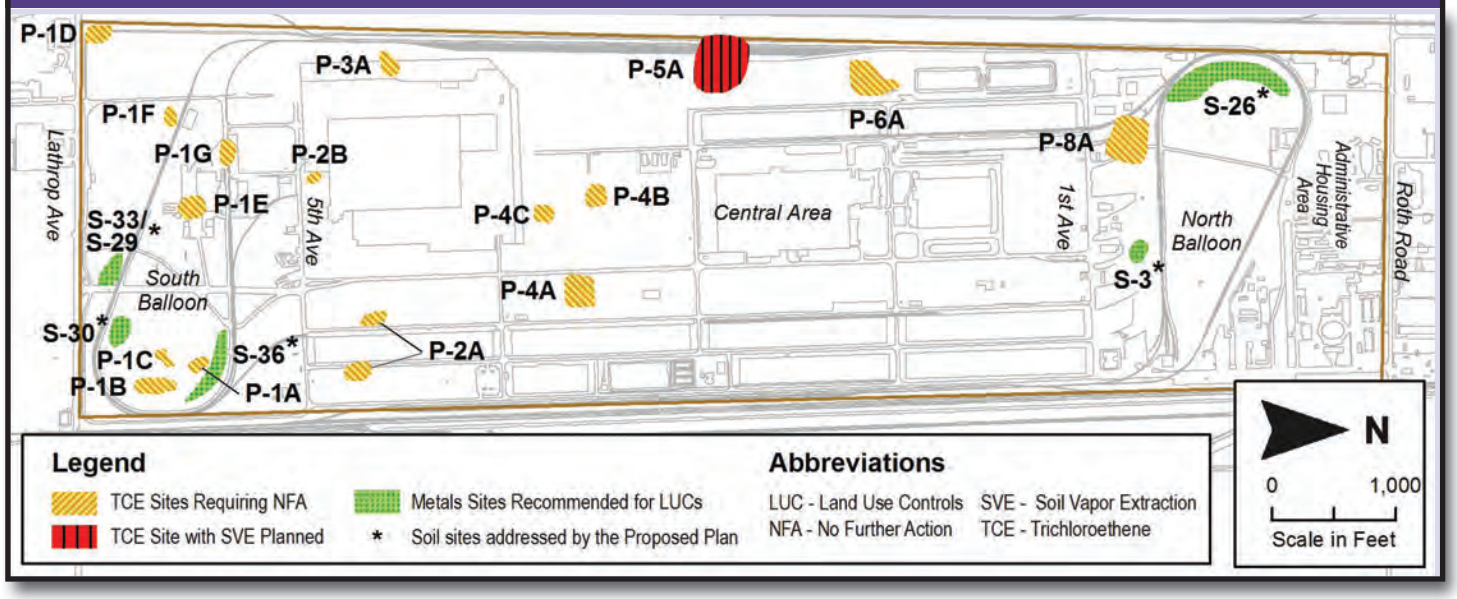
Purpose of the Proposed Plan

In 1996, after DESJC and state and federal regulatory agencies reviewed and incorporated public comments on the Proposed Plan, a ROD was developed and signed for soils at DDJC-Sharpe. The ROD describes the investigations and cleanup activities that DESJC is required to complete at specified sites where soil may have been contaminated by past depot activities. DDJC-Sharpe has been using the ROD to direct its environmental cleanup program and has implemented its requirements. For the 16 **trichloroethene (TCE)** sites *(shown in yellow on the map below)* identified in the ROD and in subsequent investigations, all but one require **no further action (NFA)**. The remaining site, P-5A *(shown in red on the map below)*, will require a remedial action because the results of recent investigations indicate that TCE is present in soil vapor at concentrations that exceed the cleanup standard identified in the ROD. In accordance with the ROD, **soil vapor extraction (SVE)** will be implemented at site P-5A to protect **groundwater** quality.

Five metals sites *(shown in green on the map below)* have undergone excavation and off-site disposal of contaminated soil or were determined to meet cleanup standards without remedial action. However, since the concentrations of metals that remain in soil are protective of human health in an industrial worker setting, but not a residential setting, further action in the form of LUCs will be necessary to protect human health. LUCs are used to ensure proper use of the land, and to prevent improper use that could potentially result in exposure to **contaminants** by sensitive communities, such as those at daycare centers. Because of the addition of LUCs, an amendment to the previously published ROD is required.

The purpose of this *Proposed Plan for the Amendment to the Record of Decision, Basewide Remedy for DDJC-Sharpe Site* is to give the public an opportunity to review and comment on the proposed change to the ROD. The ROD Amendment will be published as a final document after public comments have been received and considered. DLA in consultation with EPA, DTSC, and RWQCB-CVR will respond to all comments received during the public comment period. Comments and responses will appear in the Responsiveness Summary section of the ROD Amendment.

Location and Status of the DDJC-Sharpe Soil Sites



continued from page 2

DDJC-Sharpe Background and Site Characteristics

DDJC-Sharpe is located in San Joaquin County, northeast of the City of Lathrop and approximately nine miles south of the City of Stockton. The installation – encompassing approximately 720 acres – forms a 0.5-mile-wide (east-west), 2-mile-long (north-south) rectangle. Current land use at DDJC-Sharpe is designated as industrial and it is anticipated that the land use designation will remain industrial in the future. The area surrounding DDJC-Sharpe includes mixed-use light industrial, agricultural, and residential land. Railroad rights-of-way parallel the eastern and western depot boundaries.

The principal depot mission has been the storage, shipping, and packaging of general supplies in support of America's Armed Forces, as well as the maintenance of military equipment. These tasks require the use of petroleum hydrocarbon fuels and a variety of other industrial chemicals. Past use and disposal practices resulted in the release of these chemicals into the environment. In 1979, DDJC-Sharpe began conducting environmental restoration activities to address soil and groundwater contamination. Investigations at the depot revealed that **contamination** of soil and groundwater resulted primarily from industrial cleaning solvents, petroleum fuels, metals, and pesticides.

The DLA serves as the lead federal agency authority for cleanup activities at DDJC-Sharpe, a federal facility. The EPA is the lead regulatory agency, and the DTSC and RWQCB-CVR are regulatory support agencies for environmental investigation and restoration at the depot.

Milestones in the soil cleanup program at DDJC-Sharpe are shown below. A chronology of previous community outreach activities can be found in the DDJC-Sharpe **Community Relations Plan (CRP)**, which is available for review in the **Administrative Record (AR)** *(see the Community Participation box at the bottom of page 5 for information on accessing the AR)*. Please note that the groundwater cleanup efforts at DDJC-Sharpe are guided by a separate ROD, and no amendments to that ROD are considered in this Proposed Plan.

Key DDJC-Sharpe Milestones for Soil Sites

1979	***Installation Restoration Program (IRP)*** *initiated to investigate environmental contamination*
1987	*DDJC-Sharpe placed on the* ***National Priorities List (NPL)*** *by EPA*
1989	***Federal Facilities Agreement (FFA)*** *signed by DLA, EPA, DTSC, and RWQCB-CVR*
1994	***Remedial Investigation/Feasibility Study (RI/FS)*** *completed*
1995	*Proposed Plan for soil sites published*
1996	*ROD for soil sites signed by DLA, EPA, DTSC, and RWQCB*
1997	*Pre-design technical summary for soil sites* ***remedial actions*** *completed*
1998	*Construction of* ***soil vapor extraction (SVE)*** *system completed and SVE operation begun; metals-contaminated soil excavated and disposed off site*
2000	*Two remedial action reports published documenting investigations and cleanup activities at soil sites, including no further action decisions*
2002	*Two remedial action reports published documenting investigations and cleanup activities, including no further action decisions at soil sites; SVE operations completed*
2003	*Initial* ***Five-Year Review*** *completed*
2005	***Response Completion Plan (RCP)*** *published*
2006-07	*Additional metals-contaminated soil excavated and disposed off site*
2008	*One remedial action report published documenting investigations and cleanup activities at soil sites including no further action decisions*

National Contingency Plan Criteria for Evaluating Remedial Alternatives

1 Overall Protection of Human Health and the Environment

Addresses whether a remedy provides adequate protection of human health and the environment, and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Addresses whether a remedy will meet all of the ARARs and federal and state environmental guidelines and/or justifies an ARAR waiver.

3 Long-Term Effectiveness and Permanence

Refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

4 Reduction of Toxicity, Mobility, and Volume Through Treatment

Refers to the anticipated ability of the treatment technologies to reduce the toxicity, mobility, and volume (TMV) of the hazardous compounds present at the site.

5 Cost

Evaluates the estimated capital and operation and maintenance (O&M) costs for each alternative.

6 Short-Term Effectiveness

Addresses the period of time between contaminant discovery and attainment of remedial action objectives when the environment, community, and on-site workers must be protected against adverse impacts.

7 Implementability

Refers to the technical and administrative feasibility of the remedy, including the availability of materials and services needed to implement a particular option.

8 State Acceptance

Indicates whether the state favors or objects to any of the alternatives based on the available information.

9 Community Acceptance

Indicates whether community concerns are addressed by the remedy and whether the community has a preference for a remedy.

continued from page 3

ROD-Required Response Actions at Soil Sites

The **contaminants of concern (COCs)** at DDJC-Sharpe soil sites include TCE (a **volatile organic compound [VOC]**), and metals, specifically **lead** and **chromium**. As stated in the ROD, the **remedial action objective (RAO)** for TCE-contaminated sites is to prevent further degradation of groundwater and minimize aquifer cleanup time by reducing the mass of TCE that reaches groundwater. The ROD **response action** includes cleaning up TCE contamination using SVE when concentrations of TCE in soil vapor exceed the cleanup level of 0.35 parts per million by volume (ppmv) and when **vadose zone modeling** predicts that residual contamination represents a significant threat to groundwater quality. All but one of the TCE sites has been investigated and/or remediated in accordance with the ROD remedy and require no further action. The remaining site, P-5A, will be remediated using SVE in accordance with ROD requirements.

The RAO for metals-contaminated soil sites is to excavate lead- and chromium-contaminated soils to eliminate the potential threat to human health and the environment. Cleanup levels of 1,000 mg/kg for lead and 300 mg/kg for chromium were established to meet this objective. For metals-contaminated soil, the ROD response action includes excavation and off-site disposal of soil with concentrations of lead and chromium above the cleanup levels. These cleanup levels were identified in the ROD as protective of human health and the environment if land use remains industrial. Additional investigation after the ROD was signed indicated that three (S-30, S-33/29, and S-36) of the five metals sites identified in the ROD did not have lead or chromium concentrations greater than the cleanup levels. Contaminated soil from the other two sites (S-3 and S-26) was excavated and disposed of at an approved landfill in accordance with the ROD. Post-excavation soil sampling confirmed that the ROD cleanup goals were achieved.

Summary of Site Risks

Contaminants released to the soil due to previous operational activities at DDJC-Sharpe might pose a threat to human health, ecological organisms, and/or groundwater quality. **Risk assessment** is the required, structured, scientific process to evaluate that threat and characterize the likelihood for adverse health or environmental effects. Risk management is the process which then considers the risk assessment and groundwater results jointly with other issues within the framework of the **National Contingency Plan (NCP)** Criteria for Evaluating Remedial Alternatives *(see box to the left)*. This process develops environmental management solutions to address the contamination and to concurrently protect human health, the environment, and groundwater. The ROD documents the initial outcomes of the risk management process for DDJC-Sharpe, with subsequent five year reviews and other technical studies further supplementing the scientific understanding of the DDJC-Sharpe environment.

continued from page 4

DESJC has been implementing the required cleanup actions since the ROD was published. The cleanup activities have minimized potential impacts to human health and the environment and have also reduced the mass of contaminants that could migrate from soil into groundwater. In the cases where soil contamination exceeded the cleanup levels outlined in the ROD, cleanup measures were taken until the sites were deemed protective of human health and the environment and, therefore, required NFA in accordance with the ROD. These measures, in addition to the implementation of the proposed LUCs, help ensure that contaminated soil will not harm human health or the environment.

Human-Health Risk Assessment – The baseline risk assessment in the 1994 **Remedial Investigation/Feasibility Study (RI/FS)** was an initial, worst-case evaluation of chemical contamination to indicate whether untreated conditions posed a threat to human health. This assessment evaluated the potential exposure of on-depot workers, and child and adult residents, to carcinogenic and non-carcinogenic chemicals in soil through breathing of dusts and vapors, skin contact, and inadvertent eating or swallowing of soil particles. The residential exposure scenario is used as the indicator of whether "unrestricted land use" can occur at a site. A residential scenario includes the longest duration that the most-sensitive population (i.e., children) could be exposed to contaminants.

Based on DDJC investigations, concentrations of contaminants in soil were initially too high to be considered for unrestricted land use but, if remediated to cleanup standards, were safe for industrial workers. The ROD established cleanup standards to ensure that the soil at DDJC-Sharpe would be protective of the health of on-depot workers. Soils with concentrations of these metals at or below the cleanup standards are safe for industrial worker exposures, but remain unacceptable for unrestricted land use. Consequently, LUCs are necessary to create permanent controls on property use at DDJC-Sharpe.

Ecological Risk Assessment – Ecological risk assessment evaluates the threat of chemical contaminants to plants and animals at a site. A baseline ecological risk assessment was originally developed in the 1994 RI/FS, and concluded that some soil concentrations of contaminants were elevated enough to potentially pose a threat to plants and animals. However, DDJC-Sharpe is an active industrial-use facility and lacks any substantial amount of quality habitat for organisms. Based on past industrial use - and the expected continued future use as an active industrial site - ecological risks are not influential to risk management decisions. However, any change in a facility's land use requires a revised site characterization and, at a minimum, an environmental assessment to re-evaluate the potential for ecological risks. At present, there are no intentions of changing land use at DDJC-Sharpe, and the placement of LUCs for DDJC-Sharpe soils has no effect on ecological risk.

Threats to Groundwater – Since the publishing of the ROD, supplemental soil analysis has indicated that levels of metals remaining in soil do not pose a threat to groundwater. In addition, groundwater monitoring did not identify metals contamination in groundwater. In addition, groundwater monitoring did not identify metals contamination in groundwater. Therefore, enhancement of the remedy with the addition of LUCs does not affect the protectiveness of groundwater provided by implementing the ROD remedy. Groundwater use assumptions are evaluated in the groundwater RI/FS, and a selected remedy is presented in the groundwater ROD. The groundwater RI/FS and ROD documents are available for review in the AR *(see Community Participation box below for information on accessing the AR)*.

COMMUNITY PARTICIPATION

DDJC-Sharpe has had an active community relations/ public participation program since the discovery of hazardous materials on site and continues to solicit ongoing public input about environmental restoration efforts at the depot. Please contact Annette Silva, DDJC-Sharpe Public Information Officer, if you have any questions or need additional information

The remedies selected in this ROD Amendment may change based upon response to public comments, regulatory agency comments, or new information. DESJC appreciates your comments on the information presented in this Proposed Plan.

Additionally, DDJC-Sharpe provides environmental cleanup information through public meetings, the **Administrative Record (AR)**, announcements published in community newspapers, and fact sheets. The AR is a library of information related to cleanup activities at the depot, and DDJC-Sharpe encourages the public to access the AR to review environmental restoration documents.

The AR is located at:

DDJC-Tracy, Building 1
25600 S. Chrisman Rd.
Tracy, CA 95376-5000

Hours of Operation:

7am - 3 pm Monday – Friday
Please call (209) 839-4226 for an appointment to view documents.

CHANGES PROPOSED IN THE ROD AMENDMENT

Metals Sites

Because cleanup standards for the metals sites at DDJC-Sharpe are based on industrial land use and do not allow for unlimited use and unrestricted exposure (i.e., residential use), LUCs are necessary to protect human health and the environment. LUCs are measures that help minimize the potential for human exposure to contamination by restricting activity, use, and access to property with residual contamination. LUCs will be put into place at the five metals sites to permit only continued industrial use of these portions of the depot property; the LUCs do not allow for unrestricted residential use. These land use restrictions will prohibit buildings such as daycare facilities, schools, or homes from being constructed at these sites. In addition, the excavation and disposal of any soil from the five metals sites will comply with all ARARs, including appropriate environmental characterization and disposal of any excavated soil and the DDJC-Sharpe Waste Management Plan (April 2004). DLA shall notify EPA of any such excavation. The metals sites are shown in green on the map on page 2.

The ROD Amendment will describe the process to be followed if the property is sold, to ensure that these LUCs are retained. It will present additional controls in the form of legally enforceable restrictions and/or covenants (where needed) that will be applied to the property. The proposed ROD Amendment will add LUCs to the five metals sites to ensure the long-term protection of human health and comply with appropriate regulations. The LUCs will be maintained until lead and chromium in soil are at concentrations that allow for unrestricted use of the land (e.g., if future excavations resulted in cleanup to residential use levels, the LUCs would no longer be needed).

GLOSSARY OF TERMS/ACRONYMS

Administrative Record (AR) — The body of documents that forms the basis for the selection of a particular response at a site. The AR location for DDJC-Sharpe is listed on page 5.

Applicable or Relevant and Appropriate Requirements (ARARs) — Applicable requirements are those cleanup standards, standards of control, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not "applicable" to a hazardous substance, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

Chromium — An inorganic element, chromium is a metal often used as a shiny decorative or protective coating. It has been used extensively in paints and in plating operations.

Cleanup — Actions taken to deal with the release of contaminants that could affect human health and/or the environment. The term "cleanup" is sometimes used interchangeably with the terms remedial action, removal action, response action or corrective action.

Community Relations Plan (CRP) — A CERCLA-mandated document that develops policies and procedures for DDJC-Sharpe's interaction with the local community and provides a general overview of community relations performed by DDJC-Sharpe during the IRP.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) — A 1980 federal law amended in 1986 to be referred to as "Superfund/SARA," CERCLA provides funding and enforcement authority to environmental regulators for hazardous waste site cleanup and hazardous waste spills. The release or threat of release into the environment of any defined hazardous substance could result in CERCLA response or liability. Removal and remediation are the primary response actions under CERCLA.

Contaminants/Contamination — The presence of chemicals in soil, water, and/or air, introduced by humans, with the potential to pose risk to human health or the environment.

Contaminants of Concern (COCs) — The contaminants that have been identified as needing evaluation for cleanup alternatives based on the remedial investigation and sampling.

Department of Toxic Substances Control (DTSC) — A department within the California Environmental Protection Agency. DTSC is a supporting agency for DDJC-Sharpe environmental restoration efforts.

Federal Facilities Agreement (FFA) — Agreement between the operating agency (site) and federal and state regulatory agencies on the schedule of cleanup activities, including preparation of work plans, reports, and remedial designs.

Five-Year Review — A review required by CERCLA to evaluate the status of a remedy.

continued from page 6

Groundwater — Water beneath the earth's surface that fills pores between soil and gravel particles to the point of saturation. Groundwater often flows more slowly than surface water. Groundwater is the source of 80 percent of the United States' water supply.

Installation Restoration Program (IRP) — A program established in 1979 under which the Department of Defense began identifying, evaluating, and restoring its hazardous waste sites and controlling the migration of hazardous contaminants from those sites.

Land Use Controls (LUC) — An example of institutional controls, LUCs are legal and administrative measures that help minimize the potential for human exposure to contamination by restricting activity, use, and access to properties with residual contamination.

Lead — A common soft, blue-gray metal. It is an inorganic element that has been used as a pigment for paints and inks.

Metals — A group of chemical elements characterized by their luster and ability to conduct electricity and heat. Lead and chromium are examples of metals.

National Contingency Plan (NCP) — A federal regulation that guides the Superfund program. The NCP is the federal government's blueprint for responding to both oil spills and hazardous substance releases.

National Priorities List (NPL) — A list of sites developed by the U.S. Environmental Protection Agency as needing long-term remedial restoration. The purpose of the list is to inform the public of the most hazardous waste sites in the nation. DDJC-Sharpe is on the NPL, which is also referred to as the Superfund List.

No Further Action (NFA) — NFA indicates that a site requires no further activities (assessment, cleanup, or enforcement).

Proposed Plan — The public participation requirement of CERCLA that summarizes the preferred cleanup strategy, the rationale for the preference, alternatives considered, and any proposed waivers to cleanup standards.

Record of Decision (ROD) — A public document describing the cleanup alternative(s) that will be implemented at a CERCLA site. The ROD is based on information and technical analyses generated during the RI/FS and incorporates public comments and community concerns.

Regional Water Quality Control Board - Central Valley Region (RWQCB-CVR) — California RWQCB-CVR is one of nine Regional Boards, each part of the California Water Quality Control Board. The RWQCB-CVR is a supporting agency for DDJC-Sharpe environmental restoration efforts.

Remedial Action/Remedial Action Objective (RAO) — An action taken to stop or substantially reduce a release, or threat of release, of hazardous substances that are not of immediate threat to human health or the environment. See cleanup.

Remedial Investigation/Feasibility Study (RI/FS) — A two-part study of a hazardous waste site that supports the selection of a remedial action for the site. The RI identifies the type and extent of contamination. The FS identifies and evaluates alternatives for addressing site contamination based on the results of the RI.

Remedial/Remediation — An action that will rehabilitate contaminated media (such as soil) to the levels defined in a decision document, such as a ROD.

Response Action — See cleanup

Response Completion Plan (RCP) — A Response Completion Plan (RCP) reviews the selected remedies for groundwater or soil at a site and formulates appropriate approaches to bring the response action to completion.

Risk Assessment — The qualitative and quantitative evaluation performed as part of the remedial investigation in an effort to define the potential risk posed to public health and the environment.

Superfund Amendments and Reauthorization Act (SARA) — See CERCLA.

Soil Vapor Extraction (SVE) — A technique used to reduce contaminant concentrations in the soils above the **water table**. Wells are drilled into the contaminated soil, and contaminated gas (or vapor) is drawn out using vacuum pressure. The extracted vapor is treated to remove contaminants before being released into the atmosphere.

Superfund — See CERCLA.

Trichloroethene (TCE, trichloroethylene) — A stable, colorless liquid VOC with a sweet odor and low boiling point, that readily evaporates. TCE has had many common uses, such as a general solvent, a degreaser in dry cleaning, and in the manufacture of pharmaceuticals.

United States Environmental Protection Agency (EPA) — Federal agency charged with implementing CERCLA/SARA and other federal environmental regulations.

Vadose Zone Modeling — A mathematical model used to predict the potential of contamination to migrate downward through soil and into groundwater.

Volatile Organic Compounds (VOCs) — Organic compounds (for example, solvents such as TCE) that vaporize readily at room temperature.

Water Table — The depth at which enough water exists between soil particles that the soil is fully saturated.

COMMUNITY PARTICIPATION

continued from page 5

DDJC-Sharpe, along with EPA, DTSC and RWQCB, encourages the public to gain a better understanding of Superfund activities being conducted at the depot.

The public comment period is from March 4 to April 6, 2009. The public meeting is scheduled for March 19, 2009. Comments may be sent in writing or via e-mail. Verbal comments and questions will be recorded at the public meeting. DDJC-Sharpe will respond to these written and verbal comments in the final ROD Amendment.

If you would like to submit comments or if you require additional information about DDJC-Sharpe's environmental cleanup process, contact any of the resources listed below:

Defense Distribution Depot San Joaquin
Ms. Annette Silva
Office of Command Affairs
P.O. Box 960001
Stockton, CA 95207-9602
(209) 839-4226
annette.silva@dla.mil

Defense Distribution Depot San Joaquin
Mr. Maurice Benson
DESJC-Public Safety Services Office
P.O. Box 960001
Stockton, CA 95256
(209) 839-4067
maurice.benson@dla.mil

U.S. Environmental Protection Agency, Region 9
Mr. Phillip Ramsey (SFD-8)
75 Hawthorne Street
San Francisco, CA 94105-3901
(415) 972-3024
ramsey.phillip@epamail.epa.gov

California Dept. of Toxic Substances Control
Site Mitigation Unit, Region 1
Mr. Peter MacNicholl
8800 Cal Center Drive
Sacramento, CA 95826-3200
(916) 255-3713
pmacnich@dtsc.ca.gov

California Regional Water Quality Control Board Central Valley Region
Site Cleanup Section
Mr. James Brownell
11020 Sun Center Drive, #200
Rancho Cordova, CA 95670
(916) 464-4675
jbrownell@waterboards.ca.gov

Defense Distribution Depot San Joaquin California, Sharpe Site
Office of Command Affairs
PO Box 960001
Stockton, CA 95296-0002

ENCLOSED:
IMPORTANT INFORMATION
ABOUT THE ENVIRONMENT
AND YOUR COMMUNITY

USE THIS SPACE TO WRITE YOUR COMMENTS

Your input is important. Public comments are valuable in helping DESJC determine a final cleanup remedy.

You may use the space below to write your comments, then fold, tape together, and mail.
Comments must be received by close of business (5 p.m.) on April 6, 2009.

Mail your comments to:
Annette Silva – Public Affairs Officer
DDJC Office of Command Affairs
PO Box 960001
Stockton, CA 95296-0002
annette.silva@dla.mil

If you would like to receive information about cleanup activities at DDJC-Sharpe, please complete the name and address section below and mark the box. We will add your name to the mailing list.

(Please use additional pages if needed)

☐ ***Yes, add me to the mailing list***

Name _____

Address _____

_____

RETURN ADDRESS:

_____

_____

_____

Annette Silva - Public Affairs Officer
Defense Distribution Depot San Joaquin California, Sharpe Site
Office of Command Affairs
PO Box 960001
Stockton, CA 95296-0002