SOLANO GROUP
P.O. BOX 9026
BERKELEY, CA 94709

Telephone: 510-524-8122
FAX: 510-524-3264
Email: tkershaw@pacbell.net

June 12, 2006

Mr. Jerry Wickham
Alameda County Environmental Health Dept
1131 Harbor Bay Parkway
Alameda, CA 94502-6577

Re: 1187 Solano Ave, Albany

Dear Mr. Wickham,

Attached is a copy of the Soil Gas Investigation and Health Risk Assessment dated June 8, 2006 regarding the property located at 1187 Solano Avenue, Albany, California. The site is SLIC Case RO0002857. The work plan was prepared by my consultants, Avalon Environmental Consultants, Inc.

I have reviewed the report and declare, under penalty of perjury, that the information contained in the attached document or report are true and correct to the best of my knowledge.

Sincerely,

J. Anthony Kershaw

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AVALON ENVIRONMENTAL CONSULTANTS

SOIL GAS INVESTIGATION AND HEALTH RISK ASSESSMENT PERFORMED AT ALBANY 1-HOUR CLEANERS 1187 SOLANO AVENUE ALBANY, CALIFORNIA 94709

PROJECT NUMBER: 0420-458-4

PREPARED FOR
THE SOLANO GROUP
BERKELEY, CALIFORNIA
JUNE 8, 2006

AVALON ENVIRONMENTAL CONSULTANTS
941 SHORE POINT COURT, SUITE F121
ALAMEDA, CALIFORNIA 94501
510 521 2441
510 521 2607 FAX

SOIL GAS INVESTIGATION AND HEALTH RISK ASSESSMENT PERFORMED AT ALBANY 1-HOUR CLEANERS 1187 SOLANO AVENUE ALBANY, CALIFORNIA 94709

PROJECT NUMBER: 0420-458-4

PREPARED FOR
THE SOLANO GROUP
BERKELEY, CALIFORNIA
JUNE 8, 2006

PREPARED BY: _____

Trevor D Santochi,
Certified EngineeringGeologist1591

REVIEWED BY: _____

Mohammad Navid,
Project Manager

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

Avalon Environmental Consultants, Inc. (Avalon), conducted a Soil-Gas Investigation at 1-Hour Cleaners located at 1187 Solano Avenue, City of Albany, County of Alameda, California (Subject Property) on April 14, 2006. The results obtained from the Soil-Gas Investigation were used to perform a Health Risk Assessment.

This investigation and Health Risk Assessment was performed at the request of the Alameda County Environmental Health Department (ACEHD), per their review letter dated November 4, 2005.

Four soil gas probes were advanced at the subject property to a depth of five feet below ground surface (bgs.) An attempt was made to gather soil-gas from a depth of fifteen feet bgs. Of the soil gas samples collected, three were located inside the dry cleaning space and one was located outside. Native soils consisted of a tight clay and the soil-gas sampling equipment was unable to draw soil gas by ordinary methods, at either five or fifteen feet bgs. Therefore, per DTSC *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*, dated December 15, 2004, semi-permanent wells were constructed at a depth of five feet bgs. Therefore no sampling was performed at fifteen feet bgs due to the difficulty of constructing accurate semi-permanent wells at that depth.

All soil-gas samples collected were analyzed for halogenated volatiles by EPA Method 8260B. A total of eight contaminants of potential concern (COPC) were identified as part of this investigation. Tetrachloroethylene (PCE) was detected in all of the four soil-gas points. Levels ranged from 0.39 to 170 micrograms per liter (ug/L.) Soil-gas samples were analyzed by a mobile laboratory provided by Transglobal Environmental Geochemistry (TEG.)

Based on the information gathered during this investigation, a Health Risk Assessment (HRA) was prepared. The results indicated that the eight COPC including PCE were within acceptable risk levels for commercial structures for incremental lifetime cancer risk (ILCR) and for noncancer hazard index (HI.) Per the USEPA 1991 and the CalEPA/DHS, 1994 guidelines. (See Appendix V, Health Risk Assessment.)

Based on the information gathered during this investigation and the subsequent HRA, Avalon recommends the following:

- No further investigation is warranted at this time.
- This report should be submitted to the Alameda County Health Environmental Health Department (ACEHD) for their review with a request for regulatory closure.

2.0 INTRODUCTION

This report presents the results of the Soil-Gas Investigation and Health Risk Assessment conducted by Avalon at 1187 Solano Avenue, City of Albany, County of Alameda, California on April 14, 2006. (Figure 1, Topography and Site Location Map, Appendix I).

All field activities were performed under permit from the Alameda County, Department of Public Works, in accordance with the Scope of Work submitted to The Solano Group and approved by the ACEHD dated January 11, 2006. (See Appendix II, Scope of Work, Permits and Approval Letters.)

This report reviews the field methodology and presents the analytical laboratory results of the soil-gas samples collected. Health and safety guidelines were observed in conducting all field activities in accordance with the Site-Specific Health and Safety Plan (See Appendix IV.)

3.0 GENERAL SITE INFORMATION

3.1 Site Location

The subject property consists of a retail building located on the north side of Solano Avenue in the City of Albany, California. Albany 1-Hour Cleaners is located at 1187 Solano Avenue. The current and former dry-cleaning machines were located in the northern portion of the tenant space. A rear parking lot is located north of the subject property building.

3.2 Geology/Hydrology

Geology- The subject property is located in the flat lowlands of the southeastern part of the San Francisco Bay Region. The alluvial deposits underlying the site area originated from drainage that was sourced from the east and west and flowed into the area of the San Francisco bay. Near the bay these deposits interfinger with fine grained deposits of silt and clay.

Hydrology - Based on a former Phase II Subsurface Groundwater Investigation by Avalon dated May 4, 2005, groundwater is between 35 and 37 feet bgs. Surface

topography suggests a gradient direction to the west toward San Francisco Bay located one half mile from the subject property.

A topography and site location map is provided in Appendix I.

4.0 SUMMARY OF PHASE II FIELD OPERATIONS

4.1 Purpose

The purpose of this investigation is to determine the potential for indoor vapor intrusion from the soils beneath the subject property.

4.2 Utility Clearance

As required by law, Underground Service Alert was contacted in order to provide clearance of the boring locations from any possible underground utility lines which might exist in the vicinity of the proposed borings.

4.3 Sampling Procedures

Prior to the start of the drilling operations, a tailgate Health and Safety meeting was conducted by the Project Manager to discuss potential health and safety risks and the appropriate precautions required to reduce such risks. All field personnel present signed the Attendance List in the Health and Safety Plan acknowledging that a Health and Safety meeting was held (Appendix IV).

The probe locations are shown on Figure 2 (Appendix I). Transglobal Environmental Geochemistry (TEG) performed the drilling and sampling under the supervision of an Avalon Registered Geologist. TEG used a Geoprobe system to advance the soil gas probes to obtain samples.

The Geoprobe is a hydraulically-powered coring mechanism. Soil-gas samples are collected using custom fabricated probes which were pushed or pounded with a limited access geoprobe hydraulic system. Once the desired depth was reached, polyethylene tubing was lowered inside the probe tube. An airtight seal is created inside the probe tube, and a vacuum is created, drawing the surrounding vapors if any, into the pump. Once the polyethylene tubing was completely evacuated of all vapors a sample was collected in a syringe. In this case due to tight clays, no vapor samples could be obtained using this method.

Therefore, because of the tight clays encountered at both five and fifteen feet, semi-permanent vapor wells were constructed per DTSC *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* dated December 15, 2004.

Soil-gas semi-permanent wells were installed by TEG under the supervision of Avalon. The wells are constructed by advancing an insert probe to create a one inch diameter hole. Six inches of sand is placed at the bottom of the hole and an insert attached to 1/8 inch diameter tubing is inserted down the hole. Approximately six inches of sand is then deposited above the insert and the remainder of the hole is backfilled with bentonite which is hydrated to create an air tight seal. The hole is then left for approximately 30 minutes so that the formation within the vapor well can equilibrate. Three purge volumes were then drawn and 50 cubic centimeters (CCs) of vapor was collected with a disposable syringe for analysis at an onsite mobile Laboratory. Due to the depth and the potential for inaccuracies, semi-permanent vapor wells at fifteen feet were not installed. In order to ensure that no leakage was occurring around the probe area, 1,1 difluoroethane was used for detection. No difluoroethane was detected in any of the samples at or above the DTSC recommended leak check compound reporting limit of 10 ug/L of vapor.

All coring tools, screens and sample liners were decontaminated before and after coring each borehole to prevent cross contamination between boreholes using the following procedure:

- Solids were removed from the coring and sampling equipment with a brush and washed in an Alconox-water solution.
- Rinsing with tap water.
- Rinsing with distilled water.

5.0 SOIL GAS INVESTIGATION RESULTS

5.1 Soils Encountered Beneath the Subject Property

The soil-vapor probes were advanced to a maximum depth of fifteen feet bgs in soil- gas probe SG-1. Due to the tightness of clays in the five and fifteen foot depths, no vapor samples were collected. Semi-permanent vapor wells were constructed to five feet bgs in all four locations.

5.2 Laboratory Analytical Results

The soil gas samples were analyzed for VOCs by EPA Method 8260B.

Detailed laboratory results, Quality Assurance/Quality Control (QA/QC) documentation are presented in Appendix III.

TABLE I
SOIL GAS SAMPLE RESULTS

SAMPLE NUMBER	SAMPLE TYPE	EPA METHOD 8260 (ppb)
SG-1@5'	Soil gas	0.65 ug/L Toluene **0.39 ug/L Tetrachloroethene (PCE)** 0.17 ug/L Ethyl benzene 0.69 ug/L m,p-Xylene 0.29 ug/L o-Xylene
SG-2@5'	Soil gas	0.39 ug/L Trans-1,2-Dichloroethene 0.1.0 ug/L cis-1,2-Dichloroethene 0.13 ug/L Chloroform 10 ug/L Trichloroethene (TCE) 0.50 ug/L Toluene **90 ug/L Tetrachloroethene (PCE)** 0.12 ug/L Ethyl benzene 0.45 ug/L m,p-Xylene 0.20 ug/L o-Xylene
SG-3@5"	Soil gas	7.9 ug/L Trichloroethene (TCE) 1.4 ug/L Toluene **100 ug/L Tetrachloroethene (PCE)** 1.40 ug/L m,p-Xylene
SG-4@5"	Soil gas	1.5 ug/L Chloroform 5.5 ug/L Trichloroethene (TCE) 1.6 ug/L Toluene **170 ug/L Tetrachloroethene (PCE)** 1.4 ug/L m,p-Xylene

Note N.D. = Not Detected at Method Detection Limits
Ug/L = Micrograms per liter

Detection Limits: DETECTION LEVEL FOR SOIL
Halogenated Volatile Compounds Method 8260 (8010 List) =2.0 ppb

All soil gas samples collected were analyzed for VOCs by EPA Method 8260. PCE was detected in all probes. Levels of PCE ranged from 0.39 ug/L to 170 ug/L. The highest detection of PCE was encountered in SG-4 @5' located in the rear of the dry cleaning

establishment. Trichloroethene (TCE) was detected in three of the soil gas probes and ranged from 5.5 ug/L to 10 ug/L.

5.3 Health Risk Assessment

The above detections were used to determine if the soil-vapor present in the subject property soil poses a potential health risk to the site receptors via the inhalation pathway. The Heath Risk Assessment was prepared by Teri L. Copeland, M.S., D.A.B.T. Environmental Toxicologist. The health risk characterization was conducted by incorporating the results of the exposure assessment with the chemical-specific toxicity values for each contaminant of potential concern (COPC.) Two descriptors were conservatively estimated as the basis of the risk characterization: (1) incremental lifetime cancer risk (ILCR) and (2) noncancer hazard index (HI).

Based on the above information the incremental lifetime cancer risk (ILCR) estimate for the indoor worker receptor is 1E-05 (10-in-one million). This ILCR does not exceed the USEPA acceptable risk range of 1E-06 (one-in-one million) to 1E-04 (100-in-one million) (USEPA, 1991) or the California Environmental Protection Agency's (CalEPA's) Safe Drinking Water and Toxic Enforcement Act of 1986 *de minimis* risk level of 1E-05 (10-in-one million) (CalEPA/DHS. 1994).

The noncancer HI estimate for the indoor worker receptor is 0.02. The noncancer HI level of 1 or less indicated that there is no potential for noncancer health effects (USEPA, 1989a,1991). (See Appendix V for complete Health Risk assessment including tables)

6.0 CONCLUSIONS

Based on the above findings, Avalon concludes the following:

- Based on the information gathered during this investigation, the results indicated that the eight COPC including PCE were within acceptable risk levels for commercial structures for incremental lifetime cancer risk and for noncancer hazard index. Per the USEPA 1991 and the CalEPA/DHS, 1994. Appendix V.

7.0 RECOMMENDATIONS

Based on the above conclusion, Avalon recommends the following:

- No further investigation is warranted at this time.

- This report should be submitted to the ACEHD for their review with a request for regulatory closure.

8.0 ASSESSMENT LIMITATIONS

The scope of this report is limited to the matters expressly covered. This report is prepared for the sole benefit of the Solano Group and Washington Mutual Bank. This report may not be relied upon by any other person or entity without the written authorization of Avalon Environmental Consultants Inc.

In preparing this report, Avalon Environmental Consultants, Inc. has relied on information derived from secondary sources and personal interviews. Except as set forth in this report, Avalon has made no independent investigation as to the accuracy and completeness of the information derived from secondary sources of personal interviews, and has assumed that such information is accurate and complete.

It should be recognized that the definition and evaluation of geologic and hydrologic conditions, as well as the assessment of chemical fate and movement in these conditions is a difficult and inexact science. Judgments leading to conclusions are generally made with incomplete knowledge of the subsurface conditions present. More extensive studies may be performed to reduce these inherent uncertainties. No warranty, expressed or implied, is made.

All recommendations, findings, and conclusions stated in this report are based upon facts and circumstances as they existed at the time that this report was prepared (e.g./federal, state and local laws, rules, regulations, market conditions, energy costs, wage rates, political climate, and other matters that Avalon deemed relevant). A change in any fact or circumstance upon which this report is based may adversely affect the recommendations, findings and conclusions expressed in this report.

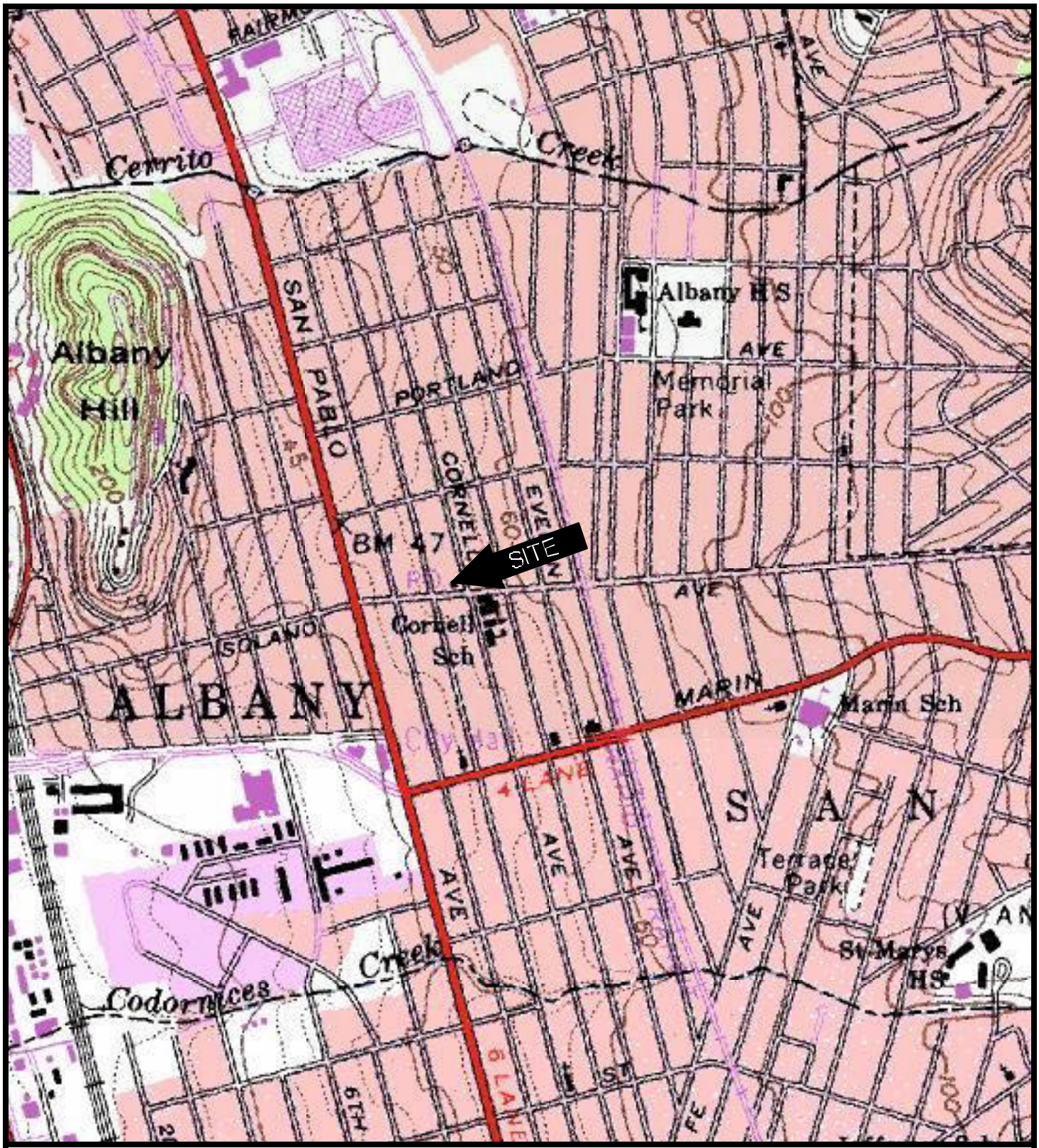
9.0 CONFLICT CERTIFICATION

Avalon Environmental Consultants has no present or contemplated future ownership interest or financial interest in the real estate that is the subject of this Phase II Environmental Site Assessment; and, Avalon Environmental Consultants has no personal interest with respect to the subject matter of the Phase II Environmental Site Assessment or the parties involved and Avalon Environmental Consultants has no relationship with the property or the owners thereof which would prevent an independent analysis of the environmental or other conditions of the property.

APPENDICES

APPENDIX I

MAPS

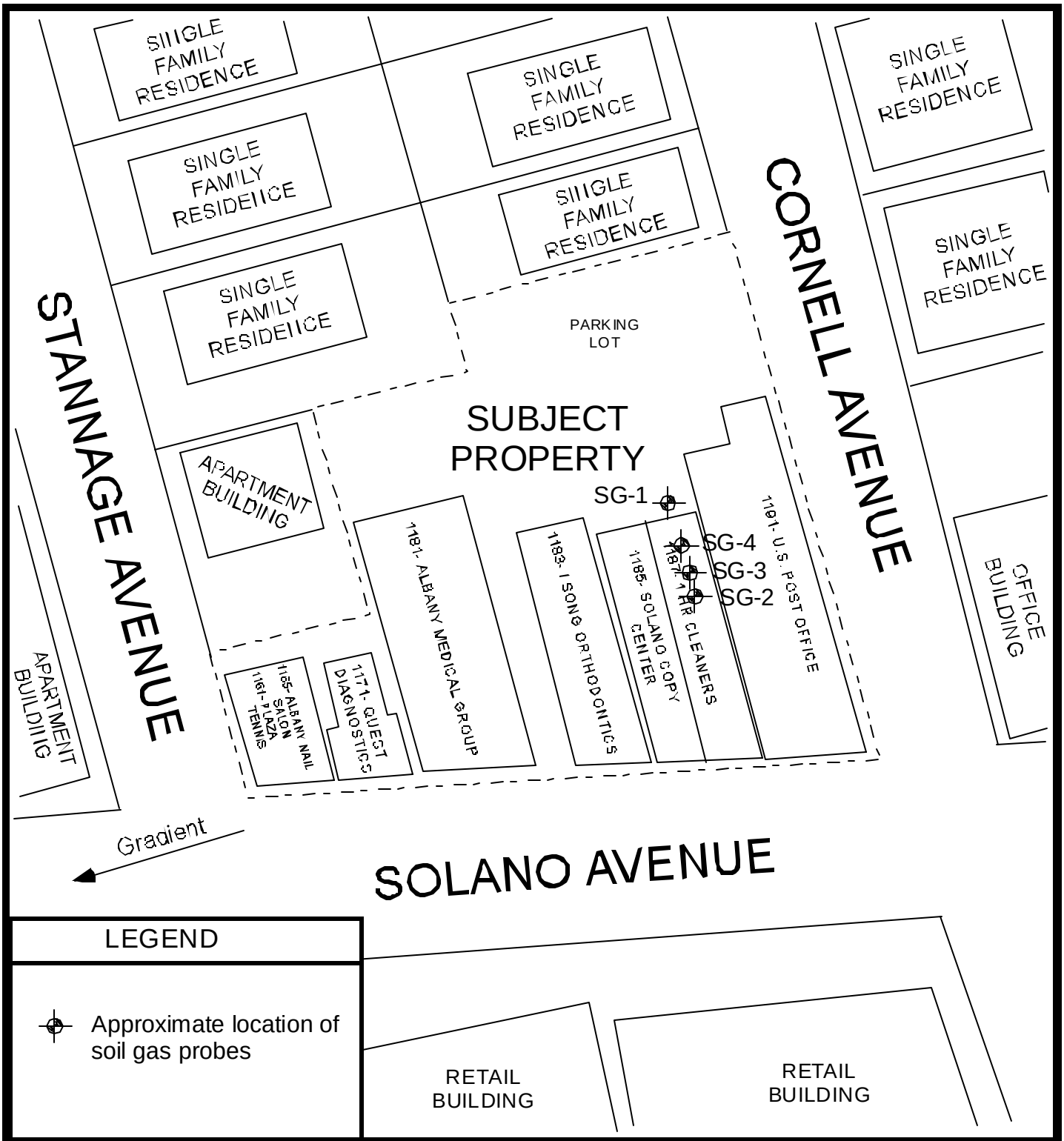


TOPOGRAPHY AND SITE LOCATION MAP

AVALON ENVIRONMENTAL CONSULTANTS
131 NORTH TUSTIN AVENUE, SUITE 213
TUSTIN, CALIFORNIA

Source:
U.S.G.S., 7.5 Minute Series Topographic Maps: Richmond, California 1959 and 1980.

N



SITE LOCATION PLAN (Location of proposed borings)

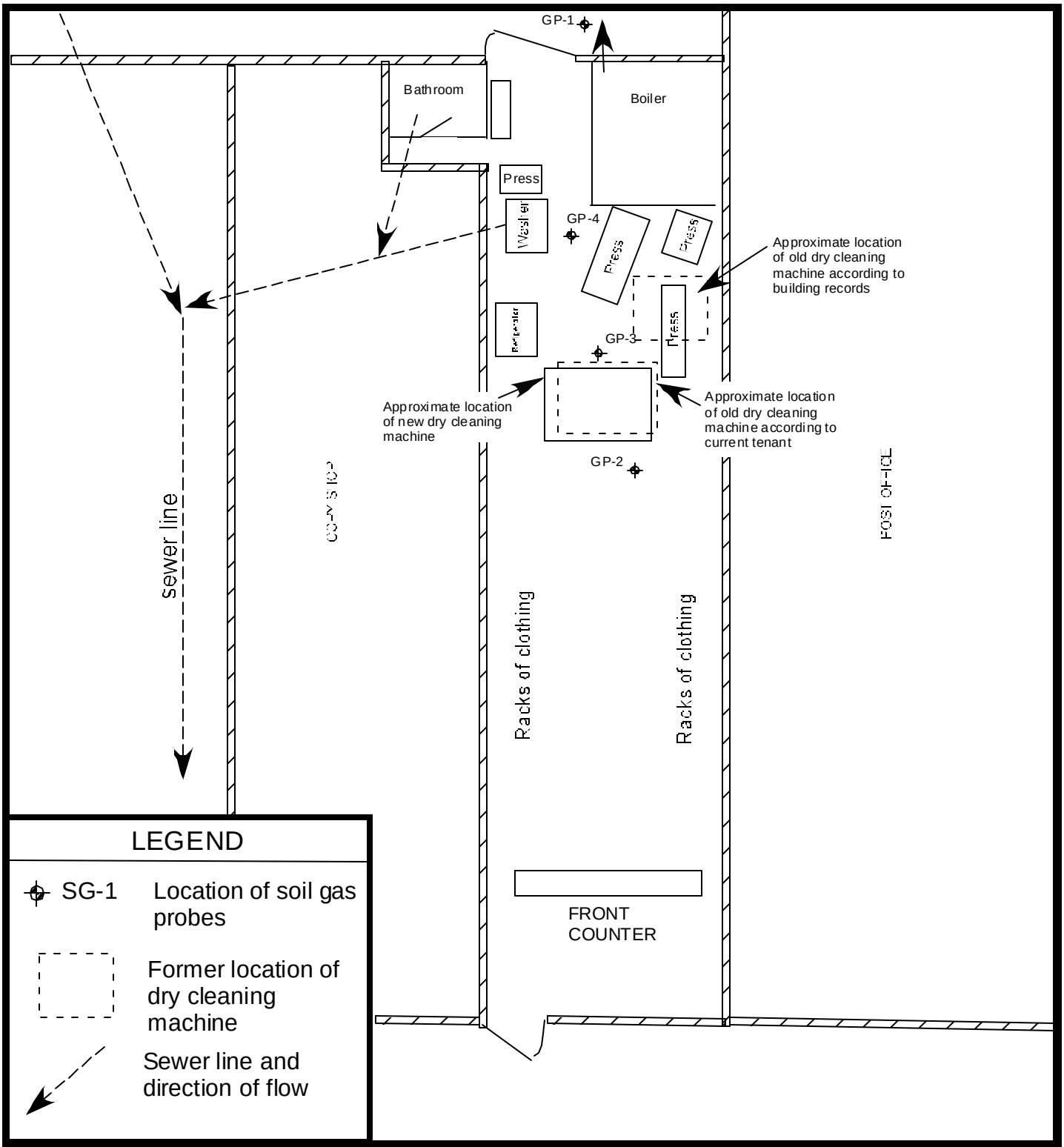
N

Site Address:	1161-1191 Solano Avenue	Client Name:	The Solano Group
Site City/State:	Albany, California	Project No.:	0420-458-4

AVALON ENVIRONMENTAL CONSULTANTS, INC.
ALAMEDA, CALIFORNIA

0 30 60 feet

FIGURE 2



SITE PLAN

Site Address:	1187 Solano Avenue	Client Name:	The Solano Group
Site City/State:	Albany, California	Project No.:	0420-458-4
AVALON ENVIRONMENTAL CONSULTANTS ALAMEDA, CALIFORNIA		Scale:	0 10 20 FEET

FIGURE 3

APPENDIX II

SCOPE OF WORK
AND PERMITS

SOLANO GROUP
P.O. BOX 9026
BERKELEY, CA 94709

Telephone: 510-524-8122
FAX: 510-524-3264
Email: tkershaw@pacbell.net

January 16, 2006

Mr. Jerry Wickham
Alameda County Environmental Health Dept
1131 Harbor Bay Parkway
Alameda, CA 94502-6577

Re: 1187 Solano Ave, Albany

Dear Mr. Wickham,

Attached is a copy of the Workplan dated January 11, 2006 for a Soil Gas and Health Risk Assessment at the property located at 1187 Solano Avenue, Albany, California. The site is SLIC Case RO0002857. The work plan was prepared by my consultants, Avalon Environmental Consultants, Inc.

I have reviewed the work plan and declare, under penalty of perjury that the information and/or recommendations contained in the attached document or report are true and correct to the best of my knowledge.

Sincerely,

J. Anthony Kershaw

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AVALON
ENVIRONMENTAL
CONSULTANTS, INC.

131 NORTH TUSTIN AVENUE • SUITE 213 • TUSTIN, CALIFORNIA 92780
TEL: (714) 836-6632 • FAX: (714) 836-6642

941 SHORE POINT COURT • SUITE F121 • ALAMEDA, CALIFORNIA 94501
TEL: (510) 521-2441 • FAX: (510) 521-2607

January 11, 2006

Mr. Jerry Wickham
Alameda County Environmental Health Department
1131 Harbor Bay Parkway
Alameda, California 94502-6577

Subject: **Work Plan for Soil Gas Investigation and Health Risk Assessment at 1 Hour Cleaners located at 1187 Solano Avenue, Albany, California 94709.**

Dear Mr. Wickham:

Pursuant to your request, Avalon Environmental Consultants, Inc. (Avalon), has prepared this work plan to perform a Soil Gas Investigation and Health Risk Assessment at the above referenced dry cleaning facility in response to the Alameda County Environmental Health Department (ACEHD) review letter dated November 4, 2005. Avalon has previously performed a Phase II Environmental Site Assessment (ESA) at the subject property in November 2004, and a Phase II Subsurface Groundwater Assessment (SGA) on May 4, 2005. The Phase II ESA identified elevated levels of Tetrachlorethene (PCE) in the soil beneath the concrete slab of the dry cleaning unit ranging from 8.4 to 1,100 parts per billion (ppb.) The Phase II SGA identified low levels of PCE in the near surface soils, and non detect levels in the deeper soils and groundwater. Based upon the findings of these investigations, the ACEHD has recommended that soil gas sampling be conduced in the dry cleaning space in order to determine if there are vapor intrusion concerns at the subject property space. Additionally, the ACEHD has requested that the possible mechanism for the transport of low levels of PCE in soils 90 feet horizontally from the source be addressed in this work plan.

HORIZONTAL EXTENT OF PCE IN SOIL

As noted by the ACEHD, Phase II SGA identified PCE levels ranging from 6.6 to 310 ppb at a depth of ten feet bgs in four of the five borings drilled in that investigation. Three of the borings were located approximately ninety feet from the dry cleaning operation. The ACEHD has requested a mechanism for the widespread detections of PCE at the subject property.

Avalon believes that the most probable mechanism may have been from several plumbing leaks which occurred on the subject property. According to the owner of the subject property Mr. J. Anthony Kershaw, there have been two large plumbing leaks in the subject property dry cleaning space which caused considerable flooding. One of the leaks took place in late 2000 and the other took place in late 2003. The first leak in 2000 only released twenty or thirty gallons of water, however, the second leak in 2003 released hundreds of gallons of water as it happened over a weekend and was not shut off until it was discovered the following Monday. The leaks were located in rear portion of the cleaner space and it is

probable that the water along with residual PCE flowed into the adjoining suite moving in a south and west direction which is the current surface flow direction.

SOIL GAS INVESTIGATION

Avalon's soil gas investigation will consist of subsurface sampling with four geoprobe borings to a depth of five and fifteen feet below ground surface (bgs). The assessment will be conducted using a limited access geoprobe device. This device, similar to a drill rig, is a pointed probe which pushes through the soil rather than drilling. The geoprobe generates no soil cuttings and therefore, saves in the expense and liability of soil disposal.

The four geoprobe borings will be advanced to depths of five and fifteen feet bgs. Guidelines in conducting the soil gas testing will be in general accordance with the DTSC Guidance for the *Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* dated December 15, 2004: Testing will also be conducted in accordance with the 2003 Cal EPA guidance document *Advisory-Active Soil Gas Investigation*, issued by the Regional Water Quality Control Board, Los Angeles Region and DTSC, January 28 {www.dtsc.ca.gov/publicationsforms/index.html}

Per the guidance documents:

- Samples will be collected at five and fifteen feet below ground surface.
- Surface area around the soil gas sampler will be sealed to prevent ambient air intrusion.
- Samples will be collected using glass syringes.
- A mobile laboratory will be onsite to analyze the samples to ensure sample recovery.
- Purging and sampling will be performed at low flow rates (Less than 200 milliliters per minute)

The borings will be located in or near the area of the dry cleaning space where previous highest detections were made. Locations are shown in attached Figure 1 and 2.

At the conclusion of sample collection and analysis, a report of findings and conclusions will be prepared and delivered to Alameda County Environmental Health Department. The report will address the soil gas results and a risk evaluation of the sites potential for vapor intrusion based upon DTSC screening numbers pursuant to SB 32 by OEHHA. The health risk assessment will be reviewed by a Board Certified Toxicologist.

SENSITIVE RECEPTORS

No sensitive receptors such as schools, day care centers or hospitals are located within 100 feet of the subject property structure. An orthodontics office is located approximately 50 feet west of the subject property, and a general medical practice is located approximately 70 feet west of the subject property. A post office is located adjacent east of the subject property, and residences are located greater than 100 feet north separated by a parking lot. South of the subject property are retail buildings also greater than 100 feet.

Should you have any questions or require further information, please feel free to contact Trevor Santochi at (510) 521-2441.

Sincerely,
AVALON ENVIRONMENTAL CONSULTANTS, INC.

Trevor Santochi, RG, CEG
President

CC: J. Anthony Kershaw, Solano Group.

OBJECTIVE

The objective of this investigation is to evaluate the potential for vapor intrusion from PCE contamination in the subsurface beneath the subject property.

SCOPE OF WORK

Site Safety and Health Plan:

Prior to subsurface testing, as required by law, a Site Safety and Health Plan will be prepared to insure workers and sub-contractors are aware of the risks and safety procedures associated with this soil gas investigation.

Underground Service Alert and Permitting

As required by law, Underground Service Alert (USA) will be contacted to check the proposed probe locations for conflict with public utilities, such as gas or electrical lines. Permits from Alameda County Public Works Department, and the City of Albany Public Works Department will be obtained as required by law.

Subsurface Testing

The four geoprobe borings will be advanced to depths of five and fifteen feet bgs. Guidelines in conducting the soil gas testing will be in general accordance with the DTSC Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air dated December 15, 2004. Per the guidance document:

- Samples will be collected at five and fifteen feet below ground surface.
- Surface area around the soil gas sampler will be sealed to prevent ambient air intrusion.
- Samples will be collected using glass syringes. A mobile laboratory will be onsite to analyze the samples to ensure sample recovery.
- Purging and sampling will be performed at low flow rates (Less than 200 milliliters per minute)

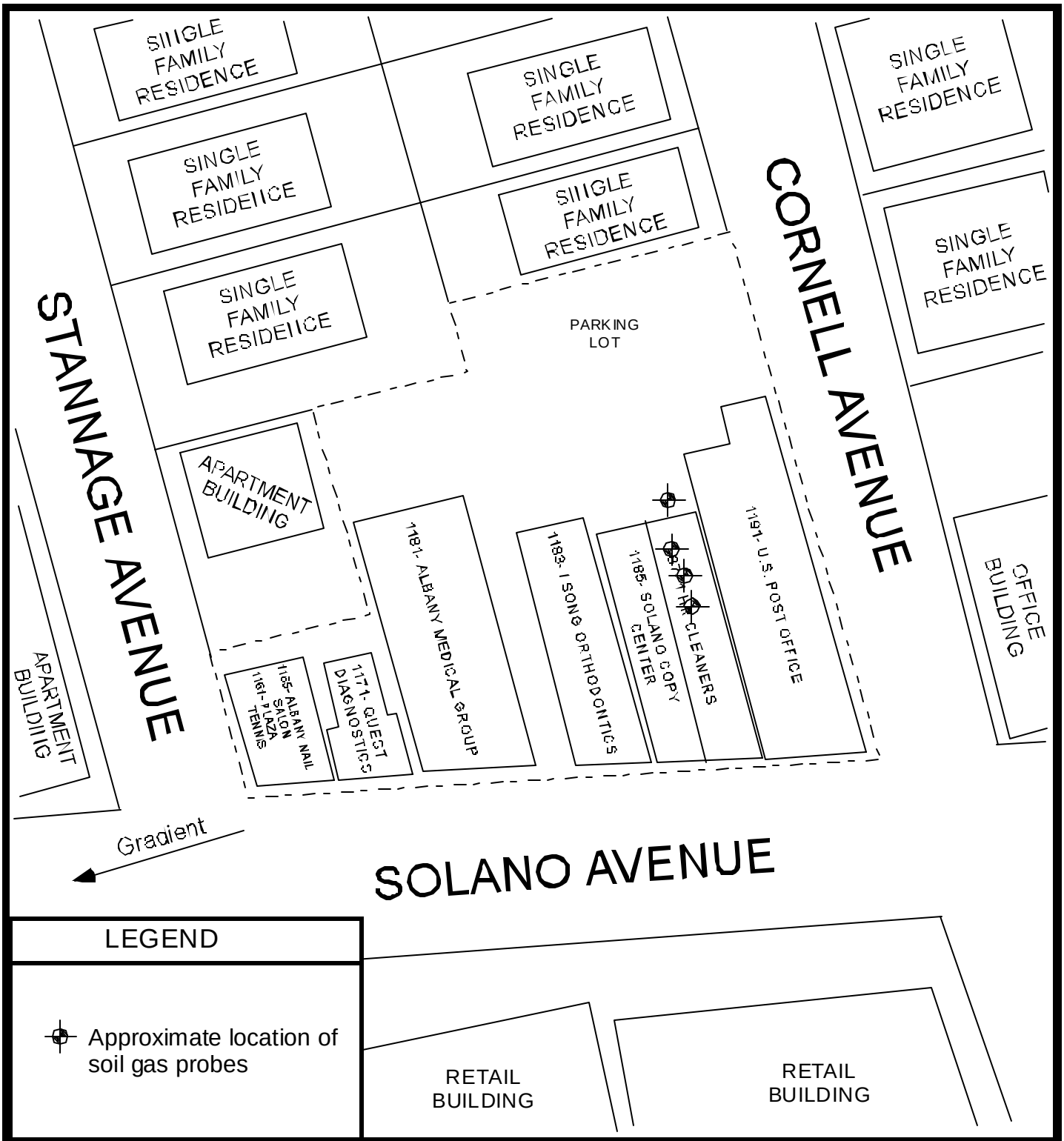
The borings will be located in or near the area of the dry cleaning space where previous highest detections were made. Locations are show in the attached Figure I.

Analytical Testing

The soil gas samples will be analyzed for Chlorinated Compounds by EPA method 8260 to the parts per billion level. Samples will be analyzed on site by a mobile certified laboratory under chain-of-custody.

Assessment Report

At the conclusion of sample collection and analysis, a report of findings and conclusions will be prepared and delivered to Alameda County Environmental Health Department. The report will address the soil gas results and will include a risk evaluation of the sites potential for vapor intrusion based upon DTSC screening numbers pursuant to SB 32 by OEHHA. The health risk assessment will be reviewed by a Board Certified Toxicologist.



LEGEND

⊕ Approximate location of soil gas probes

SITE LOCATION PLAN (Location of proposed borings)

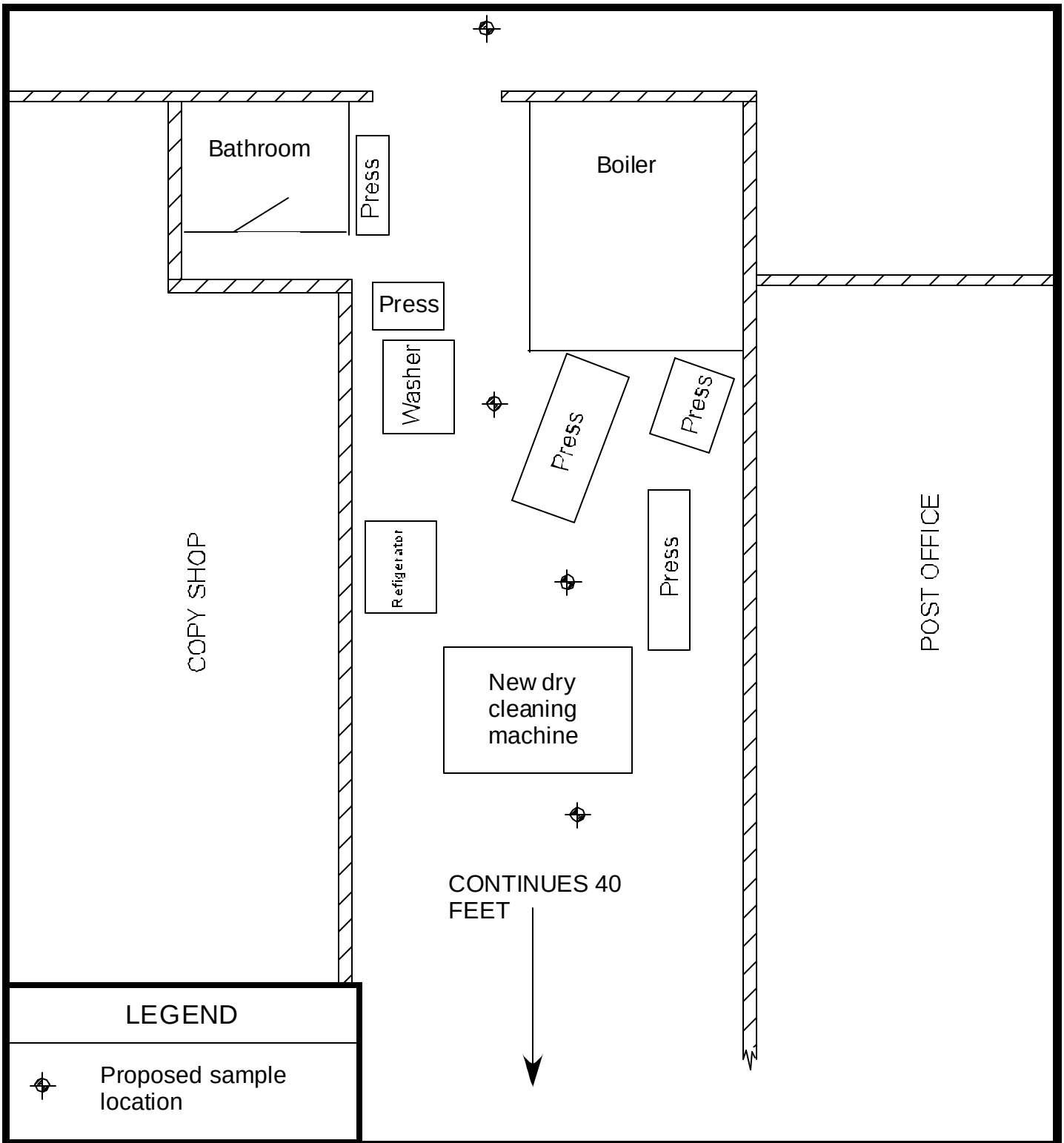
N

Site Address:	1161-1191 Solano Avenue	Client Name:	Kershaw Investments
Site City/State:	Albany, California	Project No.:	0420-458-3

AVALON ENVIRONMENTAL CONSULTANTS, INC.
ALAMEDA, CALIFORNIA

0 30 60 feet

FIGURE 1



LEGEND

Proposed sample location

SOIL GAS LOCATION MAP

N

Site Address:	1187 Solano Avenue	Client Name:	Solano Group
Site City/State:	Albany, California	Project No.:	WORK PLAN

AVALON ENVIRONMENTAL CONSULTANTS
ALAMEDA, CALIFORNIA

Scale: 0 10 FEET

FIGURE 2

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
DAVID J. KEARS, Agency Director

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-6700
FAX (510) 337-9335

January 24, 2006

Mr. J. Anthony Kershaw
Kershaw Investments
P.O. Box 9026
Berkeley, CA 94709

Subject: SLIC Case RO0002857, Albany 1-Hour Cleaners, 1187 Solano Avenue, Albany, CA – Work Plan Approval

Dear Mr. Kershaw:

Alameda County Environmental Health (ACEH) staff has reviewed the Spills, Leaks, Investigations, and Cleanups (SLIC) case file for the above-referenced site and the document entitled, "Work Plan for Soil Gas Investigation and Health Risk Assessment at 1 Hour Cleaners," dated January 11, 2006, and prepared on your behalf by Avalon Environmental Consultants. The Work Plan proposes a soil gas investigation that will include four soil borings located in or near the area of the dry cleaning space where tetrachloroethene (PCE) was detected in soil. ACEH concurs with the soil gas investigation as proposed.

We request that you perform the proposed work and send us the technical reports requested below.

TECHNICAL REPORT REQUEST

Please submit technical reports to Alameda County Environmental Health (Attention: Jerry Wickham), according to the following schedule:

- **May 25, 2006** – Soil Gas Investigation Results

These reports are being requested pursuant to California Health and Safety Code Section 25296.10. 23 CCR Sections 2652 through 2654, and 2721 through 2728 outline the responsibilities of a responsible party in response to an unauthorized release from a petroleum UST system, and require your compliance with this request.

ELECTRONIC SUBMITTAL OF REPORTS

Effective **January 31, 2006**, the Alameda County Environmental Cleanup Oversight Programs (LOP and SLIC) require submission of all reports in electronic form to the county's ftp site. Paper copies of reports will no longer be accepted. The electronic copy replaces the paper copy and will be used for all public information requests, regulatory review, and compliance/enforcement activities. Instructions for submission of electronic documents to the Alameda County Environmental Cleanup Oversight Program ftp site are provided on the attached "Electronic Report Upload (ftp) Instructions." Please do not submit reports as attachments to electronic mail.

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
DAVID J. KEARS, Agency Director

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-6700
FAX (510) 337-9335

November 4, 2005

Mr. J. Anthony Kershaw
Kershaw Investments
P.O. Box 9026
Berkeley, CA 94709

Subject: SLIC Case RO0002857, Albany 1-Hour Cleaners, 1187 Solano Avenue, Albany, CA

Dear Mr. Kershaw:

Alameda County Environmental Health (ACEH) staff has reviewed the Spills, Leaks, Investigations, and Cleanups (SLIC) case file for the above-referenced site and the report entitled, "Phase II Subsurface Groundwater Assessment," dated May 4, 2005, prepared on your behalf by Avalon Environmental Consultants. The "Phase II Subsurface Groundwater Assessment" documents the results of soil and groundwater sampling activities conducted at the site in April 2005. Soil samples were also collected from three locations inside the building during a previous phase of investigation conducted in November 2004. During the November 2004 investigation, tetrachloroethene (PCE) was detected in shallow soil beneath a portion of the building at concentrations exceeding Environmental Screening Levels (San Francisco Bay Regional Water Quality Control Board, February 2005) [ESLs] for evaluation of potential vapor intrusion concerns. PCE was not detected in groundwater samples collected in April 2005 but was detected in soil samples collected at a depth of 10 feet below ground surface in four of the five sampling locations outside the building. Based on these results, we request that you conduct additional investigation to assess potential risks from indoor vapor intrusion by PCE. **We request that you submit a work plan to address the items discussed in the technical comments below by January 16, 2006.**

We request that you address the following technical comments, perform the proposed work, and send us the technical reports requested below.

TECHNICAL COMMENTS

1. **Potential for Indoor Vapor Intrusion.** The concentrations of PCE in soil beneath the facility exceed the ESLs for vapor intrusion under a building for commercial or residential use. In order to more directly evaluate the potential risks from vapor intrusion, ACEH requests that a soil gas investigation be conducted. Soil gas samples are to be collected from areas with elevated concentrations of PCE to evaluate potential risks from indoor vapor intrusion. Please refer to the January 28, 2003 DTSC/RWQCB-LAR *Advisory – Active Soil Gas Investigations* and the December 15, 2004 DTSC *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* to help plan the soil gas investigation. Please present your plans to collect soil gas samples and address the potential for indoor vapor intrusion in the work plan requested below.

Alameda County Public Works Agency - Water Resources Well Permit

399 Elmhurst Street
Hayward, CA 94544-1395
Telephone: (510)670-6633 Fax:(510)782-1939

Application Approved on: 03/31/2006 By jamesy **Receipt Number: WR2006-0148**
Permits Issued: W2006-0239 **Permits Valid from 04/07/2006 to 04/07/2006**

Application Id: 1143843506652 **City of Project Site:** Albany
Site Location: 1187 Solano Avenue, Albany, CA 94707
Project Start Date: 04/07/2006 **Completion Date:** 04/07/2006

Applicant: Avalon Environmental - Trevor Santochi **Phone:** 714-836-6632
131 N Tustin Avenue #213, Tustin, CA 92677
Property Owner: Tony Kershaw of Solano Group **Phone:** 510-524-8122
PO Box 9026, Berkeley, CA 94707
Client: ** same as Property Owner **

Total Due: $200.00
Total Amount Paid: $200.00
Payer Name : Avalon Environmental Consultants Paid By: CHECK **PAID IN FULL**

Works Requesting Permits:

Borehole(s) for Investigation-Contamination Study - 4 Boreholes
Driller: TEG Northern Cal. Inc. - Lic #: 706568 - Method: other **Work Total: $200.00**

Specifications

Permit Number	Issued Dt	Expire Dt	# Boreholes	Hole Diam	Max Depth
W2006-0239	03/31/2006	07/06/2006	4	1.00 in.	15.00 ft

Specific Work Permit Conditions

1. Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compacted cuttings. All cuttings remaining or unused shall be containerized and hauled off site.

2. Boreholes shall not be left open for a period of more than 24 hours. All boreholes left open more than 24 hours will need approval from Alameda County Public Works Agency, Water Resources Section. All boreholes shall be backfilled according to permit destruction requirements and all concrete material and asphalt material shall be to Caltrans Spec or County/City Codes. No borehole(s) shall be left in a manner to act as a conduit at any time.

3. Permittee shall assume entire responsibility for all activities and uses under this permit and shall indemnify, defend and save the Alameda County Public Works Agency, its officers, agents, and employees free and harmless from any and all expense, cost, liability in connection with or resulting from the exercise of this Permit including, but not limited to, properly damage, personal injury and wrongful death.

4. Applicant shall contact James Yoo for an inspection time at 510-670-6633 at least five (5) working days prior to starting, once the permit has been approved. Confirm the scheduled date(s) at least 24 hours prior to drilling.

5. Copy of approved drilling permit must be on site at all times. Failure to present or show proof of the approved permit application on site shall result in a fine of $500.00.

6. Permit is valid only for the purpose specified herein. No changes in construction procedures, as described on this permit application. Boreholes shall not be converted to monitoring wells, without a permit application process.

2. **Lateral Extent of PCE in Soil.** PCE was detected in soil at a depth of 10 feet below ground surface (bgs) in 4 of the 5 sampling locations during the April 2005 investigation. All of these sampling locations are outside the building and are up to approximately 90 feet from the suspected source of PCE (dry cleaning machine). The depth to groundwater is reported to be greater than 20 feet bgs at the site. Please describe the suspected transport mechanism by which PCE migrated more than 90 feet from the suspected source in soil at depths of 10 feet bgs. Please present your evaluation in the work plan requested below. Please include plans in the work plan requested below to address any data gaps identified by this evaluation.

3. **Sensitive Receptors.** Please identify any sensitive receptors such as schools, day care centers, or medical care facilities within 100 feet of the site.

TECHNICAL REPORT REQUEST

Please submit technical reports to Alameda County Environmental Health (Attention: Jerry Wickham), according to the following schedule:

- **January 16, 2006 -** Work Plan for Subsurface Investigation
- **120 days after ACEH approval of Work Plan** – Subsurface Investigation Report

These reports are being requested pursuant to California Health and Safety Code Section 25296.10. 23 CCR Sections 2652 through 2654, and 2721 through 2728 outline the responsibilities of a responsible party in response to an unauthorized release from a petroleum UST system, and require your compliance with this request.

ELECTRONIC SUBMITTAL OF REPORTS

ACEH's Environmental Cleanup Oversight Programs (LOP and SLIC) now request submission of reports in electronic form. The electronic copy is intended to replace the need for a paper copy and is expected to be used for all public information requests, regulatory review, and compliance/enforcement activities. Instructions for submission of electronic documents to the Alameda County Environmental Cleanup Oversight Program FTP site are provided on the attached "Electronic Report Upload Instructions." Submission of reports to the Alameda County FTP site is an addition to existing requirements for electronic submittal of information to the State Water Resources Control Board (SWRCB) Geotracker website. In September 2004, the SWRCB adopted regulations that require electronic submittal of information for groundwater cleanup programs. For several years, responsible parties for cleanup of leaks from underground storage tanks (USTs) have been required to submit groundwater analytical data, surveyed locations of monitoring wells, and other data to the Geotracker database over the Internet. Beginning July 1, 2005, electronic submittal of a complete copy of all reports is required in Geotracker (in PDF format). Please visit the State Water Resources Control Board for more information on these requirements (http://www.swrcb.ca.gov/ust/cleanup/electronic_reporting).

PERJURY STATEMENT

All work plans, technical reports, or technical documents submitted to ACEH must be accompanied by a cover letter from the responsible party that states, at a minimum, the following: "I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge." This letter must be signed by an officer or legally authorized representative of your company. Please include a cover letter satisfying these requirements with all future reports and technical documents submitted for this fuel leak case.

PROFESSIONAL CERTIFICATION & CONCLUSIONS/RECOMMENDATIONS

The California Business and Professions Code (Sections 6735, 6835, and 7835.1) requires that work plans and technical or implementation reports containing geologic or engineering evaluations and/or judgments be performed under the direction of an appropriately registered or certified professional. For your submittal to be considered a valid technical report, you are to present site specific data, data interpretations, and recommendations prepared by an appropriately licensed professional and include the professional registration stamp, signature, and statement of professional certification. Please ensure all that all technical reports submitted for this fuel leak case meet this requirement.

AGENCY OVERSIGHT

If it appears as though significant delays are occurring or reports are not submitted as requested, we will consider referring your case to the Regional Board or other appropriate agency, including the County District Attorney, for possible enforcement actions. California Health and Safety Code, Section 25299.76 authorizes enforcement including administrative action or monetary penalties of up to $10,000 per day for each day of violation.

If you have any questions, please call me at (510) 567-6791.

Sincerely,

Jerry Wickham
Hazardous Materials Specialist

Enclosure: ACEH Electronic Report Upload (ftp) Instructions

cc: Trevor Santochi, Avalon Environmental Consultants, Inc., 131 North Tustin Avenue, Suite 213, Tustin, CA 92780

Donna Drogos, ACEH
Jerry Wickham, ACEH
File

Submission of reports to the Alameda County ftp site is an addition to existing requirements for electronic submittal of information to the State Water Resources Control Board (SWRCB) Geotracker website. Submission of reports to the Geotracker website does not fulfill the requirement to submit documents to the Alameda County ftp site. In September 2004, the SWRCB adopted regulations that require electronic submittal of information for groundwater cleanup programs. For several years, responsible parties for cleanup of leaks from underground storage tanks (USTs) have been required to submit groundwater analytical data, surveyed locations of monitor wells, and other data to the Geotracker database over the Internet. Beginning July 1, 2005, electronic submittal of a complete copy of all necessary reports was required in Geotracker (in PDF format). Please visit the SWRCB website for more information on these requirements (http://www.swrcb.ca.gov/ust/cleanup/electronic_reporting).

In order to facilitate electronic correspondence, we request that you provide up to date electronic mail addresses for all responsible and interested parties. Please provide current electronic mail addresses and notify us of future changes to electronic mail addresses by sending an electronic mail message to me at jerry.wickham@acgov.org.

PERJURY STATEMENT

All work plans, technical reports, or technical documents submitted to ACEH must be accompanied by a cover letter from the responsible party that states, at a minimum, the following: "I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge." This letter must be signed by an officer or legally authorized representative of your company. Please include a cover letter satisfying these requirements with all future reports and technical documents submitted for this fuel leak case.

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131 North Tustin Avenue, Suite 213
Tustin, CA 92780

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Jerry Wickham, ACEH
File

APPENDIX III

LABORATORY ANALYTICAL RESULTS

teg

TRANSGLOBAL
ENVIRONMENTAL
GEOCHEMISTRY

28 April 2006

Mr. Trevor Santochi
Avalon Environmental Consultants, Inc.
131 North Tustin Avenue, Suite 213
Tustin, CA 92780

SUBJECT: DATA REPORT - Avalon Environmental Consultants, Inc. Project #0420-458-4
1187 Solano Avenue, Albany, California

TEG Project #60414D

Mr. Santochi:

Please find enclosed a data report for the samples analyzed from the above referenced project for Avalon Environmental Consultants, Inc. The samples were analyzed on site in TEG's mobile laboratory. TEG conducted a total of 7 analyses on 7 soil vapor samples.

-- 7 analyses on soil vapors for volatile organic hydrocarbons by EPA method 8260B.

The results of the analyses are summarized in the enclosed tables. Applicable detection limits and calibration data are included in the tables.

1,1 difluoroethane was used as a leak check compound around the probe rods during the soil vapor sampling. No 1,1 difluoroethane was detected in any of the vapor samples reported at or above the DTSC recommended leak check compound reporting limit of 10 µg/L of vapor.

TEG appreciates the opportunity to have provided analytical services to Avalon Environmental Consultants, Inc. on this project. If you have any further questions relating to these data or report, please do not hesitate to contact us.

Sincerely,

Mark Jerpbak
Director, TEG-Northern California

11350 Monier Park Place, Rancho Cordova, CA 95742 Phone: (916) 853-8010 Fax: (916) 853-8020

TEG Project #60414D

EPA Method 8260B VOC Analyses of SOIL VAPOR in ug/L of Vapor

SAMPLE NUMBER:		Probe Blank	SG-1@5	SG-1@5	SG-1@5	SG-2@5	SG-3@5	SG-4@5	SG-4@5 dup
SAMPLE DEPTH (feet):			5.0	5.0	5.0	5.0	5.0	5.0	5.0
PURGE VOLUME:			1	3	7	3	3	3	3
COLLECTION DATE:		4/14/06	4/14/06	4/14/06	4/14/06	4/14/06	4/14/06	4/14/06	4/14/06
COLLECTION TIME:		08:40	08:55	09:25	09:55	10:20	10:40	11:25	11:55
DILUTION FACTOR:		1	1	1	1	1	10	10	10
	RL								
Dichlorodifluoromethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Vinyl Chloride	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Chloroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Trichlorofluoromethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
1,1-Dichloroethene	0.10	nd	nd	nd	nd	nd	nd	nd	nd
1,1,2-Trichloro-trifluoroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Methylene Chloride	0.10	nd	nd	nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	0.10	nd	nd	nd	nd	0.39	nd	nd	nd
1,1-Dichloroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
cis-1,2-Dichloroethene	0.10	nd	nd	nd	nd	1.0	nd	nd	nd
Chloroform	0.10	nd	nd	nd	nd	0.13	nd	1.5	1.6
1,1,1-Trichloroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Carbon Tetrachloride	0.10	nd	nd	nd	nd	nd	nd	nd	nd
1,2-Dichloroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Benzene	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Trichloroethene	0.10	nd	nd	nd	nd	10	7.9	5.5	5.2
Toluene	0.10	nd	0.72	0.65	0.50	0.50	1.4	1.6	1.7
1,1,2-Trichloroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Tetrachloroethene	0.10	nd	0.28	0.39	0.30	90 (10)	100	170	180
Ethylbenzene	0.10	nd	0.18	0.17	0.14	0.12	nd	nd	nd
1,1,1,2-Tetrachloroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
m,p-Xylene	0.10	nd	0.71	0.69	0.61	0.45	1.4	1.4	1.6
o-Xylene	0.10	nd	0.28	0.29	0.23	0.20	nd	nd	nd
1,1,2,2-Tetrachloroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
1,1 Diflouroethane (leak check)	10	nd	nd	nd	nd	nd	nd	nd	nd
Surrogate Recovery (DBFM)		111%	109%	107%	111%	104%	107%	104%	108%
Surrogate Recovery (1,2-DCA-d4)		107%	107%	105%	109%	102%	106%	103%	107%
Surrogate Recovery (Toluene-d8)		92%	98%	93%	97%	91%	90%	90%	89%

'RL' Indicates reporting limit at a dilution factor of 1
'nd' Indicates not detected at listed reporting limits
(NUMERAL) = Dilution factor for this compound

Analyses performed in TEG-Northern California's lab
Analyses performed by: Mr. John Henkelman

TEG Project #60414D

CALIBRATION STANDARDS - Initial Calibration / LCS

Instrument: Agilent 5973N MSD

COMPOUND	INITIAL CALIBRATION RF	INITIAL CALIBRATION %RSD	LCS RF	LCS %DIFF
Dichlorodifluoromethane*	0.307	16.0%	0.275	10.4%
Vinyl Chloride*	0.260	11.1%	0.246	5.4%
Chloroethane*	0.104	24.8%	0.126	21.2%
Trichlorofluoromethane*	0.436	12.8%	0.440	0.9%
1,1-Dichloroethene	0.213	13.3%	0.202	5.2%
1,1,2-Trichloro-trifluoroethane*	0.236	13.9%	0.242	2.5%
Methylene Chloride	0.184	13.6%	0.181	1.6%
trans-1,2-Dichloroethene	0.225	12.7%	0.218	3.1%
1,1-Dichloroethane	0.388	14.1%	0.384	1.0%
cis-1,2-Dichloroethene	0.279	14.0%	0.275	1.4%
Chloroform	0.462	12.5%	0.439	5.0%
1,1,1-Trichloroethane	0.429	12.0%	0.423	1.4%
Carbon Tetrachloride	0.344	18.6%	0.380	10.5%
1,2-Dichloroethane	0.313	15.2%	0.309	1.3%
Benzene	1.201	19.3%	1.117	7.0%
Trichloroethene	0.307	12.8%	0.298	2.9%
Toluene	0.702	12.5%	0.656	6.6%
1,1,2-Trichloroethane	0.135	16.3%	0.144	6.7%
Tetrachloroethene	0.380	13.2%	0.425	11.8%
Ethylbenzene	0.584	11.6%	0.605	3.6%
1,1,1,2-Tetrachloroethane	0.334	17.5%	0.381	14.1%
m,p-Xylene	0.708	18.3%	0.631	10.9%
o-Xylene	0.716	16.0%	0.689	3.8%
1,1,2,2-Tetrachloroethane	0.448	19.3%	0.510	13.8%
Naphthalene	1.357	19.2%	1.550	14.2%
ACCEPTABLE LIMITS:		20.0%		15.0%

'*' INDICATES RSD NOT TO EXCEED 30% & LCS NOT TO EXCEED 25%

APPENDIX IV

SITE SAFETY AND HEALTH PLAN

Site Safety and Health Plan

for

Soil Gas Investigation

at

1187 Solano Avenue

Albany, California 94709

TABLE OF CONTENTS

Avalon Environmental Consultants
SITE SAFETY AND HEALTH PLAN

CLIENT: **Anthony Kershaw**

SITE ADDRESS: **1187 Solano Avenue**
CLIENT CONTACT: **Tony Kershaw** **PHONE:** **(510) 524-8122**

PROPOSED START DATE: **April 13, 2006** **PROPOSED DURATION: One day**

PROJECT SUPERVISOR: **Trevor Santochi**

1.0 PURPOSE

The purpose of the site Health and Safety Plan (HASP) is to provide Avalon Environmental Consultants' (Avalon) field personnel and subcontractors with an understanding of the potential chemical and physical hazards that exist or may arise while the tasks of this project are being performed.

This HASP describes the procedures to be followed in order to reduce employee exposure to potential health hazards which may be present at the project site. The emergency response procedures necessary to respond to such hazards are also described within this HASP.

2.0 OBJECTIVE

The primary objective is to ensure the well-being of all field personnel and the community surrounding this site. In order to accomplish this, project staff and approved subcontractors shall acknowledge and adhere to the policies and procedures established herein. Accordingly, all personnel assigned to this project shall read this site Health and Safety Plan and sign the Acknowledgment Statement (Appendix A) to certify that they have read, understood and agreed to abide by its provisions.

All subcontractors employed directly by Avalon are responsible for compliance with the requirements of this HASP and shall assure compliance with this HASP by all their officers, agents, employees and subcontractors. Avalon personnel have the authority to stop work performed by the subcontractors at this site if any work is not performed in accordance with the requirements of this HASP.

3.0 GENERAL SITE INFORMATION

General Site Description: Retail store/dry cleaner

General Topography: Level concrete covered ground

Is the site posted with warning signs: Yes □ No☒

Is the site presently secured from trespass: Yes □ No☒

If yes, describe:

4.0 SCOPE OF WORK

4.1 Description of Work to be Performed

Advance four geoprobe borings to a depth of five and fifteen feet below ground surface (bgs). Sample soil gas from all four borings. Work to be performed in and surrounding the dry cleaners at 1187 Solano Avenue.

Emergency Response: No

5.0 PROJECT ORGANIZATION

5.1 Project Staffing/Chain of Command

Titles	Names	(Phone #/Pager)
Project Manager/FSS	Trevor Santochi	(714) 836-6632

Crew Size	No
Project Managers/FSS:	1
Equipment Operators:	2
Technicians:	0
Laborers:	0

5.2 Organization and Responsibilities

Avalon will oversee all phases of the project. The following management structure will be instituted for the purpose of successfully and safely completing this project.

Project Manager:

The Project Manager will be responsible for implementing the project and obtaining

necessary personnel or resources for the completion of the project. Specific duties will include:

- Coordinating the activities of all subcontractors, to include informing them of the required Personal Protective Equipment (PPE) and ensuring their signature acknowledging this site Health and Safety Plan.

- Selecting a Field Safety Supervisor (FSS) and field personnel for the work to be undertaken on site.

- Ensuring that the tasks assigned are being completed as planned and on schedule.

- Providing authority and resources to ensure that the FSS is able to implement and manage safety procedures.

- Preparing reports and recommendations about the project to clients and affected project personnel.

- Ensuring that persons allowed to enter the site (i.e., EPA, contractors, state officials, visitors) are made aware of the potential hazards associated with the substances known or suspected to be on site and are knowledgeable as to the location and contents of the on-site copy of the specific site safety plan.

- Ensuring that the FSS is aware of all of the provisions of this site safety plan and is instructing all personnel on site about the safety practices and emergency procedures defined in the plan.

- Ensuring that the FSS is making an effort to monitor site safety and has designated a Field Team Leader to assist with the responsibility when necessary.

Field Safety Supervisor (FSS):

The Field Safety Supervisor (FSS) shall be responsible for the implementation of the site safety plan on site. Specific duties will include:

- Evaluating health risk potential for each site activity and establishing action levels to adjust protective requirements.

- Implementing heat and cold stress monitoring and protective measures.

- Providing site specific health and safety information.

- Conducting periodic site inspections to ensure compliance with the HASP.

- Directing/instructing on-site personnel regarding appropriate actions and monitoring procedures throughout the project. The FSS will be available on-site during all work activities.

- Monitoring the compliance of field personnel for the routine and proper use of the PPE that has been designated for each task.

- Routinely inspecting PPE and clothing to ensure that it is in good condition and is being stored and maintained properly.

- Stopping work on the site or changing work assignments or procedures if any operation threatens the health and safety of workers or the public.

- Monitoring personnel who enter and exit the site and all controlled access points.

- Reporting any signs of fatigue, work-related stress or chemical exposures to the Project Manager and/or Health and Safety Manager.

- Dismissing field personnel from the site if their actions or negligence endangers themselves, co-workers or the public and reporting the same to the Project Manager and Health and Safety Manager.

- Reporting any accidents or violations of the site safety plan to the Project Manager and documenting the same in the project records.

- Evaluating weather and chemical hazard information and making recommendations to the Project Manager about any modifications to workplans or personnel protection levels in order to maintain personnel safety.

- Approving all field personnel working on site, taking into consideration their level of safety training, their physical capacity and their eligibility to wear the protective equipment necessary for their assigned tasks (i.e., Respirator Fit Testing Results.)

- Overseeing the air monitoring procedures as they are carried out by the site personnel for compliance with all company health and safety policies.

- Knowledge of emergency procedures, evacuation routes and the telephone numbers of the ambulance, local hospital, poison control center, fire and police departments.

- Ensuring that all project-related personnel have signed the personnel agreement and acknowledgments form contained in this site safety plan.

- Coordinating upgrading and downgrading PPE with the Project Manager, as necessary, due to changes in exposure levels, monitoring results, weather and other site conditions.

- Performing air monitoring with approved instruments in accordance with requirements stated in this Health and Safety Plan.

Other Project Field Staff:

Responsibilities include:

- Adherence to this HASP during all field activities.

- Communicating its requirements to subcontractors and ensuring their compliance.

- Informing the FSS and the project manager of any health or safety related questions or issues that arise in the course of the field work.

Subcontractors:

Responsibilities include:

- Adherence to this HASP during all field activities or to more stringent requirements imposed by their own guidelines.

- Submission of documentation for training, medical surveillance and respirator fit testing requirements to the FSS prior to initiation of on-site activities.

6.0 HAZARD EVALUATION

The process of collecting subsurface samples by drilling, coring or trenching involves potential exposure to environmental contaminants. Potential chemical contaminants include volatile organic hydrocarbons (VOCs).

Physical hazards will be involved in the operation of equipment used for the collection of subsurface samples. Equipment that may be used on the job site may include drill rigs, steam cleaners, pressure washers, drum dollies, backhoes, compressors and other equipment.

Potential hazards also include encountering buried utilities such as gas, electrical, sewer, water, telephone and cable television lines during drilling or trenching operations. Similarly, striking a buried container of hazardous materials can result in very high contaminant exposure and/or fire and explosion hazards.

6.1 Contaminant/Waste Characteristics:

General Forms: ⊠ Solid ⊠ Liquid ⊠ Gas/Vapor

Chemicals of Concern:

⊠ VOC ⊠ Chlorinated Hydrocarbons

Hazard Determination: Low

Primary Hazard:

Inhalation of contaminated dust and/or vapors are the primary hazards to drill site personnel. However, ingestions of contaminated food/drink is also possible if personnel do not adequately decontaminate before these activities.

First Aid:

Ingestion: Give water if patient is conscious. Call Poison Control - follow instructions. Administer CPR if necessary. Seek medical attention.

Inhalation: Remove person from contaminated environment. Administer CPR if necessary. Seek medical attention,.

Skin Contact: Brush off dry material, remove contaminated clothing. Wash skin with soap and water. Seek medical attention if irritation develops.

Eye Contact: Flush eyes and surrounding tissue with water for 15 minutes. Seek medical attention.

* Exposure Symptoms: Headache, dizziness, nausea, drowsiness, irritation of eyes, nose, throat, breathing difficulties.

Report incident to Project Manger and Health and Safety Manager after emergency procedures have been implemented.

Potential Safety Hazards:

- ☒ Wet or slippery surfaces
- ☒ Surface debris (broken glass, sharp objects)
- ☒ Noise in excessive levels
- ☒ Hoses, tools, etc. lying on ground
- ☒ Cuts and bruises

Other Hazards Present on Site: None

Overall Site Hazard Summary: LOW

7.0 GENERAL SAFETY REQUIREMENTS

All personnel involved in subsurface investigations shall read and thoroughly understand this safety plan prior to entering and/or working on the site.

No project personnel may be allowed on the site without the prior knowledge and consent of the designated field safety supervisor and project manager.

There will be no on-site activities conducted without sufficient backup personnel. At a minimum, two persons must be present during on-site activities. Visual, voice or radio communication will be maintained at all times.

There will be no eating, drinking, application of cosmetics or smoking on the site.

Project personnel shall bring to the attention of the designated FSS any unsafe condition or practice associated with on-site project-related activities.

All boring, excavation, heavy equipment operation and general construction activities shall be performed in compliance with 29 CFR 1926.

All project personnel who are required to wear purifying or air supplied respirators must first meet the training and medical requirements of 29 CFR 1910.120 and 20 CFR 1910.134.

No contact lenses may be worn within 20 feet of drilling activity ("hot zone").

7.1 Control of Work Area

Prior to the start of work the work area shall be controlled to reduce the possibility of injury to workers or pedestrians. Control of the area will be accomplished by, but not limited to, the following:

Setting up physical barriers to exclude unnecessary personnel from the area and posting appropriate signage.

Establish the working zones (Exclusion Zone, Support Zone and Clean Zone) within the work site.

Minimize the number of personnel and equipment in the work area consistent with effective operations.

Establish control points to regulate access to work zones.

Prior to the start of work each shift, the FSS shall conduct an inspection of the devices used to control the work area. (See Appendix F, Site monitoring Log.)

7.2 Drill Rig Safety Guidelines

Drill rig maintenance and safety is the responsibility of the drilling operator. The following information is provided as general guidelines for safe practices on the site:

- No food or beverage will be consumed or stored in the operational area.
- The route of travel before moving the drill rig off-road should be inspected. Rocks, trees, erosion, power lines and uneven surfaces should be noted.
- No passengers shall be permitted in the cab while moving the drill rig into rough or sloped terrain.
- Multiple drive power trains (when available) on rig vehicle shall be mobilized for off-road travel.
- Travel directly up or down grade on slopes is preferred.
- Changes in grade shall be approached squarely to avoid shifting loads or unexpected weighting.
- A spotter (person at grade) to provide guidance when vertical and lateral

clearance is questionable shall be utilized.

- Use hand brakes and chock rig wheels when grades are steep.
- Rig mast shall be lowered when traveling off-road.
- All loads to rig shall be secured prior to off-road mobilization.
- Locate and treat overhead electrical lines as if they were energized.
- Utility agencies shall be contacted to de-activate overhead service in areas that interfere with drilling operations. Utilities shall be handled only by utility personnel.
- Utility agencies shall be contacted to survey, mark and flag locations of buried utility lines.
- Allow at least 20 feet clearance between rig mast and overhead utility lines. Prevent rig contact with utility lines.
- Stabilize and level each work site prior to drill rig setup.
- Maintain orderly housekeeping on and around the drill rig.
- Store tools, materials and supplies to allow safe handling by drill crew members. Proper storage on racks or sills will prevent spreading, rolling or sliding.
- Storage of tools, materials or supplies within or on the drill rig derrick during transportation shall be avoided.
- Store gasoline only in containers specifically designed or approved for such use.
- Wear eye protection when chipping, chiseling or breaking material that presents a risk of flying objects.
- Wear appropriate respiratory protection when performing dusty work. (i.e. concrete cutting, mixing cement etc.)
- Inspect wire, rope, hoisting hardware, swivels, hooks, bearings, sheaves, guides, rollers, clutches, brakes for the following: abrasions, breaks, wear, fatigue, corrosion, jamming and kinking.
- Suspension of loads when hoist is unattended should be avoided.

- Hoisting loads directly over field personnel shall not be permitted.
- Restrict hoisting operations during unfavorable environmental conditions such as rain or high winds.
- Maintain safe distance from hoisting equipment (e.g., wire rope, hooks, pinch points) when slack is reduced.
- Responsibilities of driller, geologists, field crew, etc. during drilling operations shall be established before work activities are initiated.
- Hand auger the first five feet in all borings.
- Begin auger borings slowly with the drive engine operating at low RPMs.
- Restrict contact with power coupling or auger during rotation.
- Prevent placing hands or feet under auger during rotation.
- Prevent placing hands or feet under auger sections during hoisting over hard surfaces.
- Avoid the removal of soil/cuttings with hands or feet.
- Cleaning shall occur when drill rig is in neutral and the augers are not rotating.

7.3 General Heavy Equipment Operation Safety Guidelines

Hazards/Controls

(1) The use of heavy equipment produces noise levels in excess of regulatory limits. During any activities involving the use of heavy equipment, ear plugs or ear muffs providing at least 25 NRR of protection must be worn.

(2) Since verbal communication is impossible, standardized/recognized hand signals must be used and should be reviewed by all personnel prior to job startup.

(3) It is the responsibility of all personnel to keep well back from operating equipment, since the equipment operator may have limited visibility.

(4) Prior to the use of cranes, verify that a current certification is available and perform an appropriate load test.

(5) Crane operations should be performed using tag lines and sufficient number of "chokers".

(6) Heat stress is a hazard, especially where PPE is required. Use work-rest regimens and maintain hydration.

Other Requirements

Only personnel that have been trained and certified in the use of heavy equipment may operate said equipment. Each piece of equipment must be trained on separately. Personnel involved in other specialized tasks must be appropriately trained prior to performing them.

7.4 Decontamination/Cleaning Activities Safety Guidelines

Hazards/Controls

- The fact that decontamination or cleaning activities are taking place implies that chemical contamination is present and must be protected against. In addition, the cleaning agents may be irritating, or worse, and protective measures must be implemented.

- Proper lockout/tagout procedures must be employed to prevent injury. Electrical circuits require special attention.

- Significant amounts of decontamination work must be in restricted work areas and from ladders, etc. Slips, trips and falls cause serious injury and good housekeeping is very important.

- Heat stress is a hazard, especially where PPE is required. Use work-rest regimens and maintain hydration.

Other Requirements

All decontamination operations that involve confined spaces, supplied air, etc., also require the task specific training.

7.5 Sampling Activities Safety Guidelines

Hazards/Controls

- When opening drums, check first for pressure. Loosen the retaining ring part-way

and lift lid gently. After insuring that no residual pressure is present, finish removing retaining ring.

- The need for sampling is often the result of "lack of knowledge" of the material, implying a somewhat unknown situation. PPE requirements and handling procedures must address this.

- Some sampling activities require use of special sampling equipment. Persons using this equipment should be trained prior to performing sampling.

- There is a concern of punctures and cuts. Special protective equipment will be required.

- Heat stress is a hazard, especially where PPE is required. Use work-rest regimens and maintain hydration.

8.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Based on information gathered during prior investigations, the appropriate starting level of PPE for this project is Level D.

8.1 Level D Protection

The minimum ensemble (Level D) for work zone and decontamination work is as follows:

- Hard Hat

- Steel toe safety shoes or boots

- Safety Glasses

- Hearing Protection (if necessary)

Note: Contaminants are anticipated in some, if not most, areas of subsurface work; should evidence of contamination become apparent, then protective gloves, including a latex liner and chemical resistant outer gloves and Tyvek™ coverall will be required (see selection criteria below). In addition, latex over-boots (disposable) or reusable chemically resistant over-boots or steel toe over the sock rubber boots will be necessary. Provisions for decontamination must be established at any exclusion zone where non-disposable outer boots are to be worn.

For operations which require work gloves to protect the hands from abrasion, sharp edges, etc., leather (or equivalent) work gloves may be worn OVER chemical resistant gloves. Such gloves will be dedicated to exclusion zone work, but must be assumed to be

chemically contaminated once put into service.

Upgrades of additional equipment may be mandated by the FSS based upon conditions or activities. Substitutions other than those described in this section are permissible only upon approval by the FSS.

8.2 Level C Protection

Consists of the addition of the following respiratory protection to the Level D ensemble (Section 8.1):

- Full face air purifying respirators with combination HEPA/organic vapor/acid cartridges.
- Eyeglass inserts MUST be provided for those employees who require prescription eyewear.

8.2.1 Criteria for Upgrading to Level C

The presence of any one of the following conditions shall be sufficient to require Level C PPE.

- Verified detection of combustible gas levels in the breathing zone using the combustible gas meter. The detection of methane is likely to be an indication of the presence of other contaminants.
- "Verified" organic vapor levels in the breathing zone, as measured by PID:

  $\geq$ 2 ppm above background, sustained for five minutes.
  $\geq$ 5 ppm above background, sustained for one minute.

- The detection of readings above background at the borehole/pit shall be noted in the sampling log as evidence of environmental contamination, but only breathing zone PID measurements shall be used for establishing respiratory protection criteria.
- Visible dust release (for example, during drill or when jack hammering concrete). Alternate NIOSH-approved dust respirators may be substituted for full face air purifying respirators with specific approval by the FSS.

- The detection of chemical odors arising from boreholes.

- Once Level C protection is initiated, it will continue to be worn until the triggering condition returns to background levels.

- The term "verified" is used to indicate measurements that are confirmed by one or more of the following:

  (1) Detection of the contaminant using more than one instrument (i.e., verification by detector tubes, OVA, etc.)

  (2) Repeatable measurements - for example, if the PID indicates a reading above background, the meter should be moved upwind of the operation. If the reading falls and rises again upon returning the instrument to the original location, the initial measurement may be considered "verified".

  (3) If the meter response is not attributable to the borehole or excavated material, the meter should be checked for drift. If circumstances suggest a vapor source not related to the sampling process, the FSS should be immediately contacted for evaluation.

8.3 Additional Protective Equipment

American National Standard Institute (ANSI) approved safety glasses with side shields shall be required during chip-producing operations, such as drilling/jackhammering through concrete.

Splash-proof chemical goggles shall be mandated by the FSS for operations presenting splash or splatter potential, such as vehicle decontamination or wet drilling operations.

(Full face respirators preclude the need for other forms of eye protection.)

Hearing protection: Employees will be offered a choice of ear muffs or disposable ear plugs for use around high noise levels. The FSS shall base decisions as to what conditions require the use of hearing protection on the criteria set forth in Section 13.5.

8.4 Personal Protective Equipment Restrictions

Contact lenses will not be permitted in any exclusion zone.

Personnel who may be required to don respiratory protection shall be required to report

to work clean shaven every day (in situations requiring face-to-facepiece seal.)

Personnel may only wear Level C respirator models for which the result of a previous fit test are on file with the FSS.

8.5 Selection Criteria for Coveralls

Uncoated Tyvek™ coveralls may be utilized for dry work.

Polyethylene-coated Tyvek™ coveralls shall be utilized for work which presents the potential for contact with contaminated liquids of wet mud (mud loose enough to splash or splatter.) Examples: Wet drilling, handling water samples, decontaminating vehicles.

Note: Vinyl rain suits may be substituted for polyethylene coated Tyvek™ provided decontamination procedures, approved by the HSO are implemented before use.

Saranex™ coveralls are to be worn during any VOC sampling and whenever indicated by the FSS.

9.0 AIR MONITORING

Air monitoring is conducted to identify and quantify airborne levels of hazardous substances, to determine appropriate levels of respiratory protection and to warn of the potential for Immediately Dangerous to Life and Health (IDLH), toxic or flammable atmospheric conditions.

The greatest potential hazards to safety and health at this site are:

1. Exposure to chemical vapors - through inhalation.
2. Exposure to chemical contamination - through skin contact and ingestion.

Ongoing air monitoring during project tasks will provide data to ensure that vapor concentrations are within acceptable ranges and will provide adequate selection criteria for respiratory and dermal protection. A Photo Ionization Detector (PID) shall be utilized for monitoring with a 1 part per million (ppm) detection limit.

- **!** If PID readings taken in the breathing zone exceed 100 ppm, a NIOSH approved air-purifying respirator with organic vapor cartridges must be worn by all site workers within any area where monitoring results exceed 100 ppm.

- **!** If PID readings taken in the breathing zone exceed 750 ppm, Level B protection will be required. Personnel must leave site immediately and contact FSS or Health & Safety Manager for further instructions.

! Respirator cartridges will be changed once per day as a minimum. This can be accomplished at the end of the work day during respirator decontamination. If odor breakthrough is detected while wearing the respirator or breathing becomes difficult, change cartridges immediately.

9.1 Tasks Performed Within a Confined Space

! Mechanical injuries and chemical injuries are possible when working in confined spaces. To minimize potential for these injuries, effective lockout/tagout and blocking/blinding procedures must be employed.

! Hazardous atmospheres may exist or develop within confined spaces. It is important to identify these atmospheres and to proceed to eliminate the condition and/or protect against it. Monitoring shall include oxygen, LEL and toxic contaminant readings. Regulatory limits for work conditions are:

19.5-23%	Oxygen
< 10%	LEL
< 100ppm	Toxic Contaminants

Varying conditions will dictate PPE particulars. Monitoring will occur prior to entry and at specified intervals during entry. (Entry into IDLH atmospheres require HLR with egress or SCBA and the use of buddy team procedures.)

! Safe work practices and emergency rescue require specific equipment for confined space entries. All entry personnel will wear harnesses, lifelines and lanyards. (Exceptions by written variance from Health and Safety only.) Entry through top manways/openings require the use of an emergency extraction device.

! The minimum number of personnel for any entry is three (3). Depending on work tasks, more personnel may be required. The standby/rescue/ holewatch person must be dressed to the same level of protection, and in the same chemical protective clothing as the entry person(s). If the job is operating "under air", the rescue attendant must be supplied by a separate air source (2 pack of bottles or SCBA.)

! Physical apparatus and materials are common within confined spaces and can cause injury and/or may damage chemical protective clothing. Such structures indicate special PPE requirements and a cautious approach.

! All hazards must be identified and controls discussed with work team.

- Entries from elevated work surfaces have the same hazards and controls are the same as for any elevated work surface. Any other hazardous operations that occur within the confined spaces will be controlled, in most cases, in the same fashion as if the hazardous operation occurred outside the confined space.

- Heat stress is a hazard, especially where PPE is required. Use work-rest regimens and maintain hydration.

Other Requirements

Only personnel that have been trained and certified in Confined Space operations will be allowed to participate in these operations.

If the entry is done "under air", Supplied Air requirements must be adhered to as well.

9.2 Stopping Work

Criteria for stopping work and evacuating personnel from the work zone are listed below. Once work is stopped due to a reason listed below, operations, work practices and protective strategies will be re-evaluated and modified, if necessary, through consultation with the FSS prior to resuming activity.

The detection of combustible gas levels in excess of 25% (LEL) at the borehole or pit.

- "Verified" organic vapor levels of $\leq$ 50 ppm via the PID in the breathing zone.

- The detection of gaseous contaminants that cannot be removed by the Level C respirator at levels above 50% of the OSHA PEL as measured at the breathing zone via detector tubes. Example: H_2S, HCN, mercury vapor. EXCEPTION: Carbon monoxide - see below.

- Carbon monoxide (CO) levels in excess of the following levels (measurements via detector tubes may be used for the following determinations):

  a) In excess of 50 ppm for periods exceeding 15 minutes (breathing zone).

  b) In excess of 15 ppm for 30 minutes (breathing zone).

9.3 Air Sampling Protocol

Previous environmental investigations indicate the possibility of volatile organic compounds, such as tetrachloroethene (PCE). In the event air monitoring with a combination

oxygen/combustible gas meter becomes appropriate, alarms shall be set at 19.5% oxygen, 25% LEL. The meter is to be set up with an extension probe or a length of Tygon tubing to allow sample to be drawn immediately adjacent to borehole.

- The following air/physical monitoring shall be conducted when the exclusion zones are occupied. When more than one exclusion zone exists at the same time (not anticipated), spot readings at all occupied exclusion areas shall be performed on a rotating basis.

- PID readings: Organic vapor monitoring shall be performed at the breathing zone and boreholes every 10 feet of drilling Results shall be logged on the Site Monitoring Log located in Appendix F.

- Personal sampling for: Organic vapors may be required at the discretion of the FSS.

9.4 Equipment Calibration and Maintenance

Oxygen/Combustible gas meters shall be calibrated daily against a cylinder of calibration gas of a suitable concentration, such as 25% LEL.

The PID shall be calibrated daily against isobutylene span gas and "zeroed" against organic-free zero air. Background levels measured at the site shall be noted daily, and used daily, as a baseline for detecting excursions during monitoring.

All instruments shall be charged and maintained as specified in their respective instrument manuals. This will be the responsibility of the FSS.

9.5 Documentation

The Site Monitoring Log (Appendix F) shall be used to document all air monitoring data. This log shall be used to record the following:

- Instrument calibrations

- Work zones established each day - list location and activity for each.

- Breathing zone and borehole readings.

  - type of instrument/reading
  - location
  - time of measurement

- activity
- actions taken in response to elevated levels

- **!** Any unusual occurrences (injuries, incidents of non-compliance with HASP, instrument alarms sounding, etc.) or safety concerns.

- **!** Upgrades/downgrades in PPE. The duration of use of Level C equipment shall be noted.

- **!** Weather conditions each day (temperature, wind and precipitation) are sufficient.

10.0 CHEMICALS OF CONCERN

Health Effects

Potential health effects from a chemical exposure are dependent on several exposure factors such as: toxicity of substances, duration of exposure, concentration during exposure and the overall health of the person exposed.

The chemicals commonly at this site are: Volatile organic compounds. The following is a health analysis of these chemicals.

Additional information (When Available) of these chemicals can be found in the Material Safety Data Sheet located in Appendix D.

Volatile Organic Componds

Tetrachloroethylene (also known as perchloroethene or "PERC") is a synthetic chemical. It is a colorless, nonflammable and stable liquid at room temperature. Although it is liquid at room temperature, it tends to evaporate into the air producing an ether-like odor that may be detected at low concentrations. However, after a short period of time the odor may become inconspicuous, thereby becoming an unreliable warning signal.

Volatile organic compounds (VOCs) can enter the body through inhalation, ingestion and skin contact. Health effects include Eye and respiratory tract irritation, headaches, dizziness, visual disorders, and memory impairment are among the immediate symptoms that some people have experienced soon after exposure to some organics. Many organic compounds are known to cause cancer in animals; some are suspected of causing, or are known to cause, cancer in humans

11.0 SPILL CONTAINMENT

The activities anticipated in the course of this project do not present likely scenarios for hazardous

material sills. Sampling and decontamination media such as *hexane, acetone and nitric acid* will be handled in small containers.

Plastic sheeting surrounding boreholes shall be sized to contain the volume of spoil/water anticipated to be unearthed. Where significant quantities of potentially contaminated water will be handled, the sheeting will be bermed to prevent the flow of liquids to surrounding areas.

A supply of sorbents will be kept on-site sufficient to contain the contents of the largest single portable container of hazardous material (hexane, gasoline, acetone, etc.) The PPE present for field work is suitable for clean-up of spills of this nature.

12.0 WORKER DECONTAMINATION

Decontamination is required each time persons leave a work zone and there is reason to suspect soil contamination. Decontamination for this type of work relies heavily on the use of disposable PPE.

When personnel move between active work zones, minimal decontamination will be required. The Level D exclusion zone ensemble may be left on EXCEPT:

- Latex overboots shall be removed upon exiting any exclusion zone.
  ALTERNATIVE: Overboots may be washed in soap solution in a wash tub.

- Non-disposable rubber boots shall be washed in soap solution in a wash tub EACH TIME wearer leaves exclusion zone.

- Personnel who have removed or decontaminated boots, but who are wearing Level D exclusion zone PPE, must proceed on foot directly to the next exclusion zone.

When personnel are leaving a work area for any destination outside of a work zone, the following procedures shall be in effect:

- All duct tape is removed and discarded in designated disposal bag.

- Latex overboots are removed and discarded in designated disposal bag. (ALTERNATIVE: Non-disposable rubber boots shall be washed in soap solution in wash tub.)

- Outer gloves are removed and discarded in designated disposal bag.

- Coveralls are removed and discarded in designated disposal bag.

- Inner gloves are removed and discarded in designated disposal bag.

- Personnel shall proceed to nearest hand/face washing facilities before consuming food, beverages or tobacco products.

- If only light contact with excavation materials has occurred, latex overboots, coveralls and outer gloves may be set aside and reused during the next work period after a break.

NOTE: It is anticipated that all disposable components of the Level D ensemble will be used for a maximum of 4-5 hours before being discarded, since they will be discarded at lunch and at the end of the work day. Items that become torn or grossly contaminated will be replaced as needed.

13.0 JOB SITE HAZARDS

The following hazards may be encountered in this:

13.1 Slippery Surfaces

All employees must wear American National Standards Institute (ANSI)-approved work boots with steel toe protection. Skid proof soles are highly recommended.

13.2 Organic Vapors

The inhalation of volatile organic vapors during all operations can pose a potential health hazard. Hazard reduction procedures include monitoring the ambient air with a PID and/or FID and use of Personal Protective Equipment indicated on Table II. Workers should stand upwind of the source of contamination whenever possible. If ambient air levels in the breathing zone exceed 100 ppm, full face respirators equipped with organic vapor cartridges must be worn.

13.3 Flammable Vapors

Presence of flammable vapors can pose a potential fire hazard and health hazard. Hazard reduction procedures include monitoring the ambient air with an O_2/LEL meter. If the LEL reading exceeds 20%, leave the site immediately and contact the Fire Department.

13.4 Oxygen Enriched/Deprived Atmospheres

Atmospheres that contain a level of oxygen greater than 23% pose an extreme fire hazard (the usual ambient oxygen level is approximately 20.5%). All personnel encountering atmospheres that contain a level of Oxygen greater than 23% must evacuate the site

immediately and must notify the Fire Department.

13.5 Noise

When exposure to sound levels in the field personnel's ear ("A") scale, slow response) is likely to be in excess of 90 Db for greater than 5 minutes or 85 Db for greater than 30 minutes, noise protection shall be worn. Thus, a sound level meter shall be present if these levels are likely to occur.

It is anticipated that work within ten (10) feet of a drill rig will be 85 Db or greater. Sound level meter (SLB) readings will be performed whenever obvious noise sources call for measurements. The SLM readings will be used to determine the need for mandatory hearing protection. Once specific operations/tools are documented as producing noise levels that require hearing protection, the FSS may enforce the use of hearing protection whenever the operation takes place. ANSI-approved hearing protection must be worn during noise operations such as drilling.

13.6 Surface and Equipment Contamination

Contact with contaminated surfaces, or surfaces suspected of being contaminated, should be avoided. This includes walking through, kneeling or placing equipment in puddles, mud, discolored surfaces, or on drums and other containers. Eating, smoking, drinking and/or the application of cosmetics is prohibited on this site in the immediate work area. This reduces the likelihood of contamination by ingestion.

13.7 Exposure - Heat Stress

Since climatic changes cannot be avoided, work schedules will be adjusted to provide time intervals for intake of juices, juice products and water in an area free from contamination and in quantity appropriate for fluid replacement.

Heat stress may occur even in moderate temperature areas and may present any or all of the following:

- Heat Rash: Result of continuous exposure to heat, humid air and chafing clothes. Heat rash is uncomfortable and decreases the ability to tolerate heat.

- Heat Cramps: Result of the inadequate replacement of body electrolytes lost through perspiration. Signs include severe spasms and pain in the extremities and abdomen.

- Heat Exhaustion: Result of increased stress on the vital organs of the body in the

effort to meet the body's cooling demands. Signs include the following: shallow breathing; pale, cool moist skin; profuse sweating; dizziness.

- **!** Heat Stroke: Result of overworked cooling system. Heat stroke is the most serious form of heat stress. Body surfaces must be cooled and medical help must be obtained immediately to prevent severe injury and/or death. Signs include the following: red, hot dry skin; absence of perspiration; nausea; dizziness and confusion; strong, rapid pulse. This can lead to coma and death.

Heat Stress Prevention

A. Replace body fluids (water and electrolytes) lost through perspiration. Solutions may include a 0.1% salt and water solution or commercial mixes such as Gatorade and Squench.

B. Administer cooling devices to aid the natural body ventilation. Cooling occurs through evaporation of perspiration and limited body contact with heat-absorbing protective clothing. Utilize fans and air conditioners to assist in evaporation. Long, cotton underwear is suggested to absorb perspiration and limit any contact with heat-absorbing protective clothing (i.e., coated Tyvek™ suits).

C. Provide hose-down mobile shower facilities to cool protective clothing and reduce body temperature.

D. Conduct non-emergency response activities in the early morning or evening during very hot weather.

E. Provide shelter against heat and direct sunlight to protect personnel.

F. Rotate workers wearing protective clothing during hot weather.

13.8 Exposure - Cold Stress

Work schedules will be adjusted to provide sufficient rest periods in a heated area for warming up during operations conducted in cold weather. Also thermal protective clothing such as wind and/or moisture resistant outerwear is recommended to be worn.

If work is performed continuously in the cold at or below -7°C (20°F), including wind chill temperature, heated warming shelters (tents, cabins, company vehicles, rest rooms, etc.) shall be made available nearby and the worker should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness,

irritability or euphoria are indications for immediate return to the shelter. When entering the heated shelter, the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation. A change of dry work clothing shall be provided as necessary to prevent worker from returning to their work with wet clothing. Dehydration, or the loss of body fluids, occurs in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soup should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited. (Adapted from TLV's and Biological Exposure Indices 1988-1989; ACGI.)

13.9 Falling Objects

Hard hats must be worn by all personnel whenever construction-type activity is taking place. (i.e., drilling, excavation, trenching)

13.10 Vehicular Traffic

All employees will be required to wear a fluorescent safety vest at all times while on site. In addition, the following safety equipment procedures must be adhered to.

Task	Traffic Safety Equipment
Drilling	A

Safety Equipment Key:

A = Cones and barricades required - tapes and flags are recommended but optional.

13.11 Monitoring Well Activities and Groundwater Sampling

Skin and eye contact with contaminated groundwater and/or soil may occur during these tasks. Nitrile butyl rubber or neoprene gloves and approved safety goggles should be worn when contact with contaminated substance and/or splash is possible.

13.12 Sample Preservation and Safety Procedures

When hydrochloric acid is used, skin and eye contact can occur. This hazard can be reduced with the use of Nitrile butyl rubber or neoprene gloves and the use of safety goggles.

Skin and eye contact with contaminated soil and/or groundwater may occur during

sampling. Nitrile-butyl or neoprene gloves and approved safety glasses should be warn during sampling activities.

13.13 Cleaning Equipment

Skin and eye contact with methanol, Alconox or other cleaning substances can occur while cleaning equipment. This hazard can be reduced with the use of Nitrile butyl rubber or neoprene gloves and the use of safety goggles.

14.0 EMERGENCY COMMUNICATION

Work areas (exclusion zones) will generally be staged within short walking distances of each other so that personnel in one area may quickly and directly summon assistance from other work areas.

The telephone will be the primary means of communicating with sources of assistance not in the immediate work area. The FSS shall have a cellular phone on-site for use in an emergencies. It will be the responsibility of the FSS as Project Field Staff to familiarize themselves with the locations of telephones that will be accessible during emergencies.

The on-site personnel must also be able to accurately describe their work location(s) accurately to authorities in the event of an emergency requiring outside assistance.

14.1 Fire

A dry chemical fire extinguisher will be carried with each drill rig for use against small fires.

Only Factory Mutual (FM) approved fire safety cans will be used to transport and store flammable liquids. All gasoline and diesel-driven engines requiring refueling must be shut down and allowed to cool before filing. Smoking is not allowed during any operations within the work area in which petroleum products or solvents in free-floating, dissolved or vapor forms, or other flammable liquids may be present.

No open flame or spark is allowed in any area containing petroleum products or other flammable liquids.

14.2 Injury/Illness

The severity of on-site injury/illness will be assessed by on-site personnel. A first- aid kit will be available for minor injuries.

Conditions requiring medical treatment will be handled as follows:

- Minor Injury/Illness: Person will be assisted with decontamination and available on-site treatment will be rendered. If treatment by a physician is indicted, the person will be transported by car to the nearest emergency medical facility by project field staff.

- Major Injuries/Illness: If condition requires ambulance, emergency medical treatment will be summoned by dialing "911". If decontamination (could consist of cutting/tearing off contaminated protective clothing) can be performed without risking further injury or resulting in lost time, this shall be conducted while awaiting assistance in addition to whatever first aid may be rendered. It is anticipated the work on this project will not involve extremely hazardous contaminants. Medical personnel will be informed of the nature of potential contaminants on the victim by the FSS.

- The nearest fire station is located one mile west of the job site. Take Solano west to San Pablo....Turn left...proceed to Buchanan and turn left. The fire station is on the corner of Buchanan and Marin Avenue

14.3 Emergency Procedures

Emergency Telephone Numbers:

Telephone located at: Jobsite cellular # (714) 287-5760

Ambulance/Fire/Police:	**911**
Poison Control:	(800) 777-6476
National Response Center:	(800) 424-8802
U.S. EPA (24-Hour Hotline):	(800) 424-9346
State Regulatory Agency:	(805) 549-3699
Client:	(510) 524-8122
Contact Person:	Tony Kershaw

Encountering Hazardous Situations (requiring evacuation)

In the event of an emergency, (i.e. fires, explosions or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil or surface water at the facility) the team member that observes this condition shall give an emergency alarm. The emergency alarm signal will be three horn blasts on the horn located in the site vehicle.

Actions to be taken will be dictated by the emergency. All appropriate local emergency response agencies shall be notified immediately. The police, fire department, emergency

response teams and ambulance may be reached via telephone by dialing "911".

The nearest hospital and additional emergency contacts are listed on the previous page (Section 1.0).

Personnel encountering a hazardous situation shall instruct others on site to evacuate the vicinity immediately and call the Field Safety Supervisor and the Project Manager for instructions.

The site must not be re-entered until backup help, monitoring equipment and personal protective equipment is on hand.

14.4 Air Releases

The degree of releases of airborne contaminants that constitutes an emergency shall be determined by the FSS if circumstances permit. In general, it is unlikely that subsurface sampling operations will result in air releases of significance outside the exclusion zone. Evidence of the spread of subsurface contaminants outside the exclusion zone (as detected by instruments) will require cessation of operations and capping of the borehole.

In the event of air release of contamination that can not be immediately controlled, field personnel will withdraw to an uncontaminated area and prevent non-project personnel from entering the area.

14.5 Weather

Severe weather shall serve as a basis to ease or suspend outdoor field operations. Examples include snow, high winds, temperature extremes and rain. Determinations of what conditions will require shutdown or postponement of operation shall be made through consultation between the Project Manager, FSS and Field Staff.

14.6 Work Site Access

Access within a five-foot radius of any on-site operation is prohibited to all but Avalon authorized field personnel and subcontractors.

14.7 Emergency Equipment

Vehicles used for site work will be equipped with a first aid kit and safety equipment including:

- fluorescent cones
- flags (as needed)
- barricades (as needed)
- fire extinguisher (dry chemical ABC-type extinguisher)
- flashlight
- water, suitable for drinking
- appropriate emergency bandage material

14.8 Carbon Treatment

If this site involves the use of a Carbon Treatment System, then the following information will apply:

> The Carbon Treatment System is equipped with an emergency shut-off. The system will shut off automatically when the non-methane TPH vapor concentrations in the intermediate line reach 5% of the Lower Explosive Limit (LEL) for gasoline as recorded by the system monitors.

The suggested equipment for decontamination and spill response procedures includes:

- wash tubs (3)
- plastic sheets
- trash bags
- scrub brushes
- detergent
- sorbent booms (as applicable)

The carbon system is a closed system where no chemicals are used. The potential for a spill is minimal; thus, spill containment is not addressed in this Site Safety Plan.

14.9 Drilling Notification Procedures

A Dig-Alert authorization number must be obtained prior to drilling.

During the drilling operation, two persons (one designed as "driller" and the other as "helper") must be present at all times. The helper (whether Avalon personnel or subcontractors) must be instructed as to the location of the emergency shut-off switch. Every attempt must be made to keep unauthorized personnel from entering the work area. If this is not possible, the operation should be shut down until the area is cleared. The area where the operation is taking place shall be cordoned off with a barricade. The FSS or the PM has the authority and the responsibility to shut down the drilling operations whenever a hazardous situation is deemed present.

The mast of the drilling rig must maintain a minimum clearance of 20 feet from any overhead electrical cables. All drilling operations will cease immediately during hazardous weather conditions such as high winds, heavy rain, lightening and snow.

Hard hats shall be worn at all times. Hearing protection shall be worn during noisy operations.

If product is encountered during the drilling operation, all work must stop in order for employees to upgrade personal protective equipment to Level C. A full-face respirator should be worn in order to prevent the inhalation of vapors and to provide face and eye protection from splashes. Coated tyvek suits, gloves and overboots should be worn to prevent skin contact with the soil.

Air monitoring must be performed in the work area to document breathing-zone concentrations. If air monitoring results indicate concentrations greater than 700 ppm, then Level B respiratory protection will be implemented.

Respirator cartridges must be changed at the end of a work period or if "breakthrough" occurs. If employees experience continuous cartridge "breakthrough", then the employee's work procedures and the level of respiratory protection must be re-evaluated by the Site Safety Officer and the Health and Safety Manager in order to determine the necessity of upgrading to Level B respiratory protection.

14.10 Electrical Equipment and Ground-Fault Circuit Interrupters

All electrical equipment and power cables in and around wells or structures suspected of containing chemical contamination must be intrinsically safe and equipped with a three-wire ground lead, rated explosion-proof for hazardous atmospheres. In accordance with OSHA 29 CFR 1926.404, approved ground fault circuit interrupters (GFCI) must be used for all 120 volt, single phase, 15 and 20 ampere receptacle outlets on the site which are in use by employees. Receptacles on the ends of extension cords are not part of the permanent wiring and therefore, must be protected by GFCI's whether or not the extension cord is plugged into permanent wiring.

The GFCI is a fast-acting circuit breaker which senses small imbalances in the circuit caused by current leakage to ground and, in a fraction of a second, shuts off the electricity. However, the GFCI will not protect the employee from line-to-line contact hazards (such as a person holding two "hot" wires or a hot and neutral wire in each hand.) The GFCI does provide protection against the most common form of electrical shock hazard - the ground fault. It also provides protection against fires, overheating and destruction of insulation on wiring.

GFCI's can be used successfully to reduce electrical hazards on construction sites. Tripping of GFCI's - interruption of current flow - is sometimes caused by wet connectors and tools. It is good practice to limit exposure of connectors and tools to excessive moisture by using watertight or sealable connectors. Providing more GFCI's or shorter circuits can prevent tripping caused by the cumulative leakage from several tools or by leakages from extremely long circuits. (Adapted from OSHA 307; Ground-Fault Protection on Construction sites, 1987.)

14.11 Damage to a Utility

In the event an underground utility (gas, electric, sewer, water, phone, etc.) is struck in the course of subsurface drilling, the local utility shall be notified as soon as possible after any fire or injuries are addressed as listed above.

14.12 General Health

Medicine and alcohol can increase the effects of exposure to toxic chemicals. Unless specifically approved by a qualified physician, prescription drugs should not be taken by personnel assigned to operations where the potential for absorption, inhalation or ingestion of toxic substances exists.

Drinking alcoholic beverages is prohibited. Drinking alcoholic beverages and driving is prohibited at any time. Driving at excessive speeds is always prohibited.

Skin abrasions must be thoroughly protected to prevent chemicals from penetrating the abrasion. It is recommended that contact lenses not be worn by persons working on the site.

14.13 **MSDS Information** (When Available)

Material Safety Data Sheets (MSDS) on chemical substances encountered at the site shall be made available to all persons (including subcontractors) working at the site. These MSDS's shall be enclosed within this site safety plan in Appendix D. For emergency situations not specifically addressed by this site safety plan, refer to MSDS recommendations for action information.

15.0 HEALTH AND SAFETY REQUIREMENTS

15.1 Medical Surveillance

All subcontractor personnel and visitors who intend to enter the exclusion zones or decontamination areas shall participate in a medical surveillance program that meets the

requirements of 29 CFR 1910.120.

All on-site personnel are included in the corporate medical monitoring program and receive physical examination on an annual basis.

Additional medical monitoring may be required if exposure or potential exposures are identified by the FSS for which such monitoring is deemed necessary. The content of this monitoring will be determined by the FSS and consulting physician.

The petrochemicals typical of these facilities can affect specific organ systems producing characteristic health effects. The medical evaluation will, therefore, focus on the liver, kidney, nervous system, blood systems, skin and lung functions. Laboratory testing will include complete blood count and applicable kidney and liver-function tests. Other tests include skin examination.

15.2 Training Requirements

All personnel (including subcontractors) whose work requires entry into exclusion zones, decontamination areas or otherwise present potential exposure to health or safety hazards associated with this project, shall meet the training requirements set forth in 29 CFR 1910.120, the OSHA Hazardous Waste Operations and Emergency Response Standard.

Personnel shall not be permitted to participate in or supervise activities in the exclusion or decontamination zones until they have completed the specified training. Written documentation of the completion of training (e.g., copies of course certificate) must be submitted to the FSS prior to entry into work areas.

Specifically, such personnel must complete:

- 40 hours of off-site instruction on the health and safety topics prescribed in 29 CFR 1910.120.
- 8 hours of refresher training within the past 12 months
- Site specific training
- Prior to the initiation of sampling activities, all personnel shall attend a tail-gate safety meeting conducted by the FSS. The training shall address the following:

    1. The content of this HASP, with emphasis on the hazards specific to this site, work rules, standard operating procedures, PPE requirements and decontamination.

2. Site emergency procedures.

15.3 Respiratory Fit Testing

All personnel (including subcontractors) whose work requires entry into exclusion zones, decontamination areas or otherwise present potential exposure to health or safety hazards associated with this project, shall meet the respiratory protection requirements set forth in the HASP. All personnel shall have a current fit testing certificate for each type of respiratory protection equipment used.

APPENDIX A

HEALTH AND SAFETY PLAN REVIEW/TAILGATE HEALTH AND SAFETY MEETING

HEALTH AND SAFETY PLAN REVIEW/TAILGATE SAFETY MEETING

By signing below, I certify that I have reviewed the Site Specific Health and Safety Plan, and that I agree to abide by all requirements of the Plan, including all PPE requirements. I understand that if I have any questions I should discuss them with my Supervisor, or contact the Health and Safety Department. I further understand that I have the "Right to Refuse" unsafe work, subject to the conditions of the company policy. By signing below, I also hereby certify that I am free of drug and/or alcohol impairment, have attended the Tailgate Safety Meeting for this specific project, and in all ways prepared for work.

Print Name	Sign Name	Date
Matt Klint		4/14/06
Leif Jonsson		4-14-06

HEALTH AND SAFETY PLAN REVIEW/TAILGATE SAFETY MEETING

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Print Name	Sign Name	Date

APPENDIX B

FIRE STATION LOCATION MAP

APPENDIX C

DEFINITION OF HAZARD EVALUATION GUIDELINES

DEFINITION OF HAZARD EVALUATION GUIDELINES

Hazard: Airborne Contaminants

Guideline	Explanation
Threshold Limit Value Time-Weighted Average (TLV-TWA)	The time-weighted average concentration for a normal 8-hour week day and a 40-hour work week, to which nearly all workers may be repeatedly exposed without adverse effect.
Permissible Exposure Limit (PEL)	Time-weighted average concentrations similar to (and in many cases derived from) the Threshold Limit Values.
Immediately Dangerous to Life and Health (IDLH)	"IDLH" or "Immediately dangerous to life or health" means any atmospheric condition that poses an immediate threat to life, or which is likely to result in acute or immediate severe health effects. This includes oxygen deficiency conditions.

Hazard: Explosion

Guideline	Explanation
Lower Explosive Limit	The minimum concentration of (LEL) vapor in air below which propagation of a flame will not occur in the presence of an ignition source.
Upper Explosive Limit (UEL)	The maximum concentration of vapor in the air above which propagation of a flame will not occur in the presence of an ignition source.

Hazard: Fire

Guideline	Explanation
Flash Point (flash p)	The lowest temperature at which the vapor of a combustible liquid can be made to ignite momentarily in air.

APPENDIX D

MSDS INFORMATION

No onsite MSDS information available.

APPENDIX E

ACCIDENT/INJURY FORM

ACCIDENT/INCIDENT/NEAR MISS REPORT

Employee's Name:_____
D.O.B._____/_____/_____

Address:_____

D.O.H._____/_____/_____

_____ SS#_____-_____-

_____

Job Title:_____Supervisor's

Name_____

Office

Location:_____

_

Location at Time of

Incident:_____

Date/Time of

Incident:_____

_____

_____

_____
_____
Description: Describe clearly how the accident occurred:
_____
_____

_____

_____

_____

_____

_____

_____

_____

Was Incident: Physical_____

Chemical_____

Part(s) of body

affected:_____

Exposure:Dermal_____Inhalation_____Ingestion_____

_____

Witnesses: 1)_____

2)_____

Conditions/acts contributing to this

incident:_____

_____

_____

_____

_____

Explain specifically the corrective action you have taken to prevent a recurrence:

_____

_____

Did the injured go to a

doctor?_____When?_____

Where?_____

_____

Did the injured go to a

hospital?_____When?_____

Where?_____

_____

Signatures:

_____ _____

_____

Employee Reporting Manager H&S Manager

_____/_____/_____ _____/_____/_____ _____/_____/_____

APPENDIX F
SITE MONITORING FORM

SITE MONITORING LOG

Site Name _____ Technician _____
Address _____ Equipment _____
Avalon Job No. _____ Calibration Gas _____

Date _____ Weather _____

DAILY SAFETY INSPECTION LIST	
( ) Work Area Barriers in Place	( ) Hard Hats
( ) Warning Signs Posted	( ) Steel Toed Boots
( ) Safety Cones in Place	( ) Protective Eyewear
( ) Traffic Blocked From Work Area	( ) Gloves
( ) Utilities Identified	( ) Hand Tool Inspection for Condition
( ) Tailgate Safety Meeting	( ) Safe Distance Between Workers
( ) Respiratory Protection (If necessary)	( ) Safe Lifting Practices

AIR MONITORING RECORD

TIME OF READING	LOCATION	ACTIVITY	READING/COMMENTS (ppm)

TIME OF READING	LOCATION	ACTIVITY	READING/COMMENTS (ppm)

APPENDIX V

HEALTH RISK ASSESSMENT

Teri L. Copeland, M.S., D.A.B.T.
Environmental Toxicologist

5737 Kanan Rd. #182, Agoura Hills, CA 91301 * (818) 991-8240 phone (818) 991-8140 fax

Technical Memorandum

To: Trevor Santochi, R.G., CEG
Avalon Environmental Consultants, Inc.

From: Teri Copeland, M.S., DABT and Jim Van de Water, R.G., C.HG.

Date: May 30, 2006

Re: ***Health Risk Assessment, 1 Hour Cleaners, 1187 Solano Avenue, Albany, California***

EXECUTIVE SUMMARY

This report documents a site-specific health risk assessment (HRA) for a dry cleaning facility located at 1187 Solano Avenue, Albany, California (the site). The HRA has been prepared at the request of the Alameda County Environmental Health Department (ACEHD) and follows CalEPA guidance.

Objective

The objective of the HRA is to determine if soil vapor present in site soil poses a potential health risk to site receptors via the inhalation pathway.

Receptors and Chemicals of Potential Concern (COPCs)

The site is used as a dry cleaning facility. Based on the commercial land use, the receptor that is evaluated in the HRA is a default indoor worker, as described in USEPA risk assessment guidance (USEPA, 2002).

The COPCs were identified as any chemical detected in at least one soil vapor sample, based on recent soil vapor characterization. Eight COPCs were identified as follows:

- cis-1,2-Dichloroethene (c-1,2-DCE)
- trans-1,2,-Dichloroethene (t-1,2-DCE)
- Chloroform
- Ethylbenzene
- Toluene
- Trichloroethene (TCE)
- Tetrachloroethene (PCE)
- Xylenes.

Exposure Assessment

COPCs are limited to volatile chemicals present in subsurface soil at the site. Accordingly, the exposure pathway assessed is inhalation of vapors in air. In accordance with CalEPA guidance, soil vapor data were used to conservatively predict reasonable maximum exposure point concentrations (EPCs) in indoor air. Based on analysis of the soil vapor data collected for purposes of the HRA, the highest soil vapor results within the boundaries of the site were conservatively used as the basis for the air EPCs.

The USEPA implementation of the Johnson & Ettinger model (J&E model; Johnson and Ettinger, 1991; USEPA, 2004a) was employed as the basis for estimation of indoor air EPCs for the worker receptor.

Risk Characterization

The health risk characterization was conducted by incorporating the results of the exposure assessment with the chemical-specific toxicity values for each COPC. Two risk descriptors were conservatively estimated as the basis of the risk characterization: (1) incremental lifetime cancer risk (ILCR) and (2) noncancer hazard index (HI).

The incremental lifetime cancer risk (ILCR) estimate for the indoor worker receptor is 1E-05 (10-in-one million).[1] This ILCR does not exceed the USEPA acceptable risk range of 1E-06 (1-in-one million) to 1E-04 (100-in-one million) (USEPA, 1991) or the California Environmental Protection Agency's (CalEPA's) Safe Drinking Water and Toxic Enforcement Act of 1986 *de minimis* risk level of 1E-05 (10-in-one million) (CalEPA/DHS, 1994).

The noncancer hazard index (HI) estimate for the indoor worker receptor is 0.02. The noncancer HI level of 1 or less indicates that there is no potential for noncancer health effects (USEPA, 1989a, 1991).

[1] USEPA advises that conservatism in the risk estimate be communicated when results are presented and suggests the following statement in regard to estimated incremental lifetime cancer risks characterized using the HRA framework (USEPA, 1986, 1989b): "These values are upperbound estimates of excess cancer risk potentially arising from lifetime exposure to the chemical in question. A number of assumptions have been made in the derivation of these values, many of which are likely to overestimate exposure and toxicity. The actual incidence of cancer is likely to be lower than these estimates and may be zero."

1 INTRODUCTION

The objective of this HRA is to provide a conservative assessment of the potential health risks associated with the presence of VOCs in soil vapor at the property located at 1187 Solano Avenue, Albany, California (the site) (Figure 1). A HRA is an appropriate analytical methodology for determining the potential health risks for a hypothetical individual living or working at a site where a chemical release has, or may have, occurred (USEPA, 1989a). The hypothetical individual that is evaluated in a standard health risk assessment is assumed to have a reasonable maximum exposure (RME) by applicable exposure routes. The RME, as defined by the USEPA (1989a), is the "highest exposure that is reasonably expected to occur" and is intended to best represent "a conservative exposure estimate that is within the range of possible exposures". This approach is recommended by regulatory risk assessment guidance in order to make the health risk assessment sufficiently protective of the potential receptors.

HRA applies four evaluation components as the basis for characterizing potential health risks posed to potential receptors at a site (USEPA, 1989a). These components are:

Site Characterization/Selection of Chemicals of Potential Concern: Site characterization data are evaluated and the chemicals of potential concern (COPCs) are identified.

Toxicity Assessment: The toxicological endpoints and toxicity criteria are identified for each COPC.

Exposure Assessment: The routes through which potential exposure to COPCs may occur are identified and the magnitude and duration of the receptor doses are estimated.

Risk Characterization: Information from the toxicity assessment and exposure assessment is integrated into quantitative expressions of potential health risk. The level of confidence in the quantitative estimates is discussed.

The methodologies used in this HRA are consistent with standard risk assessment practices and information provided in the following guidance documents:

- USEPA, 1989a. *Risk Assessment Guidance for Superfund (RAGS), Volume I Human Health Evaluation Manual (Part A)*. December.
- CalEPA, 1992. Supplemental *Guidance for Human Health Multimedia Risk Assessment of Hazardous Waste Sites and Permitted Facilities*. Department of Toxic Substances Control (DTSC), October 7.
- CalEPA/Department of Toxic Substances Control (DTSC), 2005. *Guidance for the Evaluation of Mitigation of Subsurface Vapor Intrusion to Indoor Air*. Interim Final, December 15, 2004 (Revised February 7, 2005).

1.1 ORGANIZATION OF REPORT

The organization of this report is as follows:

Section 2.0: Site Description and Environmental History: Background information for the site is discussed and characterization data relevant to the HRA are presented.

Section 3.0: Data Usability Evaluation and Selection of Chemicals of Potential Concern: The usability of the data for the HRA is evaluated and the COPCs are identified.

Section 4.0: Toxicity Assessment: The toxicity criteria established by the regulatory agencies are discussed and presented.

Section 5.0: Exposure Assessment: The exposure scenarios and pathways, exposure parameters, dose calculations, and EPCs (including fate-and-transport modeling), are discussed.

Section 6.0: Risk Characterization: The potential incremental lifetime cancer risks (ILCR values) and noncancer hazard indices (HI values) are characterized for the exposure scenarios.

Section 7.0: Uncertainty Analysis: Uncertainties associated with the risk assessment process are discussed.

Section 8.0: Limitations: The limitations associated with the preparation and use of this report are stated.

Section 9.0: References Cited: The references cited in the HRA are provided.

2 SITE DESCRIPTION AND ENVIRONMENTAL HISTORY

This section provides an overview regarding the property and its environmental history.

2.1 SITE DESCRIPTION

The site is located at 1187 Solano Avenue, Albany, California. The approximately 1600 square foot site has operated for a number of years as a dry cleaning facility and will remain in use as a commercial facility in the future.

2.2 SITE SOURCES

As described in the Soil Gas Investigation Work Plan (Avalon Environmental Consultants, Inc. [Avalon], 2006), the most probable mechanism for chemical release at the site is release of solvents to soil via plumbing leaks. According to the owner of the property, there have been two large plumbing leaks on site which resulted in considerable flooding. One of the leaks occurred in late 2000 and the other occurred in late 2003. The 2000 leak released approximately 20 to 30 gallons of water. The 2003 leak released hundreds of gallons of water, as it occurred during the weekend and was not mitigated until the following Monday. The leaks occurred in the rear portion of the facility and likely contained PCE.

2.3 SITE INVESTIGATIONS

Avalon previously performed a Phase II Environmental Site Assessment (ESA) at the site in November 2004, and a Phase II Subsurface Groundwater Assessment (SGA) on May 4, 2005. The Phase II ESA identified PCE in soil matrix samples collected from beneath the concrete slab of the facility. PCE concentrations in the soil matrix samples ranged from 8.4 to 1,100 parts per billion (ppb). The Phase II SGA identified low levels of PCE in near surface soils but did not detect PCE in deeper soil or groundwater.

Based on the findings of the Phase II ESA and Phase II SGA, the Alameda County Environmental Health Department (ACEHD) recommended that soil vapor sampling be conducted in the dry cleaning space in order to determine if there are vapor intrusion-related health risks at the facility. Accordingly, a work plan for soil vapor investigation was submitted to the ACEHD (Avalon, 2006; Attachment A). Following approval of the work plan, the field investigation was conducted on April 14, 2006.

Soil vapor samples were collected in accordance with CalEPA guidance (CalEPA, 2003; CalEPA/DTSC, 2005). Samples were collected at a depth of 5 feet at four locations (three locations within the building and one location outside of the building (Figure 2). The samples were collected using glass syringes and were analyzed by an onsite mobile laboratory for VOCs using EPA Method 8260B. PCE was detected in the samples at concentrations ranging from 0.28 to 170 micrograms per liter (μg/L). Other VOCs detected in at least one sample were: cis-1,2-dichloroethene (c-1,2-DCE), trans-1,2-dichloroethene, (t-1,2-DCE), chloroform, ethylbenzene, trichloroethene (TCE), toluene, and xylenes. No other VOCs were detected over the reporting limit of 0.1 μg/L. The laboratory report is provided in Attachment B.

3 DATA USABILITY EVALUATION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

This section presents the data usability evaluation and identifies the COPCs.

3.1 DATA USABILITY EVALUATION

Site characterization data are evaluated for usability for risk assessment using the criteria identified in the USEPA *Guidance for Data Usability in Risk Assessment* (USEPA, 1992a). Data usability (DU) is the process of determining that the quality of data generated meets the intended use. USEPA has established a specific guidance framework to provide a consistent basis for making decisions about the minimum quality and quantity of analytical data that are sufficient to support risk assessment decisions (USEPA, 1992a). The DU evaluation specifically addresses: (1) procedures for assessing the quality of the analytical data intended for use in risk assessment; and (2) procedures for assessing uncertainty in health risk characterization based on the uncertainty in the analytical data.

The risk assessment-based site characterization data set (Attachment B) was evaluated for usability for purposes of identifying COPCs and for determining representative concentrations of COPCs in soil vapor. Based on the results of the DU evaluation, the site is been adequately characterized based on the results of the April 2006 soil vapor investigation. The data usability evaluation summary is provided as Attachment C. Sample locations are shown on Figure 2.

3.2 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCS)

COPCs were selected for indoor air based on the risk assessment-based soil vapor data set. Any chemical that was detected in at least one sample was identified as a COPC for the HRA. The following eight chemicals were assessed as COPCs:

- cis-1,2-Dichloroethene (c-1,2-DCE)
- trans-1,2,-Dichloroethene (t-1,2-DCE)
- Chloroform
- Ethylbenzene
- Toluene
- Trichloroethene (TCE)
- Tetrachloroethene (PCE)
- Xylenes.

4 TOXICITY ASSESSMENT

This step of the HRA identifies the toxicological endpoints and discusses the toxicity criteria that are based on the dose-response relationship for each COPC. The dose-response assessment characterizes the relationship between the dose of a chemical and the potential for an adverse health effect in the exposed population. Based on this quantitative dose-response relationship, CalEPA and USEPA have applied the results of the chemical-specific toxicity assessments to derive numerical toxicity criteria to estimate the likelihood of a specific adverse health effect occurring as a function of exposure. The methods used to establish the dose-response criteria associated with evaluating potential carcinogenic and noncarcinogenic health impacts are addressed separately in the following sections.

4.1 CARCINOGENIC HEALTH EFFECTS

The current approach to carcinogenic risk assessment used by CalEPA, USEPA, and other U.S. regulatory agencies assumes that every exposure to a carcinogen poses a finite probability, however small, of producing a carcinogenic response (i.e., there is no threshold to carcinogenic effects). The linearized multistage (LMS) low dose extrapolation model, or similar model, is applied to high dose data to predict carcinogenic response at low doses. The use of this model is recognized to represent a conservative approach to assessing carcinogenic potency (USEPA, 1986, 2005).

Cancer slope factors (CSFs) are derived in most cases from the LMS or similar model. Based on the non-threshold theory for carcinogens, the modeling assumes a carcinogenic risk of zero only at zero dose (i.e., at all doses some risk is assumed to be present). The chemical-specific cancer slope factor, which is expressed in units of $(mg/kg\text{-}day)^{-1}$, represents the 95 percent upper confidence limit of the probability of carcinogenic response per unit daily intake of a substance over a lifetime.

Based on the toxicological classification of the COPCs (CalEPA/OEHHA, 2006), chloroform, TCE, and PCE were evaluated for carcinogenic health effects. The chemical-specific CSFs used in this HRA and their sources are provided in Table 1. Summary references for these values, downloaded from the CalEPA and USEPA, websites (CalEPA/OEHHA, 2006; USEPA, 2006), are provided in Attachment D.

4.2 NONCARCINOGENIC HEALTH EFFECTS

It is widely accepted that most biological effects of chemicals occur only after a threshold dose is reached. That is to say, there is a range of doses that exists from zero to some finite value that can be tolerated by an animal or human with essentially no adverse health effects. For the evaluation of chronic noncarcinogenic health effects, CalEPA/Office of Environmental Health Hazard Assessment (CalEPA/OEHHA) Reference Exposure Levels (RELs), USEPA Reference Concentrations (RfCs) and Reference Doses (RfDs), and ATSDR Minimum Risk Levels (MRLs) (ATSDR, 2004) that incorporate the concept of a biological threshold are used. The chronic REL, RfC, RfD, and MRL are defined as the daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime.

For the purposes of establishing the noncancer health criteria, the threshold dose is estimated from the no-observed adverse effect level (NOAEL) or the lowest-observed adverse effect level (LOAEL) determined from human and/or animal studies. The NOAEL is defined as the highest dose at which no adverse effects are observed, while the LOAEL is defined as the lowest dose at which adverse effects are observed. Uncertainty factors are applied to the NOAEL or LOAEL observed in animal studies or human epidemiological studies to establish the chemical-specific REL, RfC, or RfD (the noncancer toxicity criteria). The noncancer toxicity criteria are applied in the risk characterization to estimate the potential noncancer health hazard. In this HRA, c-1,2-DCE, t-1,2-DCE, chloroform, ethylbenzene, TCE, toluene, PCE, and xylenes were evaluated for chronic noncarcinogenic health effects. The chemical-specific toxicity criteria values and their sources are summarized in Table 1. Summary references for these values, downloaded from the CalEPA website (CalEPA/OEHHA, 2006) the USEPA Integrated Risk Information System (IRIS) database (USEPA 2006), and the ATSDR website are provided in Attachment D.

5 EXPOSURE ASSESSMENT

Exposure assessment is the process of measuring or estimating the intensity, frequency, and duration of human exposure. The definition of exposure (USEPA, 1992b) is "a condition in which a chemical contacts the outer boundary of a human." The amount of chemical contacted is termed "potential dose."

This section identifies the receptors and exposure pathways evaluated in the HRA. It also discusses the methods applied to estimate dose, including methods for fate-and-transport modeling, calculation of exposure point concentrations (EPCs), and derivation of the exposure assumptions (parameters) and estimated doses for each COPC.

5.1 RECEPTORS

As recommended by USEPA (1989a, 1992b), a reasonable maximum exposure (RME) scenario for an indoor worker was assessed. The RME, as defined by the USEPA, is the "highest exposure that is reasonably expected to occur" and is intended to best represent a conservative exposure estimate that is within the range of possible exposures (USEPA, 1989a). In accordance with USEPA guidance (USEPA, 1997), it was assumed that the indoor worker receptor works at the site for 25 years, which is the upperbound value for occupational tenure in the United States (USEPA, 1997).

5.2 EXPOSURE PATHWAYS AND PARAMETERS

Pathways of exposure are the means through which an individual may come into contact with a chemical. For a complete exposure pathway to exist, each of the following elements must be present (USEPA, 1989a):

- A source and mechanism for chemical release;
- An environmental transport medium (e.g., air, water, soil);
- A point of potential human contact with the medium; and
- A route of exposure (e.g., inhalation, ingestion, dermal contact).

The only source of COPCs at the site is the emission of vapors from the subsurface. Accordingly, onsite air represents the exposure medium of interest and the inhalation of VOCs in air is the complete exposure pathway for site worker receptors. Site receptors may be exposed to VOCs in indoor air as well as outdoor air. For purposes of the HRA, it is conservatively assumed that worker receptors are exposed to indoor air 8 hours per day, every day for 25 years. The exposure parameter values for the default indoor worker receptor are summarized in Table 2.

5.3 INDOOR AIR MODELING AND EXPOSURE POINT CONCENTRATIONS

The USEPA implementation of the Johnson and Ettinger (J&E) indoor air screening model using soil vapor data was used to estimate indoor air concentrations for the indoor worker receptor (USEPA, 2004a; Johnson and Ettinger, 1991). Based on site-specific data, the soil type at the site is composed of clay. Table 3 presents the indoor air EPCs for the COPCs quantified in this HRA. Attachment E provides the output from the Johnson and Ettinger model.

6 RISK CHARACTERIZATION

This step of the HRA combines outputs of the exposure and dose-response assessments to characterize the potential health risks for the potential receptors. The risk characterization endpoints, incremental lifetime cancer risk and hazard index, are discussed below. The risk characterization calculations are provided in Tables 4 and 5. Uncertainties associated with the cancer risk and hazard index are discussed in Section 7.

6.1 INCREMENTAL LIFETIME CANCER RISK (ILCR)

Potential carcinogenic health risks are defined in terms of the probability of an individual developing cancer over a lifetime as a result of the exposure to a given chemical at a given concentration (USEPA, 1989a). The incremental probability of developing cancer (i.e., the theoretical excess carcinogenic risk) is that risk attributed to exposure to the COPCs present at the site and is independent of non-site-related cancer risks (USEPA, 1989a). For example, national cancer statistics indicate that each male has a 1 in 2 chance, or 500,000 chances in one million, of developing cancer during his lifetime and that each female has a 1 in 3 chance, or 333,333 chances in one million, of developing cancer in her lifetime (American Cancer Society, 2006). An individual with an excess cancer risk of 1-in-one million (denoted as 1E-06 or 1 x 10-6) has a total cancer risk of 500,001-in-one million (male) or 333,334-in-one million (female). The theoretical incremental cancer risk is based on the total incremental lifetime average daily dose (LADD) of the COPC received as a result of the assumed exposure over a 70-year (25,550 days) lifetime (USEPA, 1989a). The ILCRs are calculated as follows:

1. For each relevant COPC, a cancer risk estimate is obtained by multiplying the lifetime average daily dose (LADD) by the pathway-specific cancer slope factor (CSF).
2. The cancer risk estimates are summed for all COPCs to characterize the total incremental lifetime cancer risk (ILCR).

The ILCRs and associated calculations are provided in Table 4.

6.2 NONCANCER HAZARD INDEX (HI)

Potential noncarcinogenic adverse health effects are characterized by comparing predicted estimated site doses to established regulatory criteria (USEPA, 1989a). As discussed in Section 4, the noncancer toxicity criteria (e.g., RELs, RfDs) are identified as exposure levels at which no adverse health effects are expected to occur, even to sensitive individuals.

In order to evaluate the general acceptability of a particular dose relative to a reference criterion, the data are presented using the “hazard quotient” approach. The hazard quotient, for each COPC, is the site-related dose divided by the regulatory acceptable dose (e.g., ADD/RfD).

The possible additive effects due to potential exposure to multiple substances are addressed by calculating a Hazard Index (HI). The HI is the sum of the hazard quotients for each chemical (USEPA, 1989a).

The hazard index is based on the average daily dose (ADD) of the COPC received as a result of the assumed exposure averaged over the exposure duration (USEPA, 1989a). The HIs are calculated as follows:

1. For each noncarcinogenic COPC, a hazard quotient estimate is obtained by dividing the average daily dose (ADD) by the pathway-specific RfD.
2. The hazard quotient estimates are summed for all COPCs, for each receptor.

The HIs and associated calculations are provided in Table 5.

6.3 Risk Characterization Summary and Conclusions

The incremental lifetime cancer risk (ILCR) for an indoor worker receptor at the site is conservatively estimated to be 1E-05 (10-in-one million). This ILCR does not exceed the USEPA acceptable risk range of 1E-06 (1-in-one million) to 1E-04 (100-in-one million) (USEPA, 1991) or the California Environmental Protection Agency's (CalEPA's) Safe Drinking Water and Toxic Enforcement Act of 1986 *de minimis* risk level of 10-in-one million (CalEPA/DHS, 1994).

The noncancer hazard index (HI) for the indoor worker receptor at the site is conservatively estimated to be 0.02. The HI is below the acceptable HI value of 1 identified by USEPA (1991). HI levels of 1 or less indicate that there is no potential for noncancer health effects (USEPA, 1989a, 1991).

7 UNCERTAINTY ANALYSIS

USEPA guidance recommends that the risk characterization include an assessment of the level of confidence in the risk descriptor values (the incremental lifetime cancer risk and the hazard index) (USEPA, 1989a, 1992c, 1995). Because the risk descriptors are conditional estimates based on a number of assumptions, the level of confidence in the assumptions and the related impact on the risk estimators are discussed. As discussed by USEPA, key information should be addressed in the uncertainty analysis (USEPA, 1992c).

As identified by USEPA, "regarding risk characterization, key scientific information on data and methods (e.g., use of animal or human data for extrapolating from high to low doses, use of pharmacokinetics data) must be highlighted. We also expect a statement of confidence in the assessment that identifies all major uncertainties along with comment on their influence on the assessment." In accordance with USEPA guidance, the assumptions that have the potential to introduce the greatest uncertainty, and the effects these uncertainties have on the estimates of risk, are discussed below.

7.1 SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Uncertainties in site characterization may lead to the failure to identify all of the COPCs. The results of the risk-based site investigation (Avalon, 2006) were evaluated in the data usability evaluation and data gaps for selection of COPCs were not identified. The site characterization targeted the appropriate analytical method for VOCs (EPA Method 8260B) and sample locations that were based on source and receptor information for the site. Accordingly, there is acceptable confidence that the site is adequately characterized and that the potential for underestimation of risk due to missed or eliminated COPCs is low.

7.2 TOXICITY ASSESSMENT

Sources of uncertainty associated with toxicity values may include (USEPA, 1989a):

- Use of dose-response data from animal studies to predict effects in humans;
- Use of dose-response data from effects observed at high doses to predict the adverse health effects that may occur following exposure to low levels expected from human contact in the environment;
- Extrapolation of dose-response data from one exposure route to another; and
- The interaction of chemicals (multiple substance exposure).

These areas of uncertainty are further discussed below.

Animal to Human Extrapolation

For many chemicals, animal studies provide the only reliable information on which to predict the possible adverse health effects in humans. Accordingly, uncertainties exist in regard to the extrapolation of animal data to predict human toxicity.

In regard to the toxicity assessment, CalEPA and USEPA have established risk assessment methodologies with the objective of not underestimating potential risks to humans. CalEPA and USEPA consider their methods of animal-to-human dose-response extrapolation to be health protective for the following reasons (CalEPA/OEHHA, 2006; USEPA, 1986, 2005, 2006):

- Animal dose-response data are taken from the species that responds most similarly to humans, or from the most sensitive species.
- As the basis for noncancer hazard estimation, CalEPA and USEPA apply what is considered as conservative safety factors to address uncertainties inherent in the interspecies extrapolation of dose-response data.

- CalEPA and USEPA employ health protective assumptions regarding the determination of equivalent human doses (relative to the animal study doses).

High-to-Low Dose Extrapolation

The concentrations of chemicals to which people are exposed in the environment are generally much lower than the doses to which animals are exposed in laboratory studies. CalEPA and USEPA consider their methods of extrapolation to lower doses to be conservative (e.g., health protective) based on the following:

- As the basis for cancer risk estimation, CalEPA employs the LMS low-dose extrapolation model and uses the 95 percent upper confidence limit of the slope of the predicted dose-response as the basis for the cancer slope factor (i.e., there is only a 5 percent chance that the probability of a response could be greater than the estimated value on the basis of the experimental data and model used). The LMS model has been generally recognized to be one of the most conservative low dose extrapolation models available. It is generally accepted that LMS-based high-to-low dose extrapolation modeling does not lead to the underestimation of risk (USEPA, 1986, 2005).
- The basis for the noncancer reference dose is the identification of a dose below which no adverse effects are seen. Safety factors are applied to this dose, as deemed appropriate, to ensure that a reference dose does not underestimate the human toxicity of a particular chemical. Accordingly, the potential to underestimate the noncancer hazard is low.

Route Extrapolation

When inhalation toxicity criteria are unavailable, USEPA Region 9 applies a route extrapolation approach for purposes of deriving Preliminary Remediation Goals (PRGs)[2]. Inhalation data were not deemed adequate by CalEPA, USEPA, or ATSDR to derive noncancer inhalation toxicity criteria for two of the COPCs (c-1,2-DCE and t-1,2-DCE). Accordingly, route-extrapolated inhalation RfDs derived by USEPA Region 9 (based on oral reference doses) were used in the HRA. As discussed by Region 9, this approach may be a useful screening procedure but introduces additional uncertainties into the risk characterization. The potential for the inhalation HI for the site to be underestimated due to route extrapolations for c-1,2,DCE and t-1,2-DCE is deemed to be low based on the following considerations:

- As documented by ATSDR (1996), acceptable ambient air concentration guidelines and/or standards for twelve states (24-hour average and annual average concentrations) range from 0.199 ppm to 6 ppm for c-1,2,-DCE and from 0.027 ppm to 20 ppm for t-1,2-DCE. Applying standard factors for converting the USEPA oral reference dose to an inhalation RfD (as ppm in air)[3] results in an equivalent reference concentration of 0.017 ppm for c-1,2,-DCE and 0.009 ppm for t-1,2-DCE. The route-extrapolated inhalation RfDs used in the HRA are lower (more stringent) than the lowest state acceptable ambient air concentrations.
- c-1,2,-DCE and t-1,2,DCE contribute to only 5 percent of the total HI for the site.

Multiple Substance Exposure

As discussed by USEPA (1989a), uncertainties associated with summing risks or hazard indices for several substances may be of concern, as chemical interactions can occasionally occur. For example, the effects of two chemicals given at the same time may produce a response that may be directly additive

[2] PRGs are risk-based, media-specific concentrations that are protective of human health. They are calculated using an acceptable risk or hazard index level, default exposure assumptions, and chemical-specific toxicity criteria (USEPA, 2004). PRGs were not applied in this HRA; however, route extrapolated toxicity criteria derived for the PRGs were used for two COPCs, as shown on Table 1.

[3] Based on 20 m^3 per day inhalation rate, 70 kg body weight, and the chemical-specific conversion factor for mg/m^3 to ppm.

of their individual responses, or may be greater or less than that expected by the addition of their individual responses (i.e., synergism or antagonism) (Amdur et al., 1991). An example of an *additive* effect is when the combined effect of two chemicals is equal to the sum of the effect of each chemical given alone. Additive effects are the most common type of chemical interaction (Amdur et al., 1991). A *synergistic* effect occurs when the combined effect of two chemicals is greater than the sum of the effect of each one given alone. An *antagonistic* effect occurs when the combined effect of two chemicals is less than the sum of the effect of each one given alone.

USEPA (1989a) guidelines indicate that carcinogenic risks should be treated as additive and that noncancer hazard indices should also be treated as additive. USEPA and CalEPA methodology for predicting the potential carcinogenic risks is to sum the risks for each carcinogenic COPC. Similarly, USEPA and CalEPA methodology for predicting the noncancer hazard is to sum hazard quotients for each of the noncarcinogenic COPCs. This is considered to be a health-protective approach as many chemicals affect different organs and exert toxic effects by different mechanisms (USEPA, 1989a). These assumptions are made to help prevent an underestimation of cancer risk or noncancer hazard index.

In regard to the specific COPCs evaluated in the HRA, there are no known synergistic effects associated with combined exposures to low doses of the COPCs (Amdur et al., 1991; CalEPA/OEHHA, 2006; USEPA, 2006). Accordingly, additivity is a conservative assumption for the COPCs.

7.3 EXPOSURE ASSESSMENT

Uncertainties in the exposure assessment can be related to representativeness of site characterization data, exposure scenarios, exposure parameter values, and exposure point concentrations (EPCs).

Representativeness of Site Characterization Data

Exposure may be underestimated if site data are not representative of the potential exposure points. Based on analysis of the EPA Method 8260B soil vapor data set, the highest soil vapor results within the boundaries of the site were used as the basis for the air EPCs. Based on the results of the data usability evaluation, the data were deemed complete and representative for the site.

Accordingly, there is acceptable confidence that the site is adequately characterized for assessment of worker receptors and the potential for underestimation of risk due to non-representativeness of the site data is low.

Exposure Scenarios and Parameter Values

Assumptions regarding land use and receptor activities influence the selection of input parameters employed in the exposure assessment (e.g., time spent at a particular location, weight, age, breathing rate of potential receptors, environmental media contacted by the receptors). An indoor worker receptor was selected as the receptor that would have the highest potential exposure under a commercial land use scenario. Reasonable maximum exposure (i.e., “high-end” value) assumptions were employed for exposure parameters for all receptors so as to minimize the potential for underestimation of exposure.

Exposure Point Concentrations (EPCs)

Exposure may be underestimated if the estimated EPCs are underestimated. VOC indoor air EPCs for the indoor worker receptor were conservatively estimated using the J&E model. For each COPC, the maximum reported soil vapor concentration was used as input to the model. The potential for underestimation of indoor air EPCs in the HRA is low due to the use of these maximum concentrations, as well as the many conservative features of the J&E model, which include:

- The model is one-dimensional and unidirectional. As such, it assumes that COPCs are transported from the source in the upward direction only (toward the potential receptor). Lateral deflection due to the presence of low permeability units or multi-dimensional diffusive transport is conservatively ignored. (Diffusion is, physically and mathematically, a three-dimensional process.)

- Chemical degradation by any means is not included in the model. Incorporation of chemical degradation processes would result in lower EPCs and lower risks.
- A number of default building parameters are employed, including a conservative assumption of a minimum allowable air turnover rate. If actual air turnover rates were employed, the EPCs and risks would be lower, particularly since the door of the facility is always left open during operating hours.

In summary, the potential for underestimation of air EPCs in the HRA is low.

7.4 RISK CHARACTERIZATION

Standard risk characterization methods were applied to estimate incremental lifetime cancer risks and hazard indices. For the COPCs evaluated in the HRA, the assumption of chemical additivity is deemed as health protective. A RME was evaluated, as recommended by USEPA (1989a, 1989b, 1992c, 1995). The RME, as defined by the USEPA, is the "highest exposure that is reasonably expected to occur" and is intended to best represent a conservative exposure estimate that is within the range of possible exposures (USEPA, 1989a, 1991).

While it is recognized that uncertainties are inherent in the health risk assessment process, USEPA is confident that health risk assessment serves as a health-protective analytical framework that can be used to support environmental decisions having the objective of protecting human health (USEPA, 1989a; NAS, 1993). USEPA advises that conservatism in the risk estimate be communicated in the risk assessment and suggests the following statement in regard to estimated incremental lifetime cancer risks characterized using the HRA framework (USEPA, 1986):

> "These values are upperbound estimates of excess cancer risk potentially arising from lifetime exposure to the chemical in question. A number of assumptions have been made in the derivation of these values, many of which are likely to overestimate exposure and toxicity. The actual incidence of cancer is likely to be lower than these estimates and may be zero."

8 LIMITATIONS

This HRA evaluates potential human health risks associated with the inhalation pathway as the result of volatilization of COPCs from the subsurface at the site. The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, expressed or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client, Avalon Environmental Consultants, Inc. Any reliance on this report by a third party is at such party's sole risk. Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulation subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

9 REFERENCES CITED

Agency for Toxic Substances and Disease Registry (ATSDR), 1996. Toxicological Profile for 1,2-Dichloroethene. August. (www.atsdr.cdc.gov/toxprofiles/tp87.html).

ATSDR, 2004. Minimal Risk Levels for Hazardous Substances. U.S. Dept. Health Human Serv., December. (www.atsdr.cdc.gov.mrls/).

Amdur, M.O., Doull, J., and C.D. Klaassen (editors), 1991. Casarett and Doull's Toxicology, The Basic Science of Poisons. 4th ed., McGraw-Hill, Inc.

Avalon Environmental Consultants, Inc., 2006. Work Plan for Soil Gas Investigation and Health Risk Assessment at 1 Hour Cleaners, 1187 Solano Avenue, Albany, California 94709. January 11.

American Cancer Society (ACS), 2006. Probability of Developing Invasive Cancers Over Selected Age Intervals, by Sex, US, 2000-2002. (www.cancer.org/downloads/stt/CAFF06Prob.pdf).

California Environmental Protection Agency/Department of Health Services (CalEPA/DHS), 1994. Safe Drinking Water and Toxic Enforcement Act of 1986 - Title 22 CCR, Division 2, Part 2, Subdivision 1, Chapter 3 (Proposition 65).

California Environmental Protection Agency/Department of Toxic Substances Control (CalEPA/DTSC), 1992. Supplemental Guidance for Human Health Multimedia Risk Assessment of Hazardous Waste Sites and Permitted Facilities. October 7.

CalEPA, 2003. Advisory – Active Soil Gas Investigation. Jointly issued by the Regional Water Quality Control Board, Los Angeles Region and the DTSC. January, 28. (www.dtsc.ca.gov/LawsRegsPolicies/Policies/SiteCleanup/upload/SMBR_ADV_activesoilgasinvst.pdf).

CalEPA/DTSC, 2005. Guidance for the Evaluation of Mitigation of Subsurface Vapor Intrusion to Indoor Air. Interim Final, December 15, 2004 (Revised February 7, 2005).

California Environmental Protection Agency/Office of Environmental Health Hazard Assessment (CalEPA/OEHHA), 2006. Toxicity Criteria Database. (www.oehha.ca.gov/risk/ChemicalDB/index.asp).

Johnson, P.C. and R.A. Ettinger, 1991. Heuristic model for predicting the intrusion rate of contaminant vapors into buildings. Environmental Science and Technology, 25:1445-1452.

National Academy of Sciences (NAS), 1983. Risk Assessment in the Federal Government: Managing the Process. National Academy Press, Washington, DC.

Transglobal Environmental Geochemistry (TEG), 2006. Data Report – Avalon Environmental Consultants, Inc. Project #0420-458-4. 1187 Solano Avenue, Albany, California. TEG Project #60414D, April, 28.

United States Environmental Protection Agency (USEPA), 1986. Guidelines for Carcinogenic Risk Assessment. 51 Federal Register, CFR 2984, No. 185, Sep. 24.

USEPA, 1989a. Risk Assessment Guidance for Superfund (RAGS), Volume I Human Health Evaluation Manual (Part A), Office of Emergency and Remedial Response. December.

USEPA, 1989b. Human Health Risk Assessment, U.S. EPA Region IX Recommendations (Interim Final), December 15.

USEPA, 1991. Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions. Memorandum from D.R. Clay, Assistant Administrator, USEPA. OSWER Directive 9355.0-30, April.

USEPA, 1992a. Guidance for Data Usability in Risk Assessment (Part A), Final. Office of Emergency and Remedial Response. April.

USEPA, 1992b. Guidelines for Exposure Assessment. 57 Federal Register 22888, May 29.

USEPA, 1992c. Guidance on Risk Characterization for Risk Managers and Risk Assessors. Memorandum to EPA administrators from F.H. Habicht II, Deputy Administrator, USEPA. February.

USEPA, 1995. Guidance for Risk Characterization. Science Policy Council. February.

USEPA, 1997. Exposure Factors Handbook, Office of Research and Development. August.

USEPA. 2004a. User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings. Prepared by Environmental Quality Management, Inc. for the U.S. Environmental Protection Agency (Office of Emergency and Remedial Response, Washington, D.C.). June 19.

USEPA, 2004b. Preliminary Remediation Goals. Region 9, Solid and Hazardous Waste, Superfund (www.epa.gov/region09/waste/sfund/prg/index.htm).

USEPA, 2005. Guidelines for Carcinogen Risk Assessment. Risk Assessment Forum, March.

USEPA, 2006. Integrated Risk Information System (IRIS). Online database of USEPA toxicity criteria. (www.epa.gov/iris/).

TABLES

Table 1. Toxicity Criteria

Analyte	Carcinogenic Effects		Non-Carcinogenic Effects			
	SF_i $(mg/kg\text{-}day)^{-1}$		REL (ug/m^3) or MRL (ppm)		RfD_i (mg/kg-day)	
c-1,2-DCE	Non-carcinogenic	a	-	-	0.020	c,r
t-1,2-DCE	Non-carcinogenic	a	-	-	0.010	b,c,r
Chloroform	0.019	a	300	a (REL)	0.086	e
TCE	0.007	a	600	a (REL)	0.171	e
Toluene	Non-carcinogenic	a	300	a (REL)	0.086	e
PCE	0.021	a	0.04	d (MRL)	0.079	e
Ethylbenzene	Non-carcinogenic	a	2000	a (REL)	0.571	e
Xylenes (m-, p-, and o- isomers)	Non-carcinogenic	a	700	a (REL)	0.200	e

Notes:

SFi	Inhalation slope factor $(mg/kg\text{-}day)^{-1}$
RfDi	Inhalation reference dose (mg/kg-day)
REL	Reference exposure level (CalEPA/OEHHA, 2006)
RfC	Chronic inhalation reference concentration (USEPA/IRIS, 2006)
a	From CalEPA/OEHHA (2006)
b	From USEPA IRIS (2006)
c	From USEPA Region 9 PRGs (2004)
d	From ATSDR (2004)
e	Inhalation reference dose (RfDi) based on CalEPA/OEHHA (2006) chronic inhalation reference exposure level (REL) or ATSDR MRL, default inhalation rate (20 m^3/day), and default body weight (70 kg) as follows: RfD_i = (REL in units of ug/m^3 X 20 m^3/day) / (70 kg X 1000 ug/mg) or (MRL in units of ppm x 6.89 mg/m^3 per ppm X 20 m^3/day) / (70 kg X 1000 ug/mg)
r	Route extrapolation (as per PRGs).

Table 1. Toxicity Criteria

Analyte	Carcinogenic Effects		Non-Carcinogenic Effects			
	SF_i $(mg/kg\text{-}day)^{-1}$		REL (ug/m^3) or MRL (ppm)		RfD_i (mg/kg-day)	
c-1,2-DCE	Non-carcinogenic	a	-	-	0.020	c,r
t-1,2-DCE	Non-carcinogenic	a	-	-	0.010	b,c,r
Chloroform	0.019	a	300	a (REL)	0.086	e
TCE	0.007	a	600	a (REL)	0.171	e
Toluene	Non-carcinogenic	a	300	a (REL)	0.086	e
PCE	0.021	a	0.04	d (MRL)	0.079	e
Ethylbenzene	Non-carcinogenic	a	2000	a (REL)	0.571	e
Xylenes (m-, p-, and o- isomers)	Non-carcinogenic	a	700	a (REL)	0.200	e

Notes:

SFi	Inhalation slope factor $(mg/kg\text{-}day)^{-1}$
RfDi	Inhalation reference dose (mg/kg-day)
REL	Reference exposure level (CalEPA/OEHHA, 2006)
RfC	Chronic inhalation reference concentration (USEPA/IRIS, 2006)
a	From CalEPA/OEHHA (2006)
b	From USEPA IRIS (2006)
c	From USEPA Region 9 PRGs (2004)
d	From ATSDR (2004)
e	Inhalation reference dose (RfDi) based on CalEPA/OEHHA (2006) chronic inhalation reference exposure level (REL) or ATSDR MRL, default inhalation rate (20 m^3/day), and default body weight (70 kg) as follows: RfD_i = (REL in units of ug/m^3 X 20 m^3/day) / (70 kg X 1000 ug/mg).
r	Route extrapolation (as per PRGs).

Table 2. Exposure Parameters

(for default indoor worker receptor)

Parameters	Value	Notes
Exposure Frequency (EF); in days/year	250	a
Exposure Duration (ED); in years	25	a
Body Weight (BW); in kg	70	a
Averaging Time (AT); in days	25,550 9,125	b, c b, d
Inhalation Rate (IR); in m^3/day	20	a

a - From USEPA, 1997 and 2002.
b - From USEPA, 1989.
c - For cancer endpoint (USEPA, 1989).
d - For noncancer endpoint (USEPA, 1989).

Table 3. Source Term Concentrations and Model-predicted Indoor Air Exposure Point Concentrations for Current Indoor Worker Receptor

(calculated using the J&E model)

Detected Analyte	Source term concentration (used as input to the J&E Model); in units of ug/L (mg/m^3)*	Attenuation Factor (unitless)	J&E Model-predicted EPC (mg/m^3)
t-1,2-DCE	0.39	4E-05	1.61E-05
c-1,2-DCE	1	4E-05	4.19E-05
Chloroform	1.5	5E-05	7.31E-05
TCE	10	4E-05	4.30E-04
Toluene	1.6	4E-05	7.17E-05
PCE	170	4E-05	7.06E-03
Ethylbenzene	0.18	4E-05	7.59E-06
Xylenes (*m*- , *p*- , and *o* - isomers)**	1.4	4E-05	6.28E-05

* - Source term is based on maximum concentration detected in soil vapor.

** - EPC shown for Xylenes is based on *o* -Xylene as it results in the highest EPC.

Table 4. Incremental Lifetime Cancer Risk
Indoor Worker Receptor - Inhalation of Indoor Air

INHALATION OF INDOOR AIR

COPC	$C_{indoor\ air}$* (mg/m^3)	IR (m^3/day)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	LADD (mg/kg-d)	$CSF_{inhalation}$ $(mg/kg\text{-}d)^{-1}$	Cancer Risk (u)	% Contribution
t-1,2-DCE				Non-carcinogenic					-	-
c-1,2-DCE				Non-carcinogenic					-	-
Chloroform	7.31E-05	20	250	25	70	25550	5.11E-06	0.019	1E-07	1%
TCE	4.30E-04	20	250	25	70	25550	3.01E-05	0.007	2E-07	2%
Toluene				Non-carcinogenic					-	-
PCE	7.06E-03	20	250	25	70	25550	4.93E-04	0.021	1E-05	97%
Ethylbenzene				Non-carcinogenic					-	-
Xylenes (m-, p-, and o- isomers)				Non-carcinogenic					-	-
							Cancer Risk for Inhalation of Indoor Air =>		**1E-05**	100%

* Air EPCs based on J&E model using maximum soil gas concentrations as the input concentration.

Table 5. Hazard Index
Indoor Worker Receptor - Inhalation of Indoor Air

INHALATION OF INDOOR AIR

COPC	$C_{indoor\ air}$* (mg/m^3)	IR (m^3/day)	EF (days/yr)	ED (yrs)	BW (kg)	AT (days)	ADD (mg/kg-d)	$RfD_{inhalation}$ (mg/kg-d)	HQ (u)	% Contribution
t-1,2-DCE	1.61E-05	20	250	25	70	9125	3.15E-06	0.020	2E-04	0.8%
c-1,2-DCE	4.19E-05	20	250	25	70	9125	8.19E-06	0.010	8E-04	4.2%
Chloroform	7.31E-05	20	250	25	70	9125	1.43E-05	0.086	2E-04	0.9%
TCE	4.30E-04	20	250	25	70	9125	8.42E-05	0.171	5E-04	2.5%
Toluene	7.17E-05	20	250	25	70	9125	1.40E-05	0.086	2E-04	0.8%
PCE	7.06E-03	20	250	25	70	9125	1.38E-03	0.079	2E-02	90.4%
Ethylbenzene	7.59E-06	20	250	25	70	9125	1.49E-06	0.571	3E-06	0.0%
Xylenes (m-, p-, and o- isomers)	6.28E-05	20	250	25	70	9125	1.23E-05	0.200	6E-05	0.3%
							Hazard Index for Inhalation of Indoor Air =>		**2E-02**	100%

* Air EPCs based on J&E model using maximum soil gas concentrations as the input concentration.

Table 6

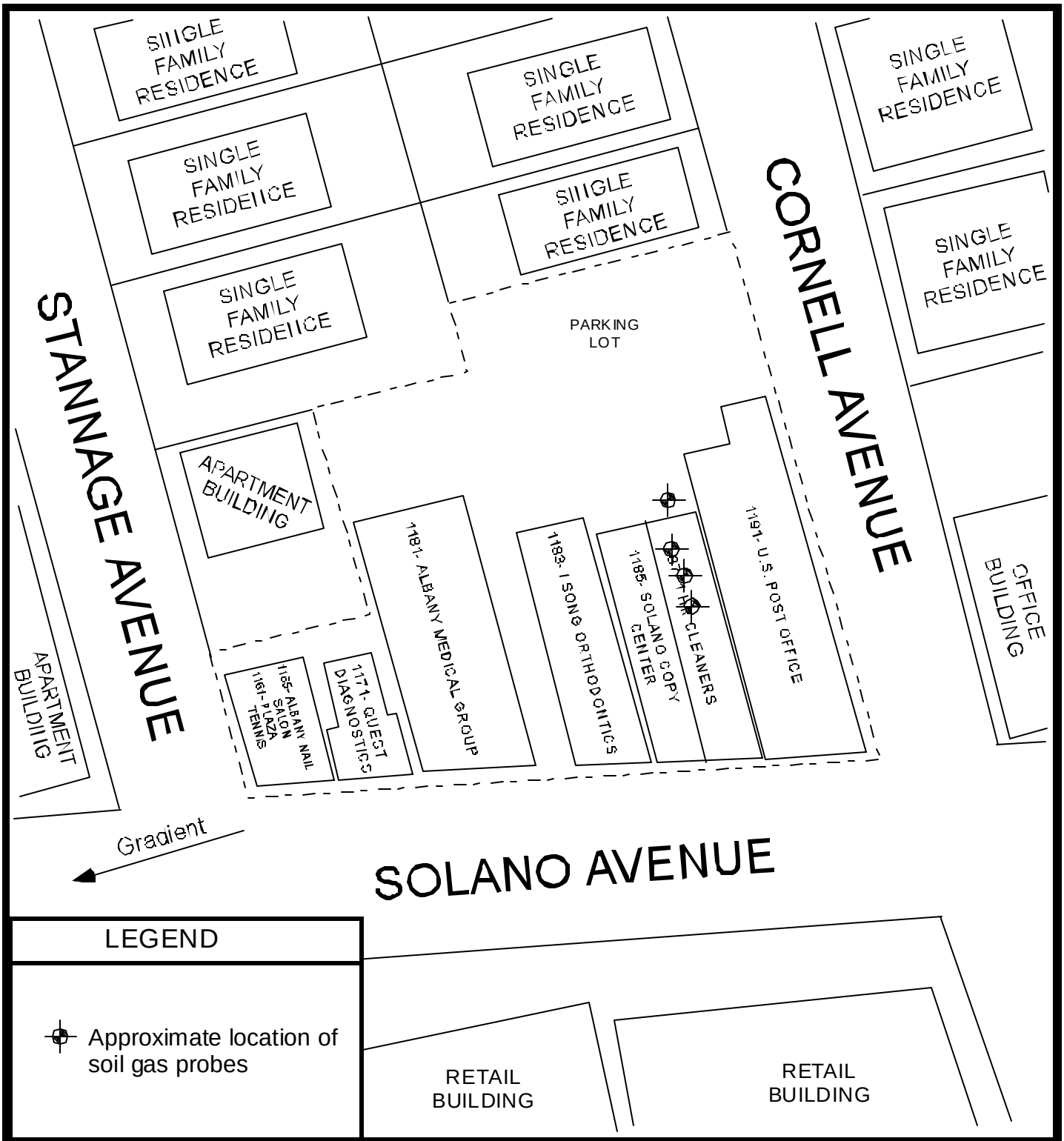
Summary of ILCR and HI Values

Inhalation of VOCs in Indoor Air

Indoor Worker Receptor

Exposure Area	ILCR	HI
Current Dry Cleaning Facility	1E-05	2E-02

FIGURES



LEGEND

⊕ Approximate location of soil gas probes

SITE LOCATION PLAN (Location of proposed borings)

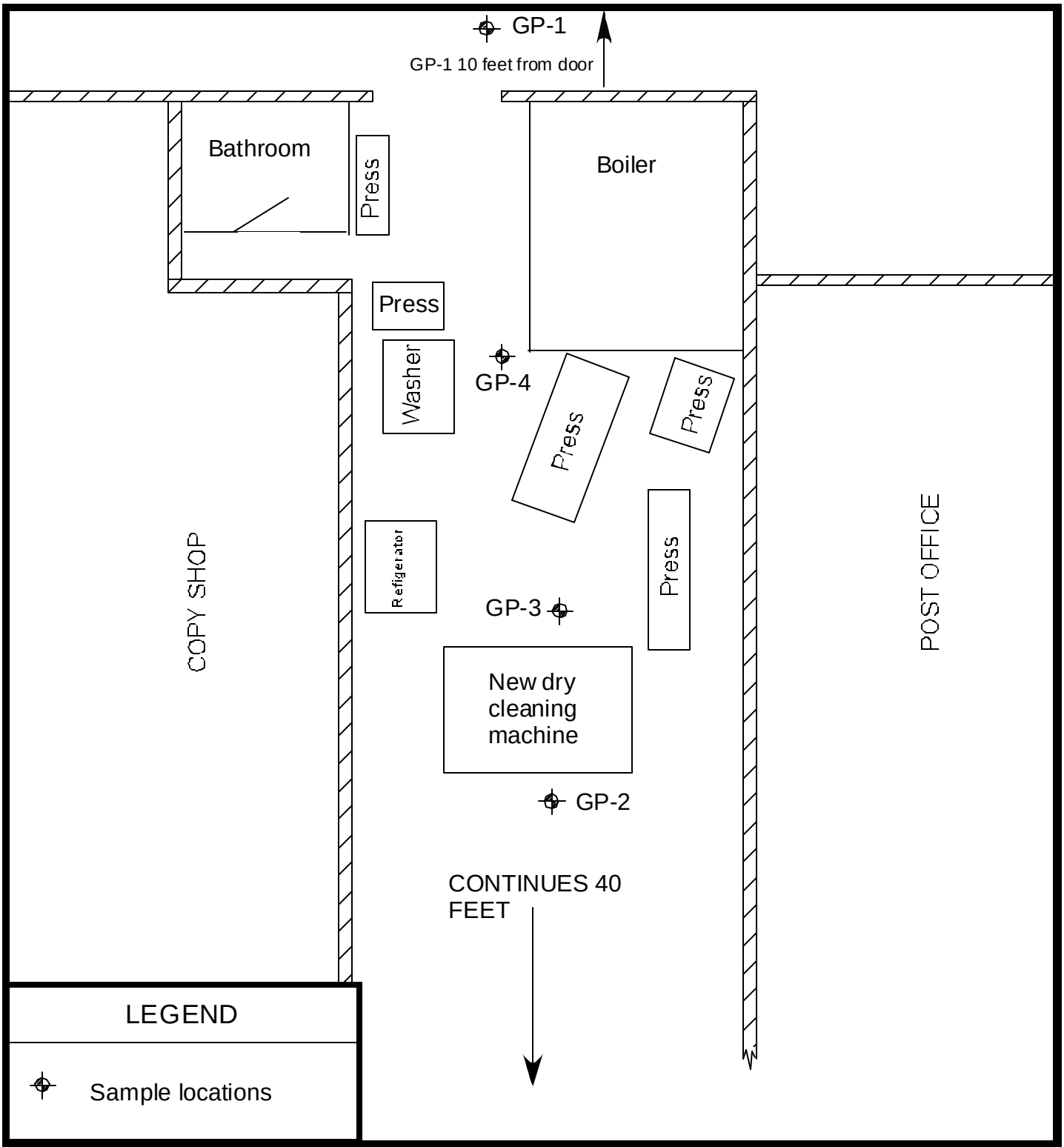
N

Site Address:	1161-1191 Solano Avenue	Client Name:	Kershaw Investments
Site City/State:	Albany, California	Project No.:	0420-458-3

AVALON ENVIRONMENTAL CONSULTANTS, INC.
ALAMEDA, CALIFORNIA

0 30 60 feet

FIGURE 1



SOIL GAS LOCATION MAP

N

Site Address:	1187 Solano Avenue	Client Name:	Solano Group
Site City/State:	Albany, California	Project No.:	0420-458-4

AVALON ENVIRONMENTAL CONSULTANTS
ALAMEDA, CALIFORNIA

Scale: 0 10 FEET

FIGURE 2

ATTACHMENT A

Work Plan for Soil Gas Investigation and Health Risk Assessment at 1 Hour Cleaners, 1187 Solano Avenue, Albany, California

AVALON
ENVIRONMENTAL
CONSULTANTS, INC.

131 NORTH TUSTIN AVENUE • SUITE 213 • TUSTIN, CALIFORNIA 92780
TEL: (714) 836-6632 • FAX: (714) 836-6642

941 SHORE POINT COURT • SUITE F121 • ALAMEDA, CALIFORNIA 94501
TEL: (510) 521-2441 • FAX: (510) 521-2607

January 11, 2006

Mr. Jerry Wickham
Alameda County Environmental Health Department
1131 Harbor Bay Parkway
Alameda, California 94502-6577

Subject: **Work Plan for Soil Gas Investigation and Health Risk Assessment at 1 Hour Cleaners located at 1187 Solano Avenue, Albany, California 94709.**

Dear Mr. Wickham:

Pursuant to your request, Avalon Environmental Consultants, Inc. (Avalon), has prepared this work plan to perform a Soil Gas Investigation and Health Risk Assessment at the above referenced dry cleaning facility in response to the Alameda County Environmental Health Department (ACEHD) review letter dated November 4, 2005. Avalon has previously performed a Phase II Environmental Site Assessment (ESA) at the subject property in November 2004, and a Phase II Subsurface Groundwater Assessment (SGA) on May 4, 2005. The Phase II ESA identified elevated levels of Tetrachlorethene (PCE) in the soil beneath the concrete slab of the dry cleaning unit ranging from 8.4 to 1,100 parts per billion (ppb.) The Phase II SGA identified low levels of PCE in the near surface soils, and non detect levels in the deeper soils and groundwater. Based upon the findings of these investigations, the ACEHD has recommended that soil gas sampling be conduced in the dry cleaning space in order to determine if there are vapor intrusion concerns at the subject property space. Additionally, the ACEHD has requested that the possible mechanism for the transport of low levels of PCE in soils 90 feet horizontally from the source be addressed in this work plan.

HORIZONTAL EXTENT OF PCE IN SOIL

As noted by the ACEHD, Phase II SGA identified PCE levels ranging from 6.6 to 310 ppb at a depth of ten feet bgs in four of the five borings drilled in that investigation. Three of the borings were located approximately ninety feet from the dry cleaning operation. The ACEHD has requested a mechanism for the widespread detections of PCE at the subject property.

Avalon believes that the most probable mechanism may have been from several plumbing leaks which occurred on the subject property. According to the owner of the subject property Mr. J. Anthony Kershaw, there have been two large plumbing leaks in the subject property dry cleaning space which caused considerable flooding. One of the leaks took place in late 2000 and the other took place in late 2003. The first leak in 2000 only released twenty or thirty gallons of water, however, the second leak in 2003 released hundreds of gallons of water as it happened over a weekend and was not shut off until it was discovered the following Monday. The leaks were located in rear portion of the cleaner space and it is

probable that the water along with residual PCE flowed into the adjoining suite moving in a south and west direction which is the current surface flow direction.

SOIL GAS INVESTIGATION

Avalon's soil gas investigation will consist of subsurface sampling with four geoprobe borings to a depth of five and fifteen feet below ground surface (bgs). The assessment will be conducted using a limited access geoprobe device. This device, similar to a drill rig, is a pointed probe which pushes through the soil rather than drilling. The geoprobe generates no soil cuttings and therefore, saves in the expense and liability of soil disposal.

The four geoprobe borings will be advanced to depths of five and fifteen feet bgs. Guidelines in conducting the soil gas testing will be in general accordance with the DTSC Guidance for the *Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* dated December 15, 2004: Testing will also be conducted in accordance with the 2003 Cal EPA guidance document *Advisory-Active Soil Gas Investigation*, issued by the Regional Water Quality Control Board, Los Angeles Region and DTSC, January 28 {www.dtsc.ca.gov/publicationsforms/index.html}

Per the guidance documents:

- Samples will be collected at five and fifteen feet below ground surface.
- Surface area around the soil gas sampler will be sealed to prevent ambient air intrusion.
- Samples will be collected using glass syringes.
- A mobile laboratory will be onsite to analyze the samples to ensure sample recovery.
- Purging and sampling will be performed at low flow rates (Less than 200 milliliters per minute)

The borings will be located in or near the area of the dry cleaning space where previous highest detections were made. Locations are shown in attached Figure 1 and 2.

At the conclusion of sample collection and analysis, a report of findings and conclusions will be prepared and delivered to Alameda County Environmental Health Department. The report will address the soil gas results and a risk evaluation of the sites potential for vapor intrusion based upon DTSC screening numbers pursuant to SB 32 by OEHHA. The health risk assessment will be reviewed by a Board Certified Toxicologist.

SENSITIVE RECEPTORS

No sensitive receptors such as schools, day care centers or hospitals are located within 100 feet of the subject property structure. An orthodontics office is located approximately 50 feet west of the subject property, and a general medical practice is located approximately 70 feet west of the subject property. A post office is located adjacent east of the subject property, and residences are located greater than 100 feet north separated by a parking lot. South of the subject property are retail buildings also greater than 100 feet.

Should you have any questions or require further information, please feel free to contact Trevor Santochi at (510) 521-2441.

Sincerely,
AVALON ENVIRONMENTAL CONSULTANTS, INC.

Trevor Santochi, RG, CEG
President

CC: J. Anthony Kershaw, Solano Group.

OBJECTIVE

The objective of this investigation is to evaluate the potential for vapor intrusion from PCE contamination in the subsurface beneath the subject property.

SCOPE OF WORK

Site Safety and Health Plan:

Prior to subsurface testing, as required by law, a Site Safety and Health Plan will be prepared to insure workers and sub-contractors are aware of the risks and safety procedures associated with this soil gas investigation.

Underground Service Alert and Permitting

As required by law, Underground Service Alert (USA) will be contacted to check the proposed probe locations for conflict with public utilities, such as gas or electrical lines. Permits from Alameda County Public Works Department, and the City of Albany Public Works Department will be obtained as required by law.

Subsurface Testing

The four geoprobe borings will be advanced to depths of five and fifteen feet bgs. Guidelines in conducting the soil gas testing will be in general accordance with the DTSC Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air dated December 15, 2004. Per the guidance document:

- Samples will be collected at five and fifteen feet below ground surface.
- Surface area around the soil gas sampler will be sealed to prevent ambient air intrusion.
- Samples will be collected using glass syringes. A mobile laboratory will be onsite to analyze the samples to ensure sample recovery.
- Purging and sampling will be performed at low flow rates (Less than 200 milliliters per minute)

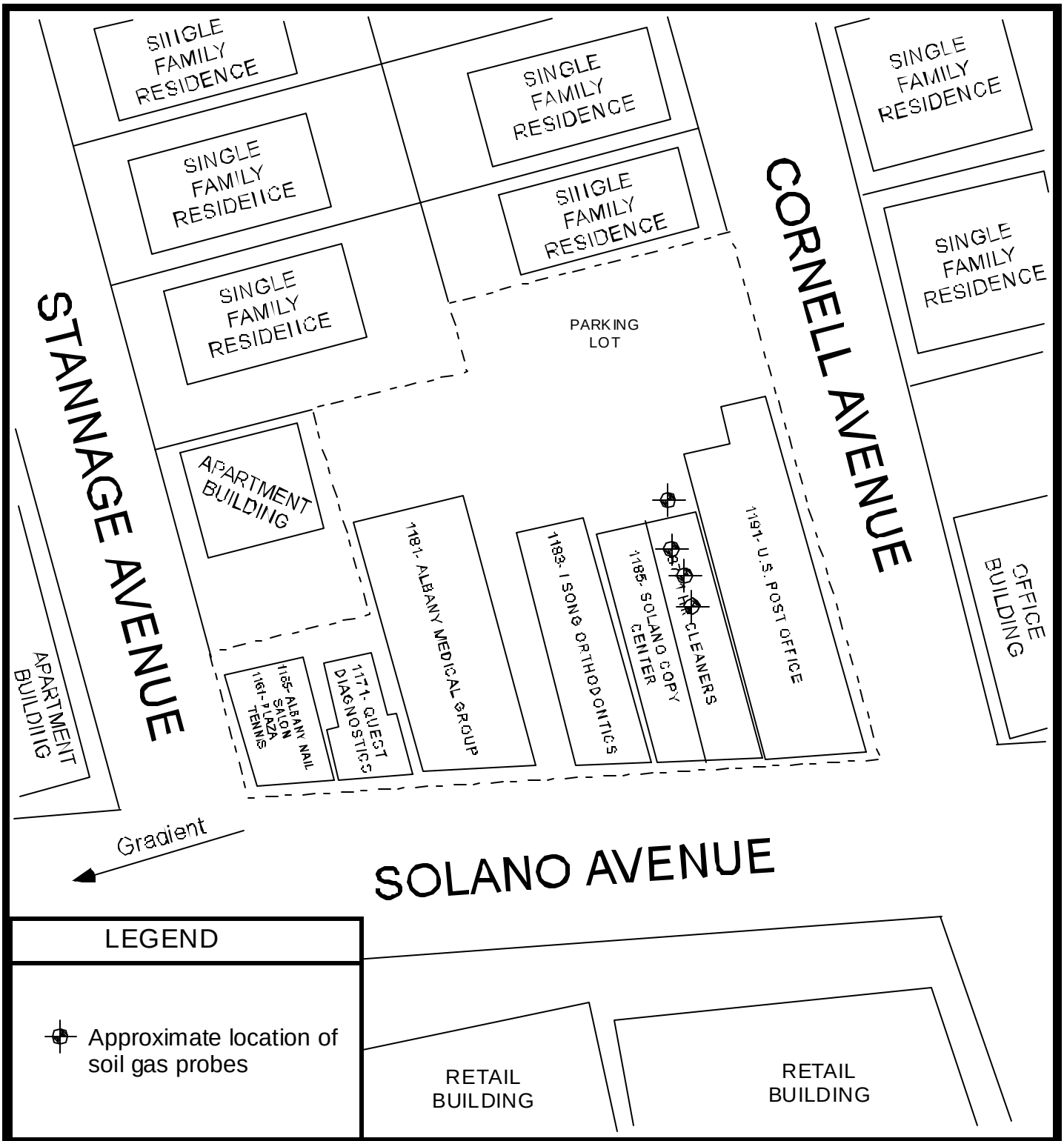
The borings will be located in or near the area of the dry cleaning space where previous highest detections were made. Locations are show in the attached Figure I.

Analytical Testing

The soil gas samples will be analyzed for Chlorinated Compounds by EPA method 8260 to the parts per billion level. Samples will be analyzed on site by a mobile certified laboratory under chain-of-custody.

Assessment Report

At the conclusion of sample collection and analysis, a report of findings and conclusions will be prepared and delivered to Alameda County Environmental Health Department. The report will address the soil gas results and will include a risk evaluation of the sites potential for vapor intrusion based upon DTSC screening numbers pursuant to SB 32 by OEHHA. The health risk assessment will be reviewed by a Board Certified Toxicologist.



LEGEND

⊕ Approximate location of soil gas probes

SITE LOCATION PLAN (Location of proposed borings)

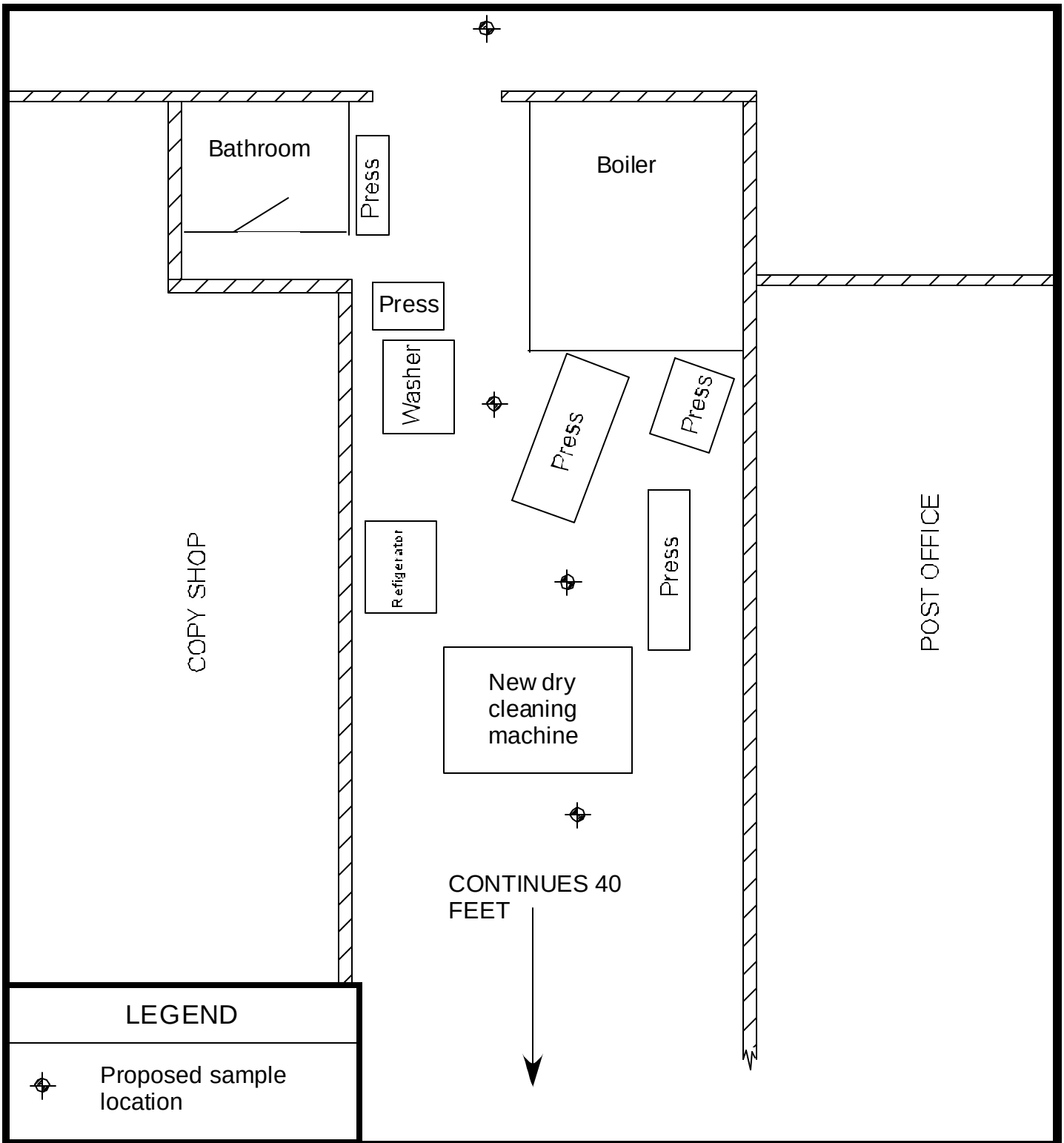
N

Site Address:	1161-1191 Solano Avenue	Client Name:	Kershaw Investments
Site City/State:	Albany, California	Project No.:	0420-458-3

AVALON ENVIRONMENTAL CONSULTANTS, INC.
ALAMEDA, CALIFORNIA

0 30 60 feet

FIGURE 1



LEGEND

Proposed sample location

SOIL GAS LOCATION MAP

N

Site Address:	1187 Solano Avenue	Client Name:	Solano Group
Site City/State:	Albany, California	Project No.:	WORK PLAN

AVALON ENVIRONMENTAL CONSULTANTS
ALAMEDA, CALIFORNIA

Scale: 0 10 FEET

FIGURE 2

ATTACHMENT B

TEG Laboratory Report
Soil Vapor Investigation, 1187 Solano Avenue, Albany, California
April, 2006

teg

TRANSGLOBAL
ENVIRONMENTAL
GEOCHEMISTRY

28 April 2006

Mr. Trevor Santochi
Avalon Environmental Consultants, Inc.
131 North Tustin Avenue, Suite 213
Tustin, CA 92780

SUBJECT: DATA REPORT - Avalon Environmental Consultants, Inc. Project #0420-458-4
1187 Solano Avenue, Albany, California

TEG Project #60414D

Mr. Santochi:

Please find enclosed a data report for the samples analyzed from the above referenced project for Avalon Environmental Consultants, Inc. The samples were analyzed on site in TEG's mobile laboratory. TEG conducted a total of 7 analyses on 7 soil vapor samples.

-- 7 analyses on soil vapors for volatile organic hydrocarbons by EPA method 8260B.

The results of the analyses are summarized in the enclosed tables. Applicable detection limits and calibration data are included in the tables.

1,1 difluoroethane was used as a leak check compound around the probe rods during the soil vapor sampling. No 1,1 difluoroethane was detected in any of the vapor samples reported at or above the DTSC recommended leak check compound reporting limit of 10 µg/L of vapor.

TEG appreciates the opportunity to have provided analytical services to Avalon Environmental Consultants, Inc. on this project. If you have any further questions relating to these data or report, please do not hesitate to contact us.

Sincerely,

Mark Jerpbak
Director, TEG-Northern California

teg

Avalon Environmental Project # 0420-458-4
1187 Solano Avenue, Albany, California

TEG Project #60414D

EPA Method 8260B VOC Analyses of SOIL VAPOR in ug/L of Vapor

SAMPLE NUMBER:		Probe Blank	SG-1@5	SG-1@5	SG-1@5	SG-2@5	SG-3@5	SG-4@5	SG-4@5 dup
SAMPLE DEPTH (feet):			5.0	5.0	5.0	5.0	5.0	5.0	5.0
PURGE VOLUME:			1	3	7	3	3	3	3
COLLECTION DATE:		4/14/06	4/14/06	4/14/06	4/14/06	4/14/06	4/14/06	4/14/06	4/14/06
COLLECTION TIME:		08:40	08:55	09:25	09:55	10:20	10:40	11:25	11:55
DILUTION FACTOR:		1	1	1	1	1	10	10	10
	RL								
Dichlorodifluoromethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Vinyl Chloride	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Chloroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Trichlorofluoromethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
1,1-Dichloroethene	0.10	nd	nd	nd	nd	nd	nd	nd	nd
1,1,2-Trichloro-trifluoroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Methylene Chloride	0.10	nd	nd	nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	0.10	nd	nd	nd	nd	0.39	nd	nd	nd
1,1-Dichloroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
cis-1,2-Dichloroethene	0.10	nd	nd	nd	nd	1.0	nd	nd	nd
Chloroform	0.10	nd	nd	nd	nd	0.13	nd	1.5	1.6
1,1,1-Trichloroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Carbon Tetrachloride	0.10	nd	nd	nd	nd	nd	nd	nd	nd
1,2-Dichloroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Benzene	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Trichloroethene	0.10	nd	nd	nd	nd	10	7.9	5.5	5.2
Toluene	0.10	nd	0.72	0.65	0.50	0.50	1.4	1.6	1.7
1,1,2-Trichloroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
Tetrachloroethene	0.10	nd	0.28	0.39	0.30	90 (10)	100	170	180
Ethylbenzene	0.10	nd	0.18	0.17	0.14	0.12	nd	nd	nd
1,1,1,2-Tetrachloroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
m,p-Xylene	0.10	nd	0.71	0.69	0.61	0.45	1.4	1.4	1.6
o-Xylene	0.10	nd	0.28	0.29	0.23	0.20	nd	nd	nd
1,1,2,2-Tetrachloroethane	0.10	nd	nd	nd	nd	nd	nd	nd	nd
1,1 Diflouroethane (leak check)	10	nd	nd	nd	nd	nd	nd	nd	nd
Surrogate Recovery (DBFM)		111%	109%	107%	111%	104%	107%	104%	108%
Surrogate Recovery (1,2-DCA-d4)		107%	107%	105%	109%	102%	106%	103%	107%
Surrogate Recovery (Toluene-d8)		92%	98%	93%	97%	91%	90%	90%	89%

'RL' Indicates reporting limit at a dilution factor of 1
'nd' Indicates not detected at listed reporting limits
(NUMERAL) = Dilution factor for this compound

Analyses performed in TEG-Northern California's lab
Analyses performed by: Mr. John Henkelman

11350 Monier Park Place, Rancho Cordova, CA 95742 Phone: (916) 853-8010 Fax: (916) 853-8020

TEG Project #60414D

CALIBRATION STANDARDS - Initial Calibration / LCS

Instrument: Agilent 5973N MSD

	INITIAL CALIBRATION		LCS	
COMPOUND	RF	%RSD	RF	%DIFF
Dichlorodifluoromethane*	0.307	16.0%	0.275	10.4%
Vinyl Chloride*	0.260	11.1%	0.246	5.4%
Chloroethane*	0.104	24.8%	0.126	21.2%
Trichlorofluoromethane*	0.436	12.8%	0.440	0.9%
1,1-Dichloroethene	0.213	13.3%	0.202	5.2%
1,1,2-Trichloro-trifluoroethane*	0.236	13.9%	0.242	2.5%
Methylene Chloride	0.184	13.6%	0.181	1.6%
trans-1,2-Dichloroethene	0.225	12.7%	0.218	3.1%
1,1-Dichloroethane	0.388	14.1%	0.384	1.0%
cis-1,2-Dichloroethene	0.279	14.0%	0.275	1.4%
Chloroform	0.462	12.5%	0.439	5.0%
1,1,1-Trichloroethane	0.429	12.0%	0.423	1.4%
Carbon Tetrachloride	0.344	18.6%	0.380	10.5%
1,2-Dichloroethane	0.313	15.2%	0.309	1.3%
Benzene	1.201	19.3%	1.117	7.0%
Trichloroethene	0.307	12.8%	0.298	2.9%
Toluene	0.702	12.5%	0.656	6.6%
1,1,2-Trichloroethane	0.135	16.3%	0.144	6.7%
Tetrachloroethene	0.380	13.2%	0.425	11.8%
Ethylbenzene	0.584	11.6%	0.605	3.6%
1,1,1,2-Tetrachloroethane	0.334	17.5%	0.381	14.1%
m,p-Xylene	0.708	18.3%	0.631	10.9%
o-Xylene	0.716	16.0%	0.689	3.8%
1,1,2,2-Tetrachloroethane	0.448	19.3%	0.510	13.8%
Naphthalene	1.357	19.2%	1.550	14.2%
ACCEPTABLE LIMITS:		20.0%		15.0%

'*' INDICATES RSD NOT TO EXCEED 30% & LCS NOT TO EXCEED 25%

ATTACHMENT C

Data Usability Evaluation

ATTACHMENT C

USABILITY OF ANALYTICAL DATA FOR RISK ASSESSMENT

Evaluation of analytical data, in terms of usability for this assessment, was conducted using the criteria provided by USEPA in the *Guidance for Data Usability in Risk Assessment* (Part A), Final (USEPA, 1992a). These USEPA criteria include:

1. Reports – confirmation that report(s) relied upon are complete and appropriate for use in the HRA;

2. Documentation – confirmation that each analytical result is associated with a specific sample location and that the appropriate sampling procedure is documented;

3. Data Sources – confirmation that the analytical methods used are appropriate to identify the chemicals of potential concern for the media of interest;

4. Analytical Methods and Detection Limits - confirmation that analytical methods appropriately identify the chemical form or species and that the sample detection limit is at or below a concentration appropriate for the risk assessment application;

5. Data Review – confirmation that the quality of analytical results is assessed by a professional knowledgeable in field collection procedures and analytical chemistry and that data quality are adequate to estimate exposure concentrations; and

6. Data Quality Indicators – documentation that sampling and analysis data quality indicators (including precision, accuracy, holding time, and reproducibility) are evaluated using criteria specific to the risk assessment.

A complete evaluation of the analytical data was conducted. A summary of the data analysis relevant to usability criteria for risk assessment are provided in Table C-1.

Table C-1. Data Usability Evaluation

Data Usability Criteria	Evaluation Result
Reports	The following report was the data source for the HRA: • Transglobal Environmental Geochemistry (TEG), 2006. Data Report – Avalon Environmental Consultants, Inc. Project #0420-458-4. 1187 Solano Avenue, Albany, California. TEG Project #60414D, April 28. • Avalon map with data locations. Soil vapor data reported in this report were used as the basis for exposure point concentrations in the HRA. This data source was considered complete for HRA purposes.
Documentation	The report provides adequate information regarding sample results related to geographic location and sampling procedures.
Data Sources	All analytical sample data results for the environmental media of interest (soil vapor) were provided. Based on sample locations (taken at apparent source locations and spread randomly throughout the property), and the sample results, the data were deemed representative of site conditions.
Analytical Method and Detection Limit	With respect to soil vapor samples, the samples were analyzed using EPA Method 8260B. This method is an industry standard used to characterize broad spectrum volatile organic compounds (VOCs) in soil vapor. Reporting limits were confirmed to be sufficient for risk assessment application.
Data Review	The quality of the analytical results was reviewed by TEG laboratory and Ms. Copeland.
Data Quality Indicators	Based on the field control duplicate and surrogate recovery results, precision and accuracy were deemed acceptable. Representativeness of the data was deemed acceptable as sampling included sitewide locations and locations biased to accommodate potential source and exposure locations. Completeness was considered adequate for HRA application, based on the analytical method and the analyte suite.

ATTACHMENT D

Toxicity Criteria Database Downloads

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Cancer Potency Information

search
OEHHA My CA

Toxicity Criteria Database: Cancer Potency

New Search:

Chemical Name

Trichloroethylene

OR

CAS Number

79016

New Search

Inhalation Unit Risk $(\mu g/cubic\ meter)^{-1}$	0.000002
Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$	0.007
Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	0.013
USEPA Classification	-
IARC Classification	2A: The agent is probably carcinogenic to humans
Comments	A change was made on 9/24/03, see history log for an explanation.
Reference	OEHHA, 2002 Technical Support Document for Describing Available Cancer Potency Factors OEHHA, 1999 Public Health Goal for Trichloroethylene in Drinking Water

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Chronic Reference Exposure Levels (RELs)

search
OEHHA My CA

Toxicity Criteria Database: Chronic RELs

New Search:

Chemical Name

Trichloroethylene

OR

CAS Number

79016

New Search

Chronic Inhalation REL (µg/m3): 600
Listed in CAPCOA: Yes
US EPA RfC: No
Target Organ(s): nervous system, eyes
Human data: Yes

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Cancer Potency Information

search
OEHHA My CA

Toxicity Criteria Database: Cancer Potency

New Search:

Chemical Name

Tetrachloroethylene

OR

CAS Number

127184

New Search

Inhalation Unit Risk $(\mu g/cubic\ meter)^{-1}$	0.0000059
Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$	0.021
Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	0.54
USEPA Classification	-
IARC Classification	2A: The agent is probably carcinogenic to humans
Comments	A change was made on 9/13/02, see history log for an explanation. Number based on calculation from PHG
Reference	OEHHA, 2002 Technical Support Document for Describing Available Cancer Potency Factors Public Health Goal for Tetrachloroethylene in Drinking Water, Aug. 2001

7. REGULATIONS AND ADVISORIES

The international, national, and state regulations and guidelines regarding tetrachloroethylene in air, water, and other media are summarized in Table 7- 1.

Tetrachloroethylene is on the list of chemicals appearing in "Toxic Chemicals Subject to Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986" (EPA 1987d).

As a result of the Eleventh Circuit Court of Appeals decision (AFL-CIO versus OSHA), OSHA's permissible exposure level for tetrachloroethylene, which was lowered to 25 ppm in 1989, was returned to 100 ppm (OSHA 1993). Based on human exposure data, Stewart et al. (1981) concluded that a TLV of 100 ppm contained no safety factor for individuals more susceptible to the subjective and neurological symptoms of tetrachloroethylene. Based on human data, the ACGIH (ACGIH 1995) TLV-TWA is 25 ppm. The geometric mean exposure of dry cleaning machine operators was 22 ppm (Ludwig et al. 1983), a value close to the ACGIH TLV-TWA.

ATSDR has derived an acute inhalation MRL of 0.2 ppm with an uncertainty factor of 10, based on increased pattern reversal visual-evoked potential latencies, and deficits for vigilance and eye-hand coordination observed in humans exposed 4 hours/day for 4 days at 50 ppm but not at 10 ppm (Altmann et al. 1992). A chronic-duration inhalation MRL of 0.04 ppm with an uncertainty factor of 100 was derived based on increased reaction times in workers exposed to tetrachloroethylene in dry cleaning shops at an average concentration of 15 ppm for about 10 years (Ferroni et al. 1992). An acute oral MRL of 0.05 mg/kg/day with an uncertainty factor of 100 was derived based on hyperactivity observed in 60-day-old mice that were treated with tetrachloroethylene for 7 days beginning at 10 days of age (Fredriksson et al. 1993). Additional inhalation and oral MRLs were not derived.

EPA (IRIS 1996) has derived an oral reference dose (RfD) for tetrachloroethylene of 0.01 mg/kg/day with an uncertainty factor of 1,000, based on hepatotoxicity in mice (Buben and O'Flaherty 1985). An inhalation reference concentration (RfC) for tetrachloroethylene has not been derived (IRIS 1996).

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Chronic Reference Exposure Levels (RELs)

search
OEHHA My CA

Toxicity Criteria Database: Chronic RELs

New Search:

Chemical Name

Ethylbenzene

OR

CAS Number

100414

New Search

Chronic Inhalation REL (µg/m3): 2000
Listed in CAPCOA: No
US EPA RfC: Yes
Target Organ(s): development; alimentary system (liver); kidney; endocrine system
Human data: No

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Chronic Reference Exposure Levels (RELs)

search
OEHHA My CA

Toxicity Criteria Database: Chronic RELs

New Search:

Chemical Name

Xylenes (m, o, p-isomers)

OR

CAS Number

New Search

Chronic Inhalation REL (µg/m3): 700
Listed in CAPCOA: Yes
US EPA RfC: No
Target Organ(s): nervous system, respiratory system
Human data: Yes

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Chronic Reference Exposure Levels (RELs)

search
OEHHA My CA

Toxicity Criteria Database: Chronic RELs

New Search:

Chemical Name

Toluene

OR

CAS Number

108883

New Search

Chronic Inhalation REL (µg/m3):	300
Listed in CAPCOA:	Yes
US EPA RfC:	Yes
Target Organ(s):	nervous system, respiratory system, development
Human data:	No

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Cancer Potency Information

search
OEHHA My CA

Toxicity Criteria Database: Cancer Potency

New Search:

Chemical Name

Chloroform

OR

CAS Number

67663

New Search

Inhalation Unit Risk $(\mu g/cubic\ meter)^{-1}$	0.0000053
Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$	0.019
Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	0.031
USEPA Classification	B2
IARC Classification	2B: The agent is possibly carcinogenic to humans
Comments	
Reference	OEHHA, 2002 Technical Support Document for Describing Available Cancer Potency Factors California Department of Health Services (CDHS) 1990. Health Effects of Chloroform. Office of Environmental Health Hazard Assessment, Air Toxicology and Epidemiology Section, Berkeley, CA

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Chronic Reference Exposure Levels (RELs)

search
OEHHA My CA

Toxicity Criteria Database: Chronic RELs

New Search:

Chemical Name

Chloroform

OR

CAS Number

67663

New Search

Chronic Inhalation REL (µg/m3): 300
Listed in CAPCOA: Yes
US EPA RfC: No
Target Organ(s): alimentary system, kidney, development
Human data: No

Key : SFo,i=Cancer Slope Factor oral, inhalation RfDo,i=Reference Dose oral, inhalation i=IRIS p=PPRTV c=California EPA n=NCEA h=HEAST x=Withdrawn r=Route-extrapolation ca=Cancer PRG nc= Noncancer PRG ca* (where: nc PRG < 100X ca PRG) ca** (where nc PRG < 10X ca PRG) +++=Non-Standard Method Applied (See User's Guide) sat=Soil Saturation (See User's Guide) max=Ceiling limit (See User's Guide) DAF=Dilution Attenuation Factor (See User's Guide) CAS=Chemical Abstract Services

TOXICITY VALUES									CONTAMINANT	PRELIMINARY REMEDIATION GOALS (PRGs) "Direct Contact Exposure Pathways"								SOIL SCREENING LEVELS "Migration to Ground Water"	
SFo 1/(mg/kg-d)		RfDo (mg/kg-d)		SFi 1/(mg/kg-d)		RfDi (mg/kg-d)		V O C / skin abs. soils / CAS No.		Residential Soil (mg/kg)		Industrial Soil (mg/kg)		Ambient Air (ug/m^3)		Tap Water (ug/l)		DAF 20 (mg/kg)	DAF 1 (mg/kg)
		9.0E-02	i			5.7E-02	h	y	95-50-1	**1,2-Dichlorobenzene**	6.0E+02	sat	6.0E+02	sat	2.1E+02	nc	3.7E+02	nc	1.7E+01	9.0E-01
		3.0E-02	n			3.0E-02	r	y	541-73-1	**1,3-Dichlorobenzene**	5.3E+02	nc	6.0E+02	sat	1.1E+02	nc	1.8E+02	nc		
2.4E-02	h	3.0E-02	n	2.2E-02	n	2.3E-01	i	y	106-46-7	1,4-Dichlorobenzene	3.4E+00	ca	7.9E+00	ca	3.1E-01	ca	5.0E-01	ca	2.0E+00	1.0E-01
4.5E-01	i			4.5E-01	r			0.1	91-94-1	3,3-Dichlorobenzidine	1.1E+00	ca	3.8E+00	ca	1.5E-02	ca	1.5E-01	ca	7.0E-03	3.0E-04
		3.0E-02	n			3.0E-02	r	0.1	90-98-2	4,4'-Dichlorobenzophenone	1.8E+03	nc	1.8E+04	nc	1.1E+02	nc	1.1E+03	nc		
9.3E+00	r			9.3E+00	h			y	764-41-0	1,4-Dichloro-2-butene	7.9E-03	ca	1.8E-02	ca	7.2E-04	ca	1.2E-03	ca		
		2.0E-01	i			5.7E-02	h	y	75-71-8	Dichlorodifluoromethane	9.4E+01	nc	3.1E+02	nc	2.1E+02	nc	3.9E+02	nc		
		1.0E-01	h			1.4E-01	h	y	75-34-3	1,1-Dichloroethane	5.1E+02	nc	1.7E+03	nc	5.2E+02	nc	8.1E+02	nc	2.3E+01	1.0E+00
5.7E-03	c			5.7E-03	c			y		"CAL-Modified PRG"	2.8E+00	ca	6.0E+00	ca	1.2E+00	ca	2.0E+00	ca		
9.1E-02	i	2.0E-02	n	9.1E-02	i	1.4E-03	n	y	107-06-2	1,2-Dichloroethane (EDC)	2.8E-01	ca*	6.0E-01	ca*	7.4E-02	ca*	1.2E-01	ca*	2.0E-02	1.0E-03
		5.0E-02	i			5.7E-02	i	y	75-35-4	1,1-Dichloroethylene	1.2E+02	nc	4.1E+02	nc	2.1E+02	nc	3.4E+02	nc	6.0E-02	3.0E-03
		1.0E-02	p			1.0E-02	r	y	156-59-2	1,2-Dichloroethylene (cis)	4.3E+01	nc	1.5E+02	nc	3.7E+01	nc	6.1E+01	nc	4.0E-01	2.0E-02
		2.0E-02	i			2.0E-02	r	y	156-60-5	1,2-Dichloroethylene (trans)	6.9E+01	nc	2.3E+02	nc	7.3E+01	nc	1.2E+02	nc	7.0E-01	3.0E-02
		3.0E-03	i			3.0E-03	r	0.1	120-83-2	2,4-Dichlorophenol	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc	1.0E+00	5.0E-02
		8.0E-03	i			8.0E-03	r	0.1	94-82-6	4-(2,4-Dichlorophenoxy)butyric Acid (2,4-DB)	4.9E+02	nc	4.9E+03	nc	2.9E+01	nc	2.9E+02	nc		
		1.0E-02	i			1.0E-02	r	0.05	94-75-7	2,4-Dichlorophenoxyacetic Acid (2,4-D)	6.9E+02	nc	7.7E+03	nc	3.7E+01	nc	3.6E+02	nc		
6.8E-02	h	1.1E-03	r	6.8E-02	r	1.1E-03	i	y	78-87-5	1,2-Dichloropropane	3.4E-01	ca*	7.4E-01	ca*	9.9E-02	ca*	1.6E-01	ca*	3.0E-02	1.0E-03
		2.0E-02	p			2.0E-02	r	y	142-28-9	**1,3-Dichloropropane**	1.0E+02	nc	3.6E+02	nc	7.3E+01	nc	1.2E+02	nc		
1.0E-01	i	3.0E-02	i	1.4E-02	i	5.7E-03	i	y	542-75-6	1,3-Dichloropropene	7.8E-01	ca	1.8E+00	ca	4.8E-01	ca	4.0E-01	ca	4.0E-03	2.0E-04
		3.0E-03	i			3.0E-03	r	0.1	616-23-9	2,3-Dichloropropanol	1.8E+02	nc	1.8E+03	nc	1.1E+01	nc	1.1E+02	nc		
2.9E-01	i	5.0E-04	i	2.9E-01	r	1.4E-04	i	0.1	62-73-7	Dichlorvos	1.7E+00	ca*	5.9E+00	ca*	2.3E-02	ca*	2.3E-01	ca*		
4.4E-01	x			4.4E-01	r			0.1	115-32-2	Dicofol	1.1E+00	ca	3.9E+00	ca	1.5E-02	ca	1.5E-01	ca		
		3.0E-02	h			5.7E-05	x	y	77-73-6	Dicyclopentadiene	5.4E-01	nc	1.8E+00	nc	2.1E-01	nc	4.2E-01	nc		
1.6E+01	i	5.0E-05	i	1.6E+01	i	5.0E-05	r	0.1	60-57-1	Dieldrin	3.0E-02	ca	1.1E-01	ca	4.2E-04	ca	4.2E-03	ca	4.0E-03	2.0E-04
		1.0E-02	p			5.7E-03	p	0.1	112-34-5	Diethylene glycol, monobutyl ether	6.1E+02	nc	6.2E+03	nc	2.1E+01	nc	3.6E+02	nc		
		6.0E-02	p			8.6E-04	p	0.1	111-90-0	Diethylene glycol, monoethyl ether	3.7E+03	nc	3.7E+04	nc	3.1E+00	nc	2.2E+03	nc		
		4.0E-04	p			4.0E-04	r	0.1	617-84-5	Diethylformamide	2.4E+01	nc	2.5E+02	nc	1.5E+00	nc	1.5E+01	nc		
1.2E-03	i	6.0E-01	i	1.2E-03	r	6.0E-01	r	0.1	103-23-1	Di(2-ethylhexyl)adipate	4.1E+02	ca	1.4E+03	ca	5.6E+00	ca	5.6E+01	ca		
		8.0E-01	i			8.0E-01	r	0.1	84-66-2	Diethyl phthalate	4.9E+04	nc	1.0E+05	max	2.9E+03	nc	2.9E+04	nc		
4.7E+03	h			4.7E+03	r			0.1	56-53-1	Diethylstilbestrol	1.0E-04	ca	3.7E-04	ca	1.4E-06	ca	1.4E-05	ca		
		8.0E-02	i			8.0E-02	r	0.1	43222-48-6	Difenzoquat (Avenge)	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		2.0E-02	i			2.0E-02	r	0.1	35367-38-5	Diflubenzuron	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		1.1E+01	r			1.1E+01	i	y	75-37-6	1,1-Difluoroethane					4.2E+04	nc	6.9E+04	nc		
		2.0E-02	n			2.0E-02	r	0.1	28553-12-0	Diisononyl phthalate	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
						1.1E-01	p		108-20-3	**Diisopropyl ether**					4.0E+02	nc				
		8.0E-02	i			8.0E-02	r	0.1	1445-75-6	Diisopropyl methylphosphonate	4.9E+03	nc	4.9E+04	nc	2.9E+02	nc	2.9E+03	nc		
		2.0E-02	i			2.0E-02	r	0.1	55290-64-7	Dimethipin	1.2E+03	nc	1.2E+04	nc	7.3E+01	nc	7.3E+02	nc		
		2.0E-04	i			2.0E-04	r	0.1	60-51-5	Dimethoate	1.2E+01	nc	1.2E+02	nc	7.3E-01	nc	7.3E+00	nc		
1.4E-02	h			1.4E-02	r			0.1	119-90-4	3,3'-Dimethoxybenzidine	3.5E+01	ca	1.2E+02	ca	4.8E-01	ca	4.8E+00	ca		
		5.7E-06	r			5.7E-06	x	y	124-40-3	Dimethylamine	6.7E-02	nc	2.5E-01	nc	2.1E-02	nc	3.5E-02	nc		
		2.0E-03	i			2.0E-03	r	0.1	121-69-7	N-N-Dimethylaniline	1.2E+02	nc	1.2E+03	nc	7.3E+00	nc	7.3E+01	nc		
7.5E-01	h			7.5E-01	r			0.1	95-68-1	2,4-Dimethylaniline	6.5E-01	ca	2.3E+00	ca	9.0E-03	ca	9.0E-02	ca		

ATTACHMENT E

Johnson & Ettinger Model Input/Output

DATA ENTRY SHEET

SG-ADV
Version 3.1; 02/04

Reset to Defaults

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
156592	1.00E+03			cis-1,2-Dichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	152.4	14.25	152.4	0	0	C		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
C	1.43	0.459	0.215	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	2590.8	548.6	304.8	1.21	1	

END

CHEMICAL PROPERTIES SHEET

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)	Molecular weight, MW (g/mol)
7.36E-02	1.13E-05	4.07E-03	25	7,192	333.65	544.00	96.94

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A 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)
9.46E+08	137.4	0.244	0.244	0.244	0.324	2.28E-09	0.821	1.87E-09	6,279	1.00E+03	1.20E+05

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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.52E+06	5.00E-03	15	7,692	2.50E-03	1.06E-01	1.77E-04	3.19E-03	0.00E+00	0.00E+00	3.19E-03	137.4

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	1.00E+03	1.21	5.20E+00	3.19E-03	7.58E+03	8.58E+00	4.19E-05	4.19E-02

END

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	2.91E+02	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	2.2E+00	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05	0.0E+00	3.18E+02	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.0E-06	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	8.8E-06	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.2E-06	9.0E-03	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	1.0E-04	0.0E+00	4.41E+01		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	1.8E-05	7.0E-02	1.64E+02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01	9.90E+01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	2.0E-01	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.3E-03	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.9E-05	4.0E-03	1.13E+02	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	1.1E-04	4.0E-02	1.31E+02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	2.1E-01	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	7.0E-04	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.5E-02	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	0.0E+00	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		

VLOOKUP TABLES

95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	5.7E-04	4.9E-03	1.47E+02	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.46E-02	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	0.0E+00	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	1.0E+00	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	4.9E-05	0.0E+00	1.27E+02	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dib	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	3.0E-02	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05	0.0E+00	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	6.8E-05	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	4.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	6.0E-02	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E+00	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	3.3E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	4.6E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.4E-05	7.0E-02	2.08E+02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	6.0E-01	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	2.52E+02	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	2.28E+02	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	4.0E-06	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04	2.01E+02		

DATA ENTRY SHEET

SG-ADV Version 3.1; 02/04

Reset to Defaults

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
156605	3.90E+02			trans-1,2-Dichloroethylene

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	152.4	14.25	152.4	0	0	C		

MORE

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
C	1.43	0.459	0.215	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	2590.8	548.6	304.8	1.21	1	

END

CHEMICAL PROPERTIES SHEET

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)	Molecular weight, MW (g/mol)
7.07E-02	1.19E-05	9.36E-03	25	6,717	320.85	516.50	96.94

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A 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)
9.46E+08	137.4	0.244	0.244	0.244	0.324	2.28E-09	0.821	1.87E-09	6,279	3.90E+02	1.20E+05

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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.52E+06	5.00E-03	15	7,091	5.98E-03	2.54E-01	1.77E-04	3.06E-03	0.00E+00	0.00E+00	3.06E-03	137.4

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	3.90E+02	1.21	5.20E+00	3.06E-03	7.58E+03	9.39E+00	4.12E-05	1.61E-02

END

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	2.91E+02	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	2.2E+00	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05	0.0E+00	3.18E+02	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.0E-06	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	8.8E-06	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.2E-06	9.0E-03	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	1.0E-04	0.0E+00	4.41E+01		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	1.8E-05	7.0E-02	1.64E+02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01	9.90E+01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	2.0E-01	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.3E-03	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.9E-05	4.0E-03	1.13E+02	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	1.1E-04	4.0E-02	1.31E+02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	2.1E-01	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	7.0E-04	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.5E-02	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	0.0E+00	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		

VLOOKUP TABLES

95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	5.7E-04	4.9E-03	1.47E+02	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.46E-02	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	0.0E+00	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	1.0E+00	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	4.9E-05	0.0E+00	1.27E+02	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dib	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	3.0E-02	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05	0.0E+00	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	6.8E-05	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	4.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	6.0E-02	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E+00	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	3.3E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	4.6E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.4E-05	7.0E-02	2.08E+02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	6.0E-01	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	2.52E+02	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	2.28E+02	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	4.0E-06	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04	2.01E+02		

SG-ADV
Version 3.1; 02/04

Reset to Defaults

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
67663	1.50E+03			Chloroform

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	152.4	14.25	152.4	0	0	C		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
C	1.43	0.459	0.215	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	2590.8	548.6	304.8	1.21	1	

END

CHEMICAL PROPERTIES SHEET

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)	Molecular weight, MW (g/mol)
1.04E-01	1.00E-05	3.66E-03	25	6,988	334.32	536.40	119.38

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A 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)
9.46E+08	137.4	0.244	0.244	0.244	0.324	2.28E-09	0.821	1.87E-09	6,279	1.50E+03	1.20E+05

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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.52E+06	5.00E-03	15	7,510	2.28E-03	9.66E-02	1.77E-04	4.51E-03	0.00E+00	0.00E+00	4.51E-03	137.4

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	1.50E+03	1.21	5.20E+00	4.51E-03	7.58E+03	4.58E+00	4.87E-05	7.31E-02

END

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	2.91E+02	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	2.2E+00	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05	0.0E+00	3.18E+02	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.0E-06	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	8.8E-06	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.2E-06	9.0E-03	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	1.0E-04	0.0E+00	4.41E+01		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	1.8E-05	7.0E-02	1.64E+02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01	9.90E+01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	2.0E-01	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.3E-03	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.9E-05	4.0E-03	1.13E+02	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	1.1E-04	4.0E-02	1.31E+02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	2.1E-01	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	7.0E-04	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.5E-02	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	0.0E+00	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		

VLOOKUP TABLES

95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	5.7E-04	4.9E-03	1.47E+02	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.46E-02	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	0.0E+00	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	1.0E+00	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	4.9E-05	0.0E+00	1.27E+02	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dib	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	3.0E-02	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05	0.0E+00	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	6.8E-05	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	4.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	6.0E-02	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E+00	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	3.3E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	4.6E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.4E-05	7.0E-02	2.08E+02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	6.0E-01	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	2.52E+02	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	2.28E+02	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	4.0E-06	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04	2.01E+02		

SG-ADV
Version 3.1; 02/04

Reset to Defaults

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
79016	1.00E+04			Trichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	152.4	14.25	152.4	0	0	C		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
C	1.43	0.459	0.215	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	2590.8	548.6	304.8	1.21	1	

END

CHEMICAL PROPERTIES SHEET

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)	Molecular weight, MW (g/mol)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	131.39

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A 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)
9.46E+08	137.4	0.244	0.244	0.244	0.324	2.28E-09	0.821	1.87E-09	6,279	1.00E+04	1.20E+05

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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.52E+06	5.00E-03	15	8,504	6.01E-03	2.55E-01	1.77E-04	3.42E-03	0.00E+00	0.00E+00	3.42E-03	137.4

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	1.00E+04	1.21	5.20E+00	3.42E-03	7.58E+03	7.42E+00	4.30E-05	4.30E-01

END

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	2.91E+02	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	2.2E+00	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05	0.0E+00	3.18E+02	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.0E-06	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	8.8E-06	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.2E-06	9.0E-03	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	1.0E-04	0.0E+00	4.41E+01		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	1.8E-05	7.0E-02	1.64E+02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01	9.90E+01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	2.0E-01	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.3E-03	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.9E-05	4.0E-03	1.13E+02	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	1.1E-04	4.0E-02	1.31E+02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	2.1E-01	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	7.0E-04	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.5E-02	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	0.0E+00	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		

VLOOKUP TABLES

95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	5.7E-04	4.9E-03	1.47E+02	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.46E-02	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	0.0E+00	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	1.0E+00	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	4.9E-05	0.0E+00	1.27E+02	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dib	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	3.0E-02	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05	0.0E+00	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	6.8E-05	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	4.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	6.0E-02	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E+00	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	3.3E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	4.6E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.4E-05	7.0E-02	2.08E+02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	6.0E-01	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	2.52E+02	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	2.28E+02	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	4.0E-06	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04	2.01E+02		

DATA ENTRY SHEET

SG-ADV Version 3.1; 02/04

Reset to Defaults

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
108883	1.60E+03			Toluene

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	152.4	14.25	152.4	0	0	C		

MORE

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil Parameters				Lookup Soil Parameters				Lookup Soil Parameters			
C	1.43	0.459	0.215	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	2590.8	548.6	304.8	1.21	1	

END

CHEMICAL PROPERTIES SHEET

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)	Molecular weight, MW (g/mol)
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	92.14

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A 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)
9.46E+08	137.4	0.244	0.244	0.244	0.324	2.28E-09	0.821	1.87E-09	6,279	1.60E+03	1.20E+05

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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.52E+06	5.00E-03	15	9,108	3.73E-03	1.58E-01	1.77E-04	3.77E-03	0.00E+00	0.00E+00	3.77E-03	137.4

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	1.60E+03	1.21	5.20E+00	3.77E-03	7.58E+03	6.17E+00	4.48E-05	7.17E-02

END

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	2.91E+02	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	2.2E+00	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05	0.0E+00	3.18E+02	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.0E-06	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	8.8E-06	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.2E-06	9.0E-03	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	1.0E-04	0.0E+00	4.41E+01		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	1.8E-05	7.0E-02	1.64E+02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01	9.90E+01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	2.0E-01	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.3E-03	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.9E-05	4.0E-03	1.13E+02	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	1.1E-04	4.0E-02	1.31E+02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	2.1E-01	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	7.0E-04	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.5E-02	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	0.0E+00	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		

VLOOKUP TABLES

95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	5.7E-04	4.9E-03	1.47E+02	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.46E-02	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	0.0E+00	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	1.0E+00	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	4.9E-05	0.0E+00	1.27E+02	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dib	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	3.0E-02	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05	0.0E+00	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	6.8E-05	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	4.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	6.0E-02	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E+00	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	3.3E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	4.6E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.4E-05	7.0E-02	2.08E+02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	6.0E-01	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	2.52E+02	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	2.28E+02	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	4.0E-06	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04	2.01E+02		

DATA ENTRY SHEET

SG-ADV Version 3.1; 02/04

Reset to Defaults

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
127184	1.70E+05			Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	152.4	14.25	152.4	0	0	C		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
C	1.43	0.459	0.215	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	2590.8	548.6	304.8	1.21	1	

END

CHEMICAL PROPERTIES SHEET

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)	Molecular weight, MW (g/mol)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	165.83

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A 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)
9.46E+08	137.4	0.244	0.244	0.244	0.324	2.28E-09	0.821	1.87E-09	6,279	1.70E+05	1.20E+05

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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.52E+06	5.00E-03	15	9,510	1.01E-02	4.27E-01	1.77E-04	3.12E-03	0.00E+00	0.00E+00	3.12E-03	137.4

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	1.70E+05	1.21	5.20E+00	3.12E-03	7.58E+03	9.02E+00	4.15E-05	7.06E+00

END

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	2.91E+02	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	2.2E+00	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05	0.0E+00	3.18E+02	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.0E-06	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	8.8E-06	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.2E-06	9.0E-03	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	1.0E-04	0.0E+00	4.41E+01		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	1.8E-05	7.0E-02	1.64E+02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01	9.90E+01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	2.0E-01	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.3E-03	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.9E-05	4.0E-03	1.13E+02	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	1.1E-04	4.0E-02	1.31E+02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	2.1E-01	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	7.0E-04	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.5E-02	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	0.0E+00	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		

VLOOKUP TABLES

95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	5.7E-04	4.9E-03	1.47E+02	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.46E-02	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	0.0E+00	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	1.0E+00	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	4.9E-05	0.0E+00	1.27E+02	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dib	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	3.0E-02	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05	0.0E+00	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	6.8E-05	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	4.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	6.0E-02	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E+00	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	3.3E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	4.6E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.4E-05	7.0E-02	2.08E+02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	6.0E-01	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	2.52E+02	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	2.28E+02	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	4.0E-06	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04	2.01E+02		

DATA ENTRY SHEET

SG-ADV Version 3.1; 02/04

Reset to Defaults

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
100414	1.80E+02			Ethylbenzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Totals must add up to value of Ls (cell F24) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
15	152.4	14.25	152.4	0	0	C		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
C	1.43	0.459	0.215	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	2590.8	548.6	304.8	1.21	1	

END

CHEMICAL PROPERTIES SHEET

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)	Molecular weight, MW (g/mol)
7.50E-02	7.80E-06	7.86E-03	25	8,501	409.34	617.20	106.17

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A 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)
9.46E+08	137.4	0.244	0.244	0.244	0.324	2.28E-09	0.821	1.87E-09	6,279	1.80E+02	1.20E+05

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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.52E+06	5.00E-03	15	10,107	4.15E-03	1.76E-01	1.77E-04	3.25E-03	0.00E+00	0.00E+00	3.25E-03	137.4

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	1.80E+02	1.21	5.20E+00	3.25E-03	7.58E+03	8.26E+00	4.22E-05	7.59E-03

END

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	2.91E+02	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	2.2E+00	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05	0.0E+00	3.18E+02	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.0E-06	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	8.8E-06	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.2E-06	9.0E-03	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	1.0E-04	0.0E+00	4.41E+01		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	1.8E-05	7.0E-02	1.64E+02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01	9.90E+01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	2.0E-01	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroethan	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.3E-03	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.9E-05	4.0E-03	1.13E+02	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	1.1E-04	4.0E-02	1.31E+02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	2.1E-01	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	7.0E-04	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.5E-02	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	0.0E+00	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02	1.42E+02		X

92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	5.7E-04	4.9E-03	1.47E+02	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.46E-02	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	0.0E+00	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	1.0E+00	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	4.9E-05	0.0E+00	1.27E+02	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	3.0E-02	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05	0.0E+00	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	6.8E-05	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2-	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	4.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	6.0E-02	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E+00	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	3.3E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	4.6E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.4E-05	7.0E-02	2.08E+02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropre	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	6.0E-01	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	2.52E+02	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	2.28E+02	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	4.0E-06	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04	2.01E+02		

DATA ENTRY SHEET

SG-ADV Version 3.1; 02/04

Reset to Defaults

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
108383	1.40E+03			m-Xylene

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	152.4	14.25	152.4	0	0	C		

MORE

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil Parameters				Lookup Soil Parameters				Lookup Soil Parameters			
C	1.43	0.459	0.215	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	2590.8	548.6	304.8	1.21	1	

END

CHEMICAL PROPERTIES SHEET

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)	Molecular weight, MW (g/mol)
7.00E-02	7.80E-06	7.32E-03	25	8,523	412.27	617.05	106.17

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A 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)
9.46E+08	137.4	0.244	0.244	0.244	0.324	2.28E-09	0.821	1.87E-09	6,279	1.40E+03	1.20E+05

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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.52E+06	5.00E-03	15	10,206	3.84E-03	1.63E-01	1.77E-04	3.03E-03	0.00E+00	0.00E+00	3.03E-03	137.4

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	1.40E+03	1.21	5.20E+00	3.03E-03	7.58E+03	9.60E+00	4.11E-05	5.75E-02

END

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	2.91E+02	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	2.2E+00	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05	0.0E+00	3.18E+02	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.0E-06	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	8.8E-06	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.2E-06	9.0E-03	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	1.0E-04	0.0E+00	4.41E+01		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	1.8E-05	7.0E-02	1.64E+02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01	9.90E+01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	2.0E-01	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.3E-03	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.9E-05	4.0E-03	1.13E+02	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	1.1E-04	4.0E-02	1.31E+02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	2.1E-01	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	7.0E-04	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.5E-02	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	0.0E+00	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		

VLOOKUP TABLES

95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	5.7E-04	4.9E-03	1.47E+02	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.46E-02	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	0.0E+00	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	1.0E+00	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	4.9E-05	0.0E+00	1.27E+02	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dib	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	3.0E-02	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05	0.0E+00	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	6.8E-05	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	4.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	6.0E-02	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E+00	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	3.3E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	4.6E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.4E-05	7.0E-02	2.08E+02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	6.0E-01	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	2.52E+02	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	2.28E+02	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	4.0E-06	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04	2.01E+02		

DATA ENTRY SHEET

SG-ADV Version 3.1; 02/04

Reset to Defaults

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
106423	1.40E+03			p-Xylene

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	152.4	14.25	152.4	0	0	C		

MORE

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
C	1.43	0.459	0.215	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	2590.8	548.6	304.8	1.21	1	

END

CHEMICAL PROPERTIES SHEET

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)	Molecular weight, MW (g/mol)
7.69E-02	8.44E-06	7.64E-03	25	8,525	411.52	616.20	106.17

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A 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)
9.46E+08	137.4	0.244	0.244	0.244	0.324	2.28E-09	0.821	1.87E-09	6,279	1.40E+03	1.20E+05

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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.52E+06	5.00E-03	15	10,199	4.01E-03	1.70E-01	1.77E-04	3.33E-03	0.00E+00	0.00E+00	3.33E-03	137.4

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	1.40E+03	1.21	5.20E+00	3.33E-03	7.58E+03	7.84E+00	4.26E-05	5.96E-02

END

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	2.91E+02	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	2.2E+00	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05	0.0E+00	3.18E+02	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.0E-06	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	8.8E-06	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.2E-06	9.0E-03	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	1.0E-04	0.0E+00	4.41E+01		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	1.8E-05	7.0E-02	1.64E+02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01	9.90E+01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	2.0E-01	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.3E-03	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.9E-05	4.0E-03	1.13E+02	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	1.1E-04	4.0E-02	1.31E+02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	2.1E-01	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	7.0E-04	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.5E-02	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	0.0E+00	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		

VLOOKUP TABLES

95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	5.7E-04	4.9E-03	1.47E+02	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.46E-02	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	0.0E+00	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	1.0E+00	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	4.9E-05	0.0E+00	1.27E+02	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dib	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	3.0E-02	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05	0.0E+00	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	6.8E-05	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	4.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	6.0E-02	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E+00	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	3.3E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	4.6E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.4E-05	7.0E-02	2.08E+02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	6.0E-01	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	2.52E+02	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	2.28E+02	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	4.0E-06	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04	2.01E+02		

DATA ENTRY SHEET

SG-ADV
Version 3.1; 02/04

Reset to Defaults

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
95476	1.40E+03			o-Xylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (^oC)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of Ls (cell F24)					
15	152.4	14.25	152.4	0	0	C		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil Parameters)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil Parameters)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil Parameters)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
C	1.43	0.459	0.215	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	2590.8	548.6	304.8	1.21	1	

END

CHEMICAL PROPERTIES SHEET

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)	Molecular weight, MW (g/mol)
8.70E-02	1.00E-05	5.18E-03	25	8,661	417.60	630.30	106.17

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A 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)
9.46E+08	137.4	0.244	0.244	0.244	0.324	2.28E-09	0.821	1.87E-09	6,279	1.40E+03	1.20E+05

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)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.52E+06	5.00E-03	15	10,356	2.69E-03	1.14E-01	1.77E-04	3.77E-03	0.00E+00	0.00E+00	3.77E-03	137.4

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	1.40E+03	1.21	5.20E+00	3.77E-03	7.58E+03	6.17E+00	4.48E-05	6.28E-02

END

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	2.91E+02	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	2.2E+00	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05	0.0E+00	3.18E+02	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.0E-06	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	8.8E-06	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.2E-06	9.0E-03	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	1.0E-04	0.0E+00	4.41E+01		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	1.8E-05	7.0E-02	1.64E+02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01	9.90E+01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	2.0E-01	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroethan	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.3E-03	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.9E-05	4.0E-03	1.13E+02	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	1.1E-04	4.0E-02	1.31E+02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	2.1E-01	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	7.0E-04	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.5E-02	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	0.0E+00	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	5.7E-04	4.9E-03	1.47E+02	X	

96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.46E-02	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	0.0E+00	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	1.0E+00	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	4.9E-05	0.0E+00	1.27E+02	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dibro	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	3.0E-02	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05	0.0E+00	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	6.8E-05	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2-p	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	4.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	6.0E-02	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E+00	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	3.3E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	4.6E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.4E-05	7.0E-02	2.08E+02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloroprer	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	6.0E-01	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	2.52E+02	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	2.28E+02	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	4.0E-06	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04	2.01E+02		