Environmental Management Company
6001 Bollinger Canyon Rd, L4050
P.O. Box 6012
San Ramon, CA 94583-2324
Tel 925-842-1589
Fax 925-842-8370

Karen Streich
Project Manager

RO 341

ChevronTexaco

June 12, 2003

RO?

Mr. Amir Gholami
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway
Alameda, CA 94502-6577

Subject: Former Chevron Service Station 9-11533, ~~3135 Gibbons Drive,~~ Alameda
Submittal of RBCA Evaluation of Vapor Intrusion to Indoor Air
3126 FOOTHILL

Dear Amir,

Attached is a RBCA Evaluation of Vapor Intrusion to Indoor Air From Soil Vapor at the referenced site.

I agree with the conclusions and recommendations presented in this report. The information in this report is accurate to the best of my knowledge and all local Agency/Regional Board guidelines have been followed. This report was prepared by ChevronTexaco Energy Research and Technology Company, upon whose assistance and advice I have relied.

This letter is submitted pursuant to the requirements of California Water Code Section 13267(b)(1) and the regulating implementation entitled Appendix A pertaining thereto.

I declare under penalty of perjury that the foregoing is true and correct.

Sincerely,

Karen Streich

Karen Streich
Project Manager

Copy to: Bob Foss, Cambria Environmental

Energy Research and Technology Company
100 Chevron Way, P.O. Box 1627
Richmond CA 94802-0627

June 2, 2003

ChevronTexaco

Ms. Karen Streich
Project Manager, Retail Business Unit
6001 Bollinger Canyon Rd, L4050
Post Office Box 6012
San Ramon, California 94583-2324

SUBJECT: **RBCA EVALUATION OF VAPOR INTRUSION TO INDOOR AIR FROM SOIL VAPOR FORMER CHEVRON SERVICE STATION 9-1153**

Dear Karen,

Per your request, we have developed a risk-based corrective action evaluation of vapor intrusion to indoor air from soil vapor at the former Chevron Service Station Number 9-1153 located at 3135 Gibbons Drive in Alameda, California. The attached document presents the RBCA evaluation and the information used to develop it.

If you have any comments or questions regarding the information presented in the evaluation, please contact me at (510) 242-1094 or Renae Magaw at (510) 242-7235.

Sincerely,

Michele Emerson Amaral

Michele Emerson Amaral
Senior Toxicologist

Attachments

Cc: THRA File
R. Magaw, ERTC

RISK-BASED CORRECTIVE ACTION EVALUATION OF VAPOR INTRUSION TO INDOOR AIR FROM SOIL VAPOR

Former Chevron Service Station 9-1153
3135 Gibbons Drive
Alameda, California

May 2003

Table of Contents

RISK-BASED CORRECTIVE ACTION EVALUATION OF VAPOR INTRUSION TO INDOOR AIR FROM SOIL VAPOR
Former Chevron Service Station 9-1153
3135 Gibbons Drive
Alameda, California

Introduction

At the request of the Alameda County Health Care Services, risks due to potential inhalation of vapors in indoor air were estimated for chemicals of potential concern (COPCs) identified in soil vapor at the former Chevron Service Station Number 9-1153 located at 3135 Gibbons Drive in Alameda, California. The main purpose of this report is to answer the question, "Could residual concentrations of chemicals in soil vapor pose adverse health effects to current residents living at the site?" In general, risk estimates provide an answer to that question. The results of this report may be used to support a risk-based corrective action (RBCA) process and closure for the site.

The following sections describe information that was used to estimate risks. Included are relevant discussions on site history and characterization, the approach used to select COPCs in soil vapor, exposure assessment, toxicity criteria, and lastly risk characterization. This report follows risk assessment guidance recommended by the United States Environmental Protection Agency (USEPA), and the California Environmental Protection Agency (Cal/EPA). This report does not include an evaluation of potential ecological receptors.

Site History

A service station was constructed at the site in 1956 and was in operation until 1986. In June 1986, all underground storage tanks were removed, and areas with high hydrocarbon concentrations in soil were excavated. The excavated soil was aerated, tested, and used as backfill at the site. Three onsite groundwater wells, Well Numbers C-1 to C-3, were installed the same year.

In both June 1987 and May 1989, soil vapor surveys were conducted, and benzene was detected up to 2,200 parts per million by volume in the southeastern portion of the site. In May 1989, eight soil borings were installed on and off site, and several areas were reported as being impacted with benzene in soil at depth. One groundwater well at the edge of the site, Well No. C-1, was impacted with separate phase hydrocarbons (SPHs).

In 1989, a residence was built onsite. In 1990 and 1991, additional areas with lower hydrocarbon concentrations in soil were excavated and removed from the site. In May 1992 and November 1993, offsite groundwater wells and temporary wells were installed (Figure 1). From October 1991 to May 1994, an onsite groundwater pump and treat system was in operation

which treated approximately 99,850 gallons of SPHs. In September 1997, an oxygen release compound and hydrogen peroxide were used in the three onsite wells to treat SPHs. In July 2001, the groundwater treatment system was removed.

In 1996, RBCA evaluations were prepared to evaluate risks due to exposures to benzene that may volatilize from groundwater beneath the site (Weiss Associates, 1996a; 1996b). The potential scenarios evaluated included residential inhalation of benzene in outdoor air and residential exposures during on site gardening. Based on results of the RBCA evaluations, estimated excess cancer risks were below USEPA's acceptable cancer risk range.

From August 2001 to January 2002, five interim corrective action events were conducted to mobilize and remove SPHs, and to extract impacted groundwater and vapor phase hydrocarbons from Well No. C-1 (Delta, 2002a). Approximately, 2,350 gallons of petroleum hydrocarbon impacted groundwater were removed.

In October 2002, soil vapor samples were collected from seven onsite locations immediately adjacent to the footprint of the existing structure (Figure 1). All samples were collected at a depth of 3 feet below ground surface (bgs) following a Work Plan Addendum for Hand-Augered Soil Borings (Delta, 2002b). This Work Plan was approved by the Alameda County Health Care Services (2002). The results of this sampling event are provided in Appendix A.

Site Characterization

The site consists of sand to fine to medium grained clayey sand. The depth to groundwater ranges from surface to 7 feet below ground surface. During the sampling event conducted in October 2002, the average depth to groundwater at the site was measured at 4.5 feet bgs.

Selection of COPCs in Soil Vapor

A list of COPCs was derived based on chemicals detected in soil vapor during sampling conducted at the site in October 2002. Volatile organic chemicals (VOCs) detected in soil vapor at least once above the method reporting limit were considered COPCs. Table 1 presents the list of COPCs and their detected concentrations by sample location (SV-1 to SV-7). The list of COPCs includes: 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 2-butanone, 4-ethyltoluene, acetone, benzene, chloroform, cyclohexane, ethanol, ethylbenzene, heptane, hexane, toluene, m- and p-xylenes.

For each COPC, the maximum detected concentration and lesser of either the 95 percent upper confident limit (UCL) of the mean concentration or the maximum concentration are provided. In order to calculate 95% UCL of the mean concentrations, one-half of the reporting limit was used for chemicals not detected at the specified reporting limit.

Exposure Assessment

Land Use

Currently, the existing structure on the site is a residence. Figure 1 shows the location of the existing residence overlaying the location of the former station building, pump island, and underground storage tanks. Groundwater monitoring well locations are also identified. Landscaping and a concrete sidewalk surround the property. The driveway and adjacent streets are paved with asphalt. During the October 2002 sampling event, the field team noted that the building foundation was slab-on-grade (Pers. Comm., 2003). The areas immediately adjacent to the site are also residential.

The site is expected to remain residential in the future. Due to the proximity to the San Francisco Bay, groundwater beneath the site is not used as a drinking water source and it is not expected to be used as a potable source in the future.

Conceptual Site Model

For this evaluation, the only exposure pathway considered to be complete was onsite adult and child residents' inhalation of VOCs in indoor air from soil vapor. Figure 2 presents a conceptual site model of the site. Also noted in the figure are potentially complete exposure pathways including onsite resident inhalation of vapors in outdoor air, and onsite resident gardener groundwater ingestion and dermal contact. These latter exposure pathways were evaluated in RBCA evaluations conducted in 1996, and are considered beyond the scope of this report. Risks were estimated assuming that onsite residents inhale VOCs in indoor air originating from soil vapor beneath the existing structure.

Quantification of Exposure

A USEPA (2000; 2001) model, SG-SCREEN, based on the work of Johnson and Ettinger (1991), was used to estimate vapor intrusion into buildings from measured soil vapor data. The input parameters used to estimate infinite source building concentrations ($C_{building}$) are presented in Table 2. For each COPC, the lesser of the 95% UCL of the mean or maximum detected concentration was assumed to be the representative source vapor concentration C_{source}. The SG-SCREEN model calculation sheets for this evaluation are presented in Appendix B, and include both the C_{source} and $C_{building}$ that were used to estimate risks.

A model default depth of 15 cm below grade to the bottom of the enclosed space floor was assumed for a slab-on-grade foundation. In addition, the model default value for average soil temperature, 50° F, was used in this evaluation.

Default model properties for a vadose zone Soil Conservation Service (SCS) soil type of silt were assumed for the site. Based on soil boring log data collected during construction of Well Numbers C-1 to C-3, a range of soil types was observed at the site including: sand, clayey sand, coarse gravel, and silty sand. A sensitivity analysis of this variable is described in the Uncertainty Section.

The remaining input parameters were either measured during the October 2002 sampling event or calculated from measured data. The soil vapor sampling depth below grade was 3 feet (91.44 cm). The average vadose zone soil dry bulk density, total porosity, and moisture content were measured at 1.7 grams per cubic centimeter, 0.36, and 12.7%, respectively. Finally, a soil water-filled porosity, 0.353, was calculated from the measured site-specific moisture content. See Appendix A for site-specific physical properties data.

The exposure parameters used to estimate indoor air risks are presented in Table 3. All exposure parameters are from USEPA sources. For example, adult and child inhalation rates of 20 and 10 m^3/day, are from USEPA (1989) and (1997), respectively. Exposure frequency and duration for adult residents were 350 days/year and 30 years, respectively (USEPA, 1991). For child residents, these values were based on standard USEPA (1991) values, such as an exposure frequency of 350 days/year, an exposure duration of 6 years, and a body weight of 15 kg.

Toxicity Assessment

Table 4 presents the inhalation toxicity criteria used to estimate risks. The primary source of inhalation cancer slope factors (CSFs) is Cal/EPA's (2002) Office of Environmental Health Hazard Assessment's (OEHHA) Cancer Potency Values, and secondarily from USEPA's (2003) Integrated Risk Information System (IRIS). Inhalation reference doses (RfDs) were obtained from IRIS (2003).

Currently, an inhalation unit risk factor, or CSF, is not established for ethylbenzene by either OEHHA or IRIS. However, USEPA's National Center for Environmental Assessment (NCEA) suggests a cancer endpoint for ethylbenzene. Therefore, to ensure the protection of human health, potential excess cancer risks are described for ethylbenzene in the Uncertainty Section.

Toxicity criteria and physical/chemical properties for some chemicals needed to be added to the SG-SCREEN model. For example, criteria for hexane, cyclohexane, methyl ethyl ketone, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene were input into the model. The majority of criteria for these COPCs were obtained from IRIS. No toxicity criteria have been established by either OEHHA or IRIS for 4-ethyltoluene, ethanol, or heptane. Therefore, risks were not estimated for these chemicals, and a discussion is provided in the Uncertainty Section.

Risk Characterization

A summary of estimated excess cancer risks and noncancer hazard indices is provided in Table 5. In addition, the infinite source building concentrations from the SG-SCREEN model, and the equations used to estimate risks are presented. For adult and child residents the estimated excess cancer risks are 1×10^{-8} and 6×10^{-9}, respectively. These risk estimates are below USEPA's established acceptable target risk level range from 1×10^{-6} to 1×10^{-4}. A carcinogenic endpoint was estimated for only two of the COPCs, benzene and chloroform, with benzene contributing almost 100% to overall risk.

The noncarcinogenic hazard index for child residents is 1×10^{-3}. This value is well below USEPA's target risk level of 1.0 for noncarcinogenic effects. Three chemicals, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and benzene, contributed approximately one third each to the overall hazard index.

Uncertainties

Toxicity Criteria

An inhalation toxicity criterion of 3.85 $(mg/kg\text{-}day)^{-1}$ for ethylbenzene is suggested by USEPA's NCEA. Assuming this cancer potency for ethylbenzene, the estimated excess cancer risks to adult and child residents, assuming inhalation of ethylbenzene in indoor air, are 4.7×10^{-10} and 2.2×10^{-10}, respectively. Therefore, incorporating these excess cancer risk estimates would not significantly affect the overall risk estimates for this exposure pathway.

Currently, neither OEHHA nor IRIS have established toxicity criteria for 4-ethyltoluene, ethanol, or heptane, and no surrogate chemical toxicity criteria were used to evaluate them. Therefore, risks were not estimated for these chemicals. Exclusion of risk estimates for these chemicals may result in an underestimate of total risks.

Soil Properties

In the USEPA's SG-SCREEN model, diffusion of soil vapor is a function of the soil properties between the building floor in contact with the soil and the sampling depth. To test the sensitivity of the various site soils, the model was run for potential adult resident exposure to benzene in indoor air assuming each of the twelve SCS soil types underneath the foundation (Appendix C). All other input parameters remained unchanged. Table 6 presents the results of this analysis including SCS soil types and the corresponding estimated excess lifetime cancer risks. The range of risks is from 8.1×10^{-9} for silt loam to 2.3×10^{-8} for loamy sand. That is, loamy sand is considered the most conservative soil type for this exposure scenario. Silt was assumed as the average soil type at the site with an estimated excess cancer risk is 1.5×10^{-8}. Therefore, if the most conservative soil type was assumed to be present beneath the building foundation, then the overall excess cancer risk would increase by a factor of less than 2 and would still result not exceed the USEPA's established acceptable risk range.

Sample Locations

Soil vapor samples were not collected directly under the building foundation. However, per USEPA (2000) guidance, care was taken to collect enough samples adjacent to the structure to adequately estimate average concentrations, based on reasonable spatial and temporal scales. In addition, samples were collected at a depth that was between the groundwater table and foundation slab.

Comparison with SFR-RWQCB RBSLs

As shown below, infinite source building concentrations of COPCs, predicted using the SG-SCREEN model, were compared with the San Francisco Region Regional Water Quality Control Board's (2002) Draft Residential Indoor Air Screening Levels for Protection of Indoor Air Quality. SFR-RWQCB levels were only available for seven of the COPCs. All of the modeled indoor air concentrations were below the SFR-RWQCB's residential indoor air screening levels.

Chemical of Potential Concern	Residential Indoor Air Screening Level for Protection of Indoor Air Quality[1] ($\mu g/m^3$)	Modeled Infinite Source Building Concentration ($\mu g/m^3$)
Acetone	7.3×10^{1}	9.53×10^{-5}
2-Butanone	2.1×10^{2}	2.76×10^{-5}
Benzene	8.4×10^{2}	1.25×10^{-3}
Chloroform	4.6×10^{-1}	8.59×10^{-6}
Ethylbenzene	2.1×10^{2}	1.05×10^{-3}
Toluene	8.3×10^{1}	2.89×10^{-3}
Xylenes	1.5×10^{2}	3.49×10^{-3}

[1] Source: SFR-RWQCB, 2002

Conclusions

Risks were estimated for potential residential exposures to COPCs in indoor air that may volatilize from soil vapor beneath the former Chevron Service Station Number 9-1153 located in Alameda, California. The results of this evaluation may be used to support a RBCA process and closure of this site. USEPA's SG-SCREEN model was used to estimate concentrations of COPCs in indoor air from measured soil vapor data. Based on the predicted indoor air concentrations, estimated risks for both adult and child onsite residents were well below the USEPA's established acceptable target risk levels.

It is noteworthy to mention that USEPA's SG-SCREEN model provides conservative predictions of indoor air concentrations for most cases. In addition, other factors, such as natural attenuation of COPCs, were not considered in this evaluation are likely to reduce risk estimates further.

References

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Personal communication from Todd Del Frate of Delta Environmental Consultants, Inc., January 2003.

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Weiss Associates. 1996a. Preliminary Gardening Scenario RBCA Results, Chevron Service Station 9-1153, 3126 Fernside Blvd, Alameda. July 10.

Weiss Associates. 1996b. Preliminary RBCA Results, Chevron Service Station 9-1153, 3126 Fernside Blvd, Alameda. June 12.

USEPA (United States Environmental Protection Agency). 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. Publication 9285.6-03. Office of Emergency and Remedial Response. Washington, DC.

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USEPA (United States Environmental Protection Agency). 2000. User's Guide for The Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion Into Buildings (Revised). Prepared by Environmental Quality Management, Inc. December.

USEPA (United States Environmental Protection Agency). 2001. SG-SCREEN Model.

USEPA (United States Environmental Protection Agency). 2003. Integrated Risk Information System. Duluth, MN.

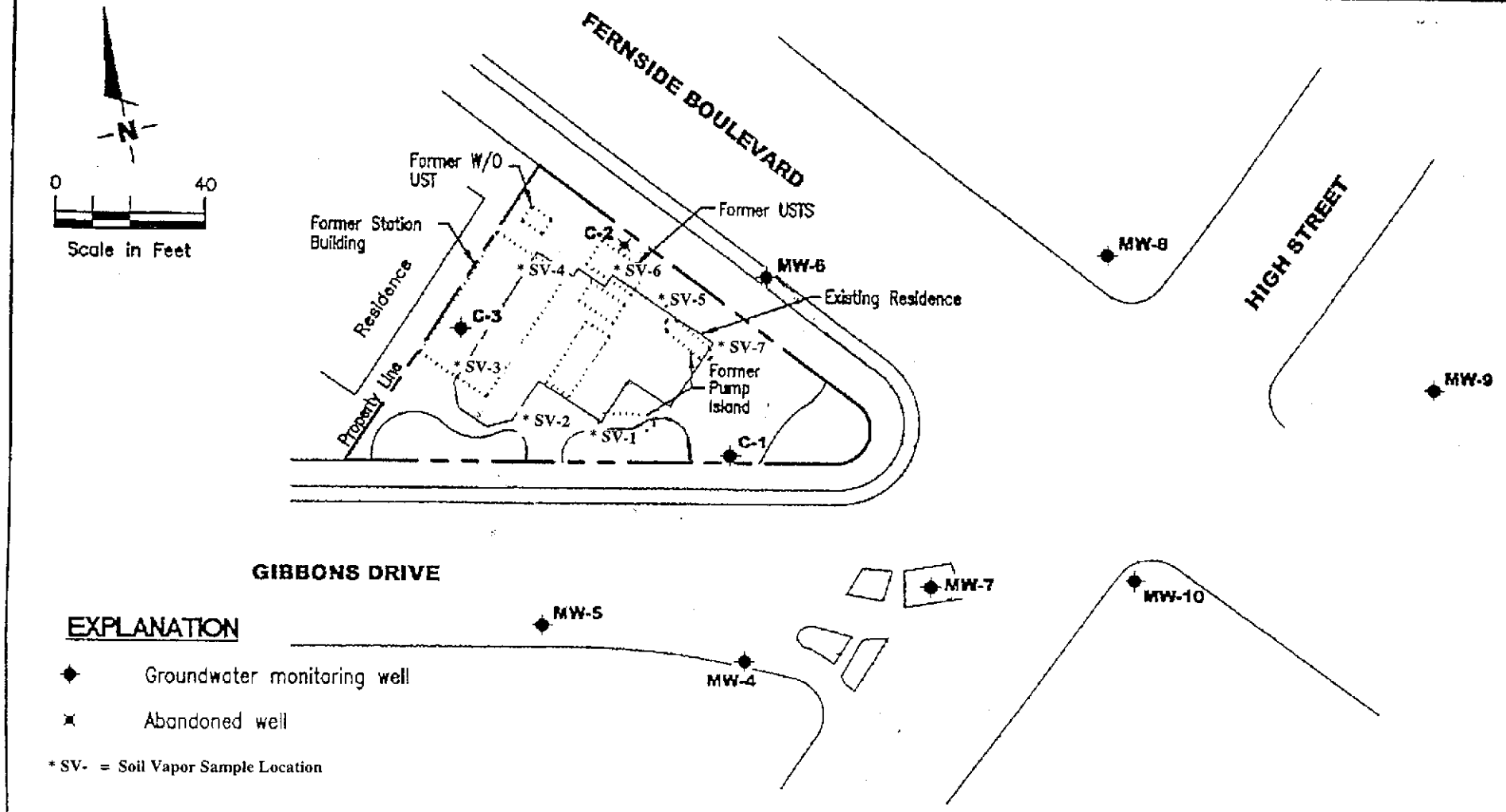
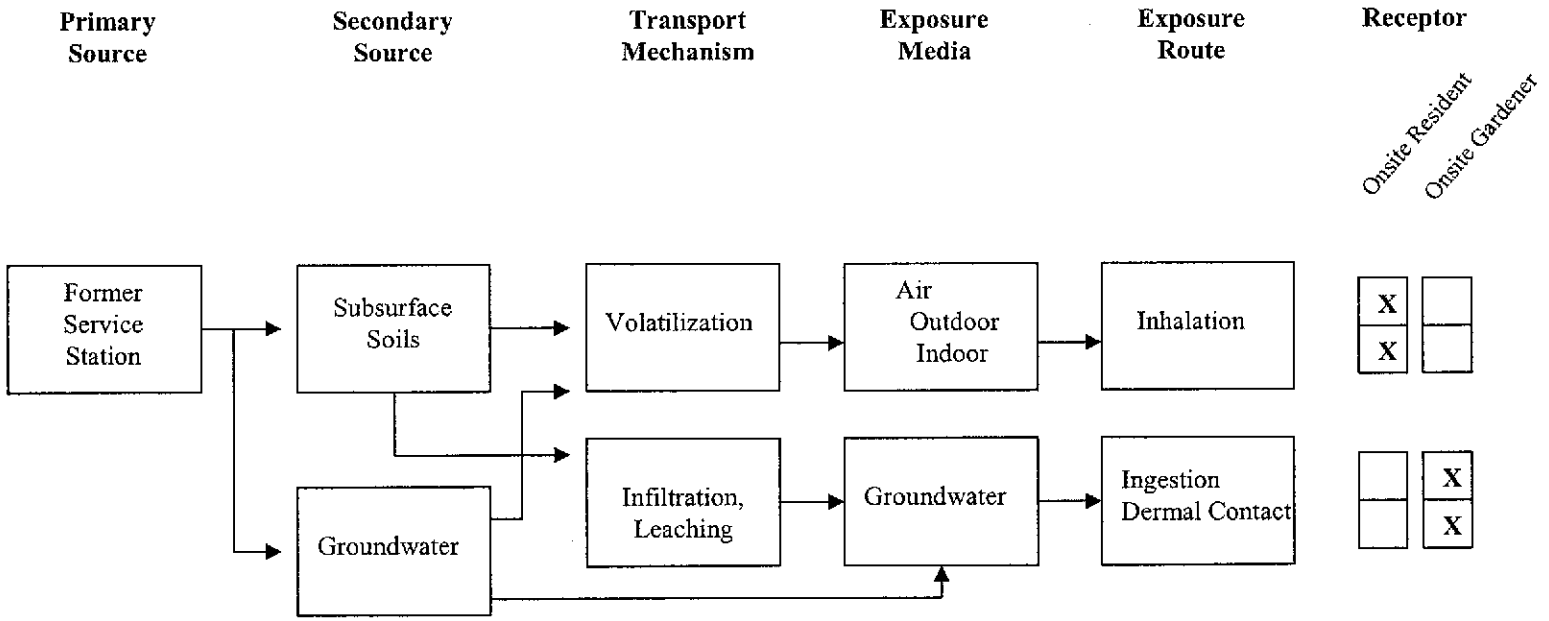


Figure 1. **October 2002 Soil Vapor Sample Locations, Historical Groundwater Well Locations, and Footprints of Existing Residence and Former Station 9-1153**

Source: Modified from Gettler-Ryan Inc, 2002.

Figure 2. Conceptual Site Model



This figure illustrates elements of an exposure pathway. For a pathway to be considered complete, there are four necessary elements: 1) a source and mechanism of release to the environment; 2) a transport medium; 3) a point of potential human contact with the contaminated medium; and 4) a human exposure route.

Table 1. Chemicals of Potential Concern in Soil Vapor and Their Detected Concentrations

Detected Chemical	SV-1	SV-2	SV-3	SV-4	SV-5	SV-6	SV-7	Maximum Detected Concentration	Lesser of 95% UCL or Max Concentration
1,2,4-Trimethylbenzene	4200	3100	5	11	<150	8.3	<15	4200	877
1,3,5-Trimethylbenzene	1300	1200	<3.5	<3.6	<150	<3.7	<15	1300	1163
2-Butanone	<120	<66	9.7	8.5[a]	<360	<8.9	<36	9.7	9.7
4-Ethyltoluene	3400	3800	<14	<14	<600	<15	<60	3800	1281
Acetone	<94	<54	98	91	<290	130	<29	130	37
Benzene	1700	1700	<2.2	3.2	3600	3.1	<9.7	3600	1035
Chloroform	<48	<28	<3.4	6.5	<150	<3.7	<15	6.5	6.5
Cyclohexane	650	2500	<9.7	<10	14000	<10	300	14000	3816
Ethanol	<75	<42	5.4	<5.5	<230	<5.7	<23	5.4	5.4
Ethylbenzene	2300	3000	<3.1	<3.2	2000	5.5	<13	3000	987
Heptane	1400	10000	<12	<12	30000	20	<50	30000	8318
Hexane	2000	15000	<10	<10	47000[b]	16	140	15000	4800
Toluene	8500	5200	<2.7	7.1	260	4.6	<11	8500	2556
Xylenes	9200	8200	4.7	9.2	860	8.7	<13	9200	3097

Units are in micrograms per cubic meter ($\mu g/m^3$).

< = Not detected at the specified reporting limit.

[a] Estimated value.

[b] Value exceeds instrument calibration range and was not included in 95% UCL calculation.

UCL = Upper confidence limit

Note: All data were collected at 3 feet below ground surface.

Table 2. USEPA SG-SCREEN Model Input Parameters Used to Estimate Indoor Air Risks

Parameter	Value	Units	Source
Source vapor concentration, C_{source}	Chemical-specific	$\mu g/m^3$	Measured (Table 1)
Depth below grade to bottom of enclosed space floor[1]	15	cm	Model default
Soil vapor sampling depth below grade	91.44 (3)	cm (ft)	Measured
Average soil temperature	10 (50)	°C (°F)	Model default
Vadose zone SCS soil type	Silt (SI)	-	Assumed
Average vadose zone soil dry bulk density	1.7	g/cm^3	Measured
Average vadose zone total porosity	0.36	unitless	Measured
Average moisture content	12.7	percent	Measured
Average vadose zone soil water-filled porosity	0.353	cm^3/cm^3	Calculated from moisture content

[1] Assumes slab-on-grade.

Table 3. Exposure Parameters Used to Estimate Indoor Air Risks

Parameter	Symbol	Units	Value	Source
Infinite source building concentration	$C_{building}$	$\mu g/m^3$	Chemical-specific	Modeled
Inhalation rate-adult resident	IRA_{adult}	m^3/day	20	USEPA, 1989
Inhalation rate-child resident	IRA_{child}	m^3/day	10	USEPA, 1997
Exposure frequency-resident	EF_r	days/year	350	USEPA, 1991
Exposure duration-adult resident	ED_{adult}	years	30	USEPA, 1991
Exposure duration-child resident	ED_{child}	years	6	USEPA, 1991
Averaging time-adult and child (carcinogens)	AT_c	days	25550	USEPA, 1989
Averaging time-adult resident (Noncarcinogen	AT_{nc-a}	days	10950	ED x 365
Averaging time-child (noncarcinogens)	AT_{nc-c}	days	2190	ED x 365
Conversion factor	CF	µg/mg	1000	-
Body weight-adult	BW_{adult}	kg	70	USEPA, 1989
Body weight-child	BW_{child}	kg	15	USEPA, 1991

Table 4. Inhalation Toxicity Criteria

Chemical	Inhalation RfD mg/kg/day	Inhalation CSF $(mg/kg\text{-}day)^{-1}$
1,2,4-Trimethylbenzene	1.70E-03	NC
1,3,5-Trimethylbenzene	1.70E-03	NC
2-Butanone	2.90E-01	NC
4-Ethyltoluene	NA	NA
Acetone	1.00E-01	NC
Benzene	1.70E-03	1.02E-01
Chloroform	8.60E-04	1.90E-02
Cyclohexane	5.70E+00	NC
Ethanol	NA	NA
Ethylbenzene[1]	2.90E-01	NA
Heptane	NA	NA
n-Hexane	5.70E-02	NC
Toluene	1.10E-01	NC
Xylenes	2.90E-02	NC

RfD = Reference dose
CSF = Cancer slope factor
NC = Noncarcinogen
NA = Not available

[1] Note, USEPA's National Center for Environmental Assessment suggests a CSF of 3.85×10^{-3} $(mg/kg\text{-}day)^{-1}$ for ethylbenzene. However, a CSF is not currently provided by either USEPA's IRIS or Cal/EPA's Office of Environmental Health Hazard Assessment.

Table 5. Estimated Excess Lifetime Cancer Risks and Noncarcinogenic Hazards

Equations:

$Risk = CSF \times C_{building} \times 1/CF \times (IRA_{adult} \times EF_r \times ED_{adult}) / (BW_{adult} \times AT_c)$

$Risk = CSF \times C_{building} \times 1/CF \times (IRA_{child} \times EF_r \times ED_{child}) / (BW_{child} \times AT_c)$

$Hazard = (1/RFD) \times C_{building} \times 1/CF \times (IRA_{child} \times EF_r \times ED_{child}) / (BW_{child} \times AT_{nc-c})$

Chemical	Infinite Source Building Concentration, $C_{building}$, SG-SCREEN[1] ($\mu g/m^3$)	Adult Excess Cancer Risk	Child Excess Cancer Risk	Child Noncancer Hazard
1,2,4-Trimethylbenzene	1.05E-03	NC	NC	3.9E-04
1,3,5-Trimethylbenzene	1.26E-03	NC	NC	4.7E-04
2-Butanone	2.76E-05	NC	NC	6.1E-08
Acetone	9.53E-05	NC	NC	6.1E-07
Benzene	1.13E-03	1.4E-08	6.3E-09	4.3E-04
Chloroform	8.59E-06	1.9E-11	8.9E-12	6.4E-06
Cyclohexane	4.16E-04	NC	NC	4.7E-08
Ethylbenzene	1.05E-03	NC	NC	2.3E-06
Hexane	1.95E-03	NC	NC	2.2E-05
Toluene	2.89E-03	NC	NC	1.7E-05
Xylenes	3.49E-03	NC	NC	7.7E-05
Total		**1.E-08**	**6.E-09**	**1.E-03**

[1] See Appendix B for model results.

NC = Noncarcinogen

NA = Not available

Table 6. Estimated Risks Due to Benzene Exposure Assuming Different Soil Types

Soil Texture	Abbreviation	Infinite Source Building Concentration, $C_{building}$, SG-SCREEN[1] ($\mu g/m^3$)	Adult Excess Cancer Risk
Sand	S	1.61E-03	1.9E-08
Loamy Sand	LS	1.96E-03	2.3E-08
Sandy Loam	SL	1.79E-03	2.1E-08
Sandy Clay Loam	SCL	1.23E-03	1.5E-08
Sandy Clay	SC	1.72E-03	2.1E-08
Loam	L	7.67E-04	9.2E-09
Clay Loam	CL	6.89E-04	8.3E-09
Silt Loam	SIL	6.80E-04	8.1E-09
Clay	C	1.74E-03	2.1E-08
Silty Clay Loam	SICL	6.92E-04	8.3E-09
Silt	SI	1.25E-03	1.5E-08
Silty Clay	SIC	1.13E-03	1.4E-08

[1] See Appendix C for model results.

APPENDIX A

OCTOBER 2002 SOIL VAPOR AND PHYSICAL PROPERTIES DATA

AIR TOXICS LTD.

SAMPLE NAME: SV-1

ID#: 0210375-01A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101905	Date of Collection:	10/15/02
Dil. Factor:	19.5	Date of Analysis:	10/19/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	9.8	49	Not Detected	Not Detected
Freon 114	9.8	69	Not Detected	Not Detected
Chloromethane	9.8	20	Not Detected	Not Detected
Vinyl Chloride	9.8	25	Not Detected	Not Detected
Bromomethane	9.8	38	Not Detected	Not Detected
Chloroethane	9.8	26	Not Detected	Not Detected
Freon 11	9.8	56	Not Detected	Not Detected
1,1-Dichloroethene	9.8	39	Not Detected	Not Detected
Freon 113	9.8	76	Not Detected	Not Detected
Methylene Chloride	9.8	34	Not Detected	Not Detected
1,1-Dichloroethane	9.8	40	Not Detected	Not Detected
cis-1,2-Dichloroethene	9.8	39	Not Detected	Not Detected
Chloroform	9.8	48	Not Detected	Not Detected
1,1,1-Trichloroethane	9.8	54	Not Detected	Not Detected
Carbon Tetrachloride	9.8	62	Not Detected	Not Detected
Benzene	9.8	32	520	1700
1,2-Dichloroethane	9.8	40	Not Detected	Not Detected
Trichloroethene	9.8	53	Not Detected	Not Detected
1,2-Dichloropropane	9.8	46	Not Detected	Not Detected
cis-1,3-Dichloropropene	9.8	45	Not Detected	Not Detected
Toluene	9.8	37	2200	8500
trans-1,3-Dichloropropene	9.8	45	Not Detected	Not Detected
1,1,2-Trichloroethane	9.8	54	Not Detected	Not Detected
Tetrachloroethene	9.8	67	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	9.8	76	Not Detected	Not Detected
Chlorobenzene	9.8	46	Not Detected	Not Detected
Ethyl Benzene	9.8	43	520	2300
m,p-Xylene	9.8	43	2100	9200
o-Xylene	9.8	43	810	3600
Styrene	9.8	42	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	9.8	68	Not Detected	Not Detected
1,3,5-Trimethylbenzene	9.8	49	260	1300
1,2,4-Trimethylbenzene	9.8	49	830	4200
1,3-Dichlorobenzene	9.8	60	Not Detected	Not Detected
1,4-Dichlorobenzene	9.8	60	Not Detected	Not Detected
alpha-Chlorotoluene	9.8	51	Not Detected	Not Detected
1,2-Dichlorobenzene	9.8	60	Not Detected	Not Detected
1,2,4-Trichlorobenzene	39	290	Not Detected	Not Detected
Hexachlorobutadiene	39	420	Not Detected	Not Detected
Propylene	39	68	Not Detected	Not Detected
1,3-Butadiene	39	88	Not Detected	Not Detected
Acetone	39	94	Not Detected	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: SV-1

ID#: 0210375-01A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101905	Date of Collection:	10/15/02
Dil. Factor:	19.5	Date of Analysis:	10/19/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	39	120	Not Detected	Not Detected
2-Propanol	39	97	Not Detected	Not Detected
trans-1,2-Dichloroethene	39	160	Not Detected	Not Detected
Vinyl Acetate	39	140	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	39	120	Not Detected	Not Detected
Hexane	39	140	550	2000
Tetrahydrofuran	39	120	Not Detected	Not Detected
Cyclohexane	39	140	190	650
1,4-Dioxane	39	140	Not Detected	Not Detected
Bromodichloromethane	39	260	Not Detected	Not Detected
4-Methyl-2-pentanone	39	160	Not Detected	Not Detected
2-Hexanone	39	160	Not Detected	Not Detected
Dibromochloromethane	39	340	Not Detected	Not Detected
Bromoform	39	410	Not Detected	Not Detected
4-Ethyltoluene	39	190	680	3400
Ethanol	39	75	Not Detected	Not Detected
Methyl tert-Butyl Ether	39	140	Not Detected	Not Detected
Heptane	39	160	340	1400

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	115	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	99	70-130

AIR TOXICS LTD.

SAMPLE NAME: SV-2

ID#: 0210375-02A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101907	Date of Collection: 10/15/02
Dil. Factor:	11.1	Date of Analysis: 10/19/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	5.6	28	Not Detected	Not Detected
Freon 114	5.6	39	Not Detected	Not Detected
Chloromethane	5.6	12	Not Detected	Not Detected
Vinyl Chloride	5.6	14	Not Detected	Not Detected
Bromomethane	5.6	22	Not Detected	Not Detected
Chloroethane	5.6	15	Not Detected	Not Detected
Freon 11	5.6	32	Not Detected	Not Detected
1,1-Dichloroethene	5.6	22	Not Detected	Not Detected
Freon 113	5.6	43	Not Detected	Not Detected
Methylene Chloride	5.6	20	Not Detected	Not Detected
1,1-Dichloroethane	5.6	23	Not Detected	Not Detected
cis-1,2-Dichloroethene	5.6	22	Not Detected	Not Detected
Chloroform	5.6	28	Not Detected	Not Detected
1,1,1-Trichloroethane	5.6	31	Not Detected	Not Detected
Carbon Tetrachloride	5.6	35	Not Detected	Not Detected
Benzene	5.6	18	530	1700
1,2-Dichloroethane	5.6	23	Not Detected	Not Detected
Trichloroethene	5.6	30	Not Detected	Not Detected
1,2-Dichloropropane	5.6	26	Not Detected	Not Detected
cis-1,3-Dichloropropene	5.6	26	Not Detected	Not Detected
Toluene	5.6	21	1400	5200
trans-1,3-Dichloropropene	5.6	26	Not Detected	Not Detected
1,1,2-Trichloroethane	5.6	31	Not Detected	Not Detected
Tetrachloroethene	5.6	38	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	5.6	43	Not Detected	Not Detected
Chlorobenzene	5.6	26	Not Detected	Not Detected
Ethyl Benzene	5.6	24	670	3000
m,p-Xylene	5.6	24	1900	8200
o-Xylene	5.6	24	590	2600
Styrene	5.6	24	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	5.6	39	Not Detected	Not Detected
1,3,5-Trimethylbenzene	5.6	28	250	1200
1,2,4-Trimethylbenzene	5.6	28	620	3100
1,3-Dichlorobenzene	5.6	34	Not Detected	Not Detected
1,4-Dichlorobenzene	5.6	34	Not Detected	Not Detected
alpha-Chlorotoluene	5.6	29	Not Detected	Not Detected
1,2-Dichlorobenzene	5.6	34	Not Detected	Not Detected
1,2,4-Trichlorobenzene	22	170	Not Detected	Not Detected
Hexachlorobutadiene	22	240	Not Detected	Not Detected
Propylene	22	39	Not Detected	Not Detected
1,3-Butadiene	22	50	Not Detected	Not Detected
Acetone	22	54	Not Detected	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: SV-2

ID#: 0210375-02A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101907	Date of Collection:	10/15/02
Dil. Factor:	11.1	Date of Analysis:	10/19/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	22	70	Not Detected	Not Detected
2-Propanol	22	55	Not Detected	Not Detected
trans-1,2-Dichloroethene	22	89	Not Detected	Not Detected
Vinyl Acetate	22	79	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	22	66	Not Detected	Not Detected
Hexane	22	80	4100 E	15000 E
Tetrahydrofuran	22	66	Not Detected	Not Detected
Cyclohexane	22	78	720	2500
1,4-Dioxane	22	81	Not Detected	Not Detected
Bromodichloromethane	22	150	Not Detected	Not Detected
4-Methyl-2-pentanone	22	92	Not Detected	Not Detected
2-Hexanone	22	92	Not Detected	Not Detected
Dibromochloromethane	22	190	Not Detected	Not Detected
Bromoform	22	230	Not Detected	Not Detected
4-Ethyltoluene	22	110	750	3800
Ethanol	22	42	Not Detected	Not Detected
Methyl tert-Butyl Ether	22	81	Not Detected	Not Detected
Heptane	22	92	2400 E	10000 E

E = Exceeds instrument calibration range.
Q = Exceeds Quality Control limits of 70% to 130%, due to matrix effects.
Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	132 Q	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	103	70-130

AIR TOXICS LTD.

SAMPLE NAME: SV-3

ID#: 0210375-03A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101909	Date of Collection:	10/15/02
Dil. Factor:	1.39	Date of Analysis:	10/19/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	0.70	3.5	Not Detected	Not Detected
Freon 114	0.70	4.9	Not Detected	Not Detected
Chloromethane	0.70	1.4	Not Detected	Not Detected
Vinyl Chloride	0.70	1.8	Not Detected	Not Detected
Bromomethane	0.70	2.7	Not Detected	Not Detected
Chloroethane	0.70	1.9	Not Detected	Not Detected
Freon 11	0.70	4.0	Not Detected	Not Detected
1,1-Dichloroethene	0.70	2.8	Not Detected	Not Detected
Freon 113	0.70	5.4	Not Detected	Not Detected
Methylene Chloride	0.70	2.4	Not Detected	Not Detected
1,1-Dichloroethane	0.70	2.8	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.70	2.8	Not Detected	Not Detected
Chloroform	0.70	3.4	Not Detected	Not Detected
1,1,1-Trichloroethane	0.70	3.8	Not Detected	Not Detected
Carbon Tetrachloride	0.70	4.4	Not Detected	Not Detected
Benzene	0.70	2.2	Not Detected	Not Detected
1,2-Dichloroethane	0.70	2.8	Not Detected	Not Detected
Trichloroethene	0.70	3.8	Not Detected	Not Detected
1,2-Dichloropropane	0.70	3.3	Not Detected	Not Detected
cis-1,3-Dichloropropene	0.70	3.2	Not Detected	Not Detected
Toluene	0.70	2.7	Not Detected	Not Detected
trans-1,3-Dichloropropene	0.70	3.2	Not Detected	Not Detected
1,1,2-Trichloroethane	0.70	3.8	Not Detected	Not Detected
Tetrachloroethene	0.70	4.8	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	0.70	5.4	Not Detected	Not Detected
Chlorobenzene	0.70	3.2	Not Detected	Not Detected
Ethyl Benzene	0.70	3.1	Not Detected	Not Detected
m,p-Xylene	0.70	3.1	1.0	4.7
o-Xylene	0.70	3.1	Not Detected	Not Detected
Styrene	0.70	3.0	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.70	4.8	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.70	3.5	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.70	3.5	1.0	5.0
1,3-Dichlorobenzene	0.70	4.2	Not Detected	Not Detected
1,4-Dichlorobenzene	0.70	4.2	Not Detected	Not Detected
alpha-Chlorotoluene	0.70	3.6	Not Detected	Not Detected
1,2-Dichlorobenzene	0.70	4.2	Not Detected	Not Detected
1,2,4-Trichlorobenzene	2.8	21	Not Detected	Not Detected
Hexachlorobutadiene	2.8	30	Not Detected	Not Detected
Propylene	2.8	4.9	Not Detected	Not Detected
1,3-Butadiene	2.8	6.2	Not Detected	Not Detected
Acetone	2.8	6.7	40	98

AIR TOXICS LTD.

SAMPLE NAME: SV-3

ID#: 0210375-03A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101909	Date of Collection:	10/15/02
Dil. Factor:	1.39	Date of Analysis:	10/19/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	2.8	8.8	Not Detected	Not Detected
2-Propanol	2.8	6.9	Not Detected	Not Detected
trans-1,2-Dichloroethene	2.8	11	Not Detected	Not Detected
Vinyl Acetate	2.8	9.9	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.8	8.3	3.2	9.7
Hexane	2.8	10	Not Detected	Not Detected
Tetrahydrofuran	2.8	8.3	Not Detected	Not Detected
Cyclohexane	2.8	9.7	Not Detected	Not Detected
1,4-Dioxane	2.8	10	Not Detected	Not Detected
Bromodichloromethane	2.8	19	Not Detected	Not Detected
4-Methyl-2-pentanone	2.8	12	Not Detected	Not Detected
2-Hexanone	2.8	12	Not Detected	Not Detected
Dibromochloromethane	2.8	24	Not Detected	Not Detected
Bromoform	2.8	29	Not Detected	Not Detected
4-Ethyltoluene	2.8	14	Not Detected	Not Detected
Ethanol	2.8	5.3	2.8	5.4
Methyl tert-Butyl Ether	2.8	10	Not Detected	Not Detected
Heptane	2.8	12	Not Detected	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	110	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	101	70-130

AIR TOXICS LTD.

SAMPLE NAME: SV-4

ID#: 0210375-04A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101910	Date of Collection: 10/15/02
Dil. Factor:	1.44	Date of Analysis: 10/19/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	0.72	3.6	Not Detected	Not Detected
Freon 114	0.72	5.1	Not Detected	Not Detected
Chloromethane	0.72	1.5	Not Detected	Not Detected
Vinyl Chloride	0.72	1.9	Not Detected	Not Detected
Bromomethane	0.72	2.8	Not Detected	Not Detected
Chloroethane	0.72	1.9	Not Detected	Not Detected
Freon 11	0.72	4.1	Not Detected	Not Detected
1,1-Dichloroethene	0.72	2.9	Not Detected	Not Detected
Freon 113	0.72	5.6	Not Detected	Not Detected
Methylene Chloride	0.72	2.5	Not Detected	Not Detected
1,1-Dichloroethane	0.72	3.0	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.72	2.9	Not Detected	Not Detected
Chloroform	0.72	3.6	1.3	6.5
1,1,1-Trichloroethane	0.72	4.0	Not Detected	Not Detected
Carbon Tetrachloride	0.72	4.6	Not Detected	Not Detected
Benzene	0.72	2.3	1.0	3.2
1,2-Dichloroethane	0.72	3.0	Not Detected	Not Detected
Trichloroethene	0.72	3.9	Not Detected	Not Detected
1,2-Dichloropropane	0.72	3.4	Not Detected	Not Detected
cis-1,3-Dichloropropene	0.72	3.3	Not Detected	Not Detected
Toluene	0.72	2.8	1.8	7.1
trans-1,3-Dichloropropene	0.72	3.3	Not Detected	Not Detected
1,1,2-Trichloroethane	0.72	4.0	Not Detected	Not Detected
Tetrachloroethene	0.72	5.0	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	0.72	5.6	Not Detected	Not Detected
Chlorobenzene	0.72	3.4	Not Detected	Not Detected
Ethyl Benzene	0.72	3.2	Not Detected	Not Detected
m,p-Xylene	0.72	3.2	2.1	9.2
o-Xylene	0.72	3.2	0.77	3.4
Styrene	0.72	3.1	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.72	5.0	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.72	3.6	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.72	3.6	2.3	11
1,3-Dichlorobenzene	0.72	4.4	Not Detected	Not Detected
1,4-Dichlorobenzene	0.72	4.4	Not Detected	Not Detected
alpha-Chlorotoluene	0.72	3.8	Not Detected	Not Detected
1,2-Dichlorobenzene	0.72	4.4	Not Detected	Not Detected
1,2,4-Trichlorobenzene	2.9	22	Not Detected	Not Detected
Hexachlorobutadiene	2.9	31	Not Detected	Not Detected
Propylene	2.9	5.0	Not Detected	Not Detected
1,3-Butadiene	2.9	6.5	Not Detected	Not Detected
Acetone	2.9	7.0	38	91

AIR TOXICS LTD.

SAMPLE NAME: SV-4

ID#: 0210375-04A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101910	Date of Collection:	10/15/02
Dil. Factor:	1.44	Date of Analysis:	10/19/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	2.9	9.1	Not Detected	Not Detected
2-Propanol	2.9	7.2	Not Detected	Not Detected
trans-1,2-Dichloroethene	2.9	12	Not Detected	Not Detected
Vinyl Acetate	2.9	10	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.9	8.6	2.8 J	8.5 J
Hexane	2.9	10	Not Detected	Not Detected
Tetrahydrofuran	2.9	8.6	Not Detected	Not Detected
Cyclohexane	2.9	10	Not Detected	Not Detected
1,4-Dioxane	2.9	10	Not Detected	Not Detected
Bromodichloromethane	2.9	20	Not Detected	Not Detected
4-Methyl-2-pentanone	2.9	12	Not Detected	Not Detected
2-Hexanone	2.9	12	Not Detected	Not Detected
Dibromochloromethane	2.9	25	Not Detected	Not Detected
Bromoform	2.9	30	Not Detected	Not Detected
4-Ethyltoluene	2.9	14	Not Detected	Not Detected
Ethanol	2.9	5.5	Not Detected	Not Detected
Methyl tert-Butyl Ether	2.9	10	Not Detected	Not Detected
Heptane	2.9	12	Not Detected	Not Detected

J = Estimated value.

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	112	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	102	70-130

AIR TOXICS LTD.

SAMPLE NAME: SV-5

ID#: 0210375-05A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101911	Date of Collection: 10/15/02
Dil. Factor:	59.6	Date of Analysis: 10/19/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	30	150	Not Detected	Not Detected
Freon 114	30	210	Not Detected	Not Detected
Chloromethane	30	62	Not Detected	Not Detected
Vinyl Chloride	30	77	Not Detected	Not Detected
Bromomethane	30	120	Not Detected	Not Detected
Chloroethane	30	80	Not Detected	Not Detected
Freon 11	30	170	Not Detected	Not Detected
1,1-Dichloroethene	30	120	Not Detected	Not Detected
Freon 113	30	230	Not Detected	Not Detected
Methylene Chloride	30	100	Not Detected	Not Detected
1,1-Dichloroethane	30	120	Not Detected	Not Detected
cis-1,2-Dichloroethene	30	120	Not Detected	Not Detected
Chloroform	30	150	Not Detected	Not Detected
1,1,1-Trichloroethane	30	160	Not Detected	Not Detected
Carbon Tetrachloride	30	190	Not Detected	Not Detected
Benzene	30	97	1100	3600
1,2-Dichloroethane	30	120	Not Detected	Not Detected
Trichloroethene	30	160	Not Detected	Not Detected
1,2-Dichloropropane	30	140	Not Detected	Not Detected
cis-1,3-Dichloropropene	30	140	Not Detected	Not Detected
Toluene	30	110	67	260
trans-1,3-Dichloropropene	30	140	Not Detected	Not Detected
1,1,2-Trichloroethane	30	160	Not Detected	Not Detected
Tetrachloroethene	30	200	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	30	230	Not Detected	Not Detected
Chlorobenzene	30	140	Not Detected	Not Detected
Ethyl Benzene	30	130	440	2000
m,p-Xylene	30	130	200	860
o-Xylene	30	130	Not Detected	Not Detected
Styrene	30	130	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	30	210	Not Detected	Not Detected
1,3,5-Trimethylbenzene	30	150	Not Detected	Not Detected
1,2,4-Trimethylbenzene	30	150	Not Detected	Not Detected
1,3-Dichlorobenzene	30	180	Not Detected	Not Detected
1,4-Dichlorobenzene	30	180	Not Detected	Not Detected
alpha-Chlorotoluene	30	160	Not Detected	Not Detected
1,2-Dichlorobenzene	30	180	Not Detected	Not Detected
1,2,4-Trichlorobenzene	120	900	Not Detected	Not Detected
Hexachlorobutadiene	120	1300	Not Detected	Not Detected
Propylene	120	210	Not Detected	Not Detected
1,3-Butadiene	120	270	Not Detected	Not Detected
Acetone	120	290	Not Detected	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: SV-5

ID#: 0210375-05A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101911	Date of Collection:	10/15/02
Dil. Factor:	59.6	Date of Analysis:	10/19/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	120	380	Not Detected	Not Detected
2-Propanol	120	300	Not Detected	Not Detected
trans-1,2-Dichloroethene	120	480	Not Detected	Not Detected
Vinyl Acetate	120	430	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	120	360	Not Detected	Not Detected
Hexane	120	430	13000 E	47000 E
Tetrahydrofuran	120	360	Not Detected	Not Detected
Cyclohexane	120	420	4100	14000
1,4-Dioxane	120	440	Not Detected	Not Detected
Bromodichloromethane	120	810	Not Detected	Not Detected
4-Methyl-2-pentanone	120	500	Not Detected	Not Detected
2-Hexanone	120	500	Not Detected	Not Detected
Dibromochloromethane	120	1000	Not Detected	Not Detected
Bromoform	120	1200	Not Detected	Not Detected
4-Ethyltoluene	120	600	Not Detected	Not Detected
Ethanol	120	230	Not Detected	Not Detected
Methyl tert-Butyl Ether	120	440	Not Detected	Not Detected
Heptane	120	500	7300	30000

E = Exceeds instrument calibration range.
Q = Exceeds Quality Control limits of 70% to 130%, due to matrix effects.
Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	154 Q	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	100	70-130

AIR TOXICS LTD.

SAMPLE NAME: SV-6

ID#: 0210375-06A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101912	Date of Collection:	10/15/02
Dil Factor:	1.49	Date of Analysis:	10/19/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	0.74	3.7	Not Detected	Not Detected
Freon 114	0.74	5.3	Not Detected	Not Detected
Chloromethane	0.74	1.6	Not Detected	Not Detected
Vinyl Chloride	0.74	1.9	Not Detected	Not Detected
Bromomethane	0.74	2.9	Not Detected	Not Detected
Chloroethane	0.74	2.0	Not Detected	Not Detected
Freon 11	0.74	4.2	Not Detected	Not Detected
1,1-Dichloroethene	0.74	3.0	Not Detected	Not Detected
Freon 113	0.74	5.8	Not Detected	Not Detected
Methylene Chloride	0.74	2.6	Not Detected	Not Detected
1,1-Dichloroethane	0.74	3.1	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.74	3.0	Not Detected	Not Detected
Chloroform	0.74	3.7	Not Detected	Not Detected
1,1,1-Trichloroethane	0.74	4.1	Not Detected	Not Detected
Carbon Tetrachloride	0.74	4.8	Not Detected	Not Detected
Benzene	0.74	2.4	0.97	3.1
1,2-Dichloroethane	0.74	3.1	Not Detected	Not Detected
Trichloroethene	0.74	4.1	Not Detected	Not Detected
1,2-Dichloropropane	0.74	3.5	Not Detected	Not Detected
cis-1,3-Dichloropropene	0.74	3.4	Not Detected	Not Detected
Toluene	0.74	2.8	1.2	4.6
trans-1,3-Dichloropropene	0.74	3.4	Not Detected	Not Detected
1,1,2-Trichloroethane	0.74	4.1	Not Detected	Not Detected
Tetrachloroethene	0.74	5.1	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	0.74	5.8	Not Detected	Not Detected
Chlorobenzene	0.74	3.5	Not Detected	Not Detected
Ethyl Benzene	0.74	3.3	1.2	5.5
m,p-Xylene	0.74	3.3	2.0	8.7
o-Xylene	0.74	3.3	Not Detected	Not Detected
Styrene	0.74	3.2	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.74	5.2	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.74	3.7	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.74	3.7	1.7	8.3
1,3-Dichlorobenzene	0.74	4.6	Not Detected	Not Detected
1,4-Dichlorobenzene	0.74	4.6	Not Detected	Not Detected
alpha-Chlorotoluene	0.74	3.9	Not Detected	Not Detected
1,2-Dichlorobenzene	0.74	4.6	Not Detected	Not Detected
1,2,4-Trichlorobenzene	3.0	22	Not Detected	Not Detected
Hexachlorobutadiene	3.0	32	Not Detected	Not Detected
Propylene	3.0	5.2	Not Detected	Not Detected
1,3-Butadiene	3.0	6.7	Not Detected	Not Detected
Acetone	3.0	7.2	55	130

AIR TOXICS LTD.

SAMPLE NAME: SV-6

ID#: 0210375-06A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101912	Date of Collection:	10/15/02
Dil Factor:	1.49	Date of Analysis:	10/19/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	3.0	9.4	Not Detected	Not Detected
2-Propanol	3.0	7.4	Not Detected	Not Detected
trans-1,2-Dichloroethene	3.0	12	Not Detected	Not Detected
Vinyl Acetate	3.0	11	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	3.0	8.9	Not Detected	Not Detected
Hexane	3.0	11	4.6	16
Tetrahydrofuran	3.0	8.9	Not Detected	Not Detected
Cyclohexane	3.0	10	Not Detected	Not Detected
1,4-Dioxane	3.0	11	Not Detected	Not Detected
Bromodichloromethane	3.0	20	Not Detected	Not Detected
4-Methyl-2-pentanone	3.0	12	Not Detected	Not Detected
2-Hexanone	3.0	12	Not Detected	Not Detected
Dibromochloromethane	3.0	26	Not Detected	Not Detected
Bromoform	3.0	31	Not Detected	Not Detected
4-Ethyltoluene	3.0	15	Not Detected	Not Detected
Ethanol	3.0	5.7	Not Detected	Not Detected
Methyl tert-Butyl Ether	3.0	11	Not Detected	Not Detected
Heptane	3.0	12	4.7	20

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	96	70-130

AIR TOXICS LTD.

SAMPLE NAME: SV-7

ID#: 0210375-07A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r102007	Date of Collection:	10/15/02
Dil. Factor:	5.96	Date of Analysis:	10/20/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	3.0	15	Not Detected	Not Detected
Freon 114	3.0	21	Not Detected	Not Detected
Chloromethane	3.0	6.2	Not Detected	Not Detected
Vinyl Chloride	3.0	7.7	Not Detected	Not Detected
Bromomethane	3.0	12	Not Detected	Not Detected
Chloroethane	3.0	8.0	Not Detected	Not Detected
Freon 11	3.0	17	Not Detected	Not Detected
1,1-Dichloroethene	3.0	12	Not Detected	Not Detected
Freon 113	3.0	23	Not Detected	Not Detected
Methylene Chloride	3.0	10	Not Detected	Not Detected
1,1-Dichloroethane	3.0	12	Not Detected	Not Detected
cis-1,2-Dichloroethene	3.0	12	Not Detected	Not Detected
Chloroform	3.0	15	Not Detected	Not Detected
1,1,1-Trichloroethane	3.0	16	Not Detected	Not Detected
Carbon Tetrachloride	3.0	19	Not Detected	Not Detected
Benzene	3.0	9.7	Not Detected	Not Detected
1,2-Dichloroethane	3.0	12	Not Detected	Not Detected
Trichloroethene	3.0	16	Not Detected	Not Detected
1,2-Dichloropropane	3.0	14	Not Detected	Not Detected
cis-1,3-Dichloropropene	3.0	14	Not Detected	Not Detected
Toluene	3.0	11	Not Detected	Not Detected
trans-1,3-Dichloropropene	3.0	14	Not Detected	Not Detected
1,1,2-Trichloroethane	3.0	16	Not Detected	Not Detected
Tetrachloroethene	3.0	20	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	3.0	23	Not Detected	Not Detected
Chlorobenzene	3.0	14	Not Detected	Not Detected
Ethyl Benzene	3.0	13	Not Detected	Not Detected
m,p-Xylene	3.0	13	Not Detected	Not Detected
o-Xylene	3.0	13	Not Detected	Not Detected
Styrene	3.0	13	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	3.0	21	Not Detected	Not Detected
1,3,5-Trimethylbenzene	3.0	15	Not Detected	Not Detected
1,2,4-Trimethylbenzene	3.0	15	Not Detected	Not Detected
1,3-Dichlorobenzene	3.0	18	Not Detected	Not Detected
1,4-Dichlorobenzene	3.0	18	Not Detected	Not Detected
alpha-Chlorotoluene	3.0	16	Not Detected	Not Detected
1,2-Dichlorobenzene	3.0	18	Not Detected	Not Detected
1,2,4-Trichlorobenzene	12	90	Not Detected	Not Detected
Hexachlorobutadiene	12	130	Not Detected	Not Detected
Propylene	12	21	Not Detected	Not Detected
1,3-Butadiene	12	27	Not Detected	Not Detected
Acetone	12	29	Not Detected	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: SV-7

ID#: 0210375-07A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r102007	Date of Collection:	10/15/02
Dil. Factor:	5.96	Date of Analysis:	10/20/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	12	38	Not Detected	Not Detected
2-Propanol	12	30	Not Detected	Not Detected
trans-1,2-Dichloroethene	12	48	Not Detected	Not Detected
Vinyl Acetate	12	43	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	12	36	Not Detected	Not Detected
Hexane	12	43	40	140
Tetrahydrofuran	12	36	Not Detected	Not Detected
Cyclohexane	12	42	85	300
1,4-Dioxane	12	44	Not Detected	Not Detected
Bromodichloromethane	12	81	Not Detected	Not Detected
4-Methyl-2-pentanone	12	50	Not Detected	Not Detected
2-Hexanone	12	50	Not Detected	Not Detected
Dibromochloromethane	12	100	Not Detected	Not Detected
Bromoform	12	120	Not Detected	Not Detected
4-Ethyltoluene	12	60	Not Detected	Not Detected
Ethanol	12	23	Not Detected	Not Detected
Methyl tert-Butyl Ether	12	44	Not Detected	Not Detected
Heptane	12	50	Not Detected	Not Detected

Q = Exceeds Quality Control limits of 70% to 130%, due to matrix effects.

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	168 Q	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	103	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0210375-08A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101904	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 10/19/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	0.50	2.5	Not Detected	Not Detected
Freon 114	0.50	3.6	Not Detected	Not Detected
Chloromethane	0.50	1.0	Not Detected	Not Detected
Vinyl Chloride	0.50	1.3	Not Detected	Not Detected
Bromomethane	0.50	2.0	Not Detected	Not Detected
Chloroethane	0.50	1.3	Not Detected	Not Detected
Freon 11	0.50	2.8	Not Detected	Not Detected
1,1-Dichloroethene	0.50	2.0	Not Detected	Not Detected
Freon 113	0.50	3.9	Not Detected	Not Detected
Methylene Chloride	0.50	1.8	Not Detected	Not Detected
1,1-Dichloroethane	0.50	2.0	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.50	2.0	Not Detected	Not Detected
Chloroform	0.50	2.5	Not Detected	Not Detected
1,1,1-Trichloroethane	0.50	2.8	Not Detected	Not Detected
Carbon Tetrachloride	0.50	3.2	Not Detected	Not Detected
Benzene	0.50	1.6	Not Detected	Not Detected
1,2-Dichloroethane	0.50	2.0	Not Detected	Not Detected
Trichloroethene	0.50	2.7	Not Detected	Not Detected
1,2-Dichloropropane	0.50	2.3	Not Detected	Not Detected
cis-1,3-Dichloropropene	0.50	2.3	Not Detected	Not Detected
Toluene	0.50	1.9	Not Detected	Not Detected
trans-1,3-Dichloropropene	0.50	2.3	Not Detected	Not Detected
1,1,2-Trichloroethane	0.50	2.8	Not Detected	Not Detected
Tetrachloroethene	0.50	3.4	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	0.50	3.9	Not Detected	Not Detected
Chlorobenzene	0.50	2.3	Not Detected	Not Detected
Ethyl Benzene	0.50	2.2	Not Detected	Not Detected
m,p-Xylene	0.50	2.2	Not Detected	Not Detected
o-Xylene	0.50	2.2	Not Detected	Not Detected
Styrene	0.50	2.2	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.50	3.5	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.50	2.5	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.50	2.5	Not Detected	Not Detected
1,3-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
1,4-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
alpha-Chlorotoluene	0.50	2.6	Not Detected	Not Detected
1,2-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
1,2,4-Trichlorobenzene	2.0	15	Not Detected	Not Detected
Hexachlorobutadiene	2.0	22	Not Detected	Not Detected
Propylene	2.0	3.5	Not Detected	Not Detected
1,3-Butadiene	2.0	4.5	Not Detected	Not Detected
Acetone	2.0	4.8	Not Detected	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0210375-08A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101904	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 10/19/02	

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	2.0	6.3	Not Detected	Not Detected
2-Propanol	2.0	5.0	Not Detected	Not Detected
trans-1,2-Dichloroethene	2.0	8.0	Not Detected	Not Detected
Vinyl Acetate	2.0	7.2	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	6.0	Not Detected	Not Detected
Hexane	2.0	7.2	Not Detected	Not Detected
Tetrahydrofuran	2.0	6.0	Not Detected	Not Detected
Cyclohexane	2.0	7.0	Not Detected	Not Detected
1,4-Dioxane	2.0	7.3	Not Detected	Not Detected
Bromodichloromethane	2.0	14	Not Detected	Not Detected
4-Methyl-2-pentanone	2.0	8.3	Not Detected	Not Detected
2-Hexanone	2.0	8.3	Not Detected	Not Detected
Dibromochloromethane	2.0	17	Not Detected	Not Detected
Bromoform	2.0	21	Not Detected	Not Detected
4-Ethyltoluene	2.0	10	Not Detected	Not Detected
Ethanol	2.0	3.8	Not Detected	Not Detected
Methyl tert-Butyl Ether	2.0	7.3	Not Detected	Not Detected
Heptane	2.0	8.3	Not Detected	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	96	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0210375-08B

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r102006	Date of Collection:	NA
Dil. Factor:	1.00	Date of Analysis:	10/20/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	0.50	2.5	Not Detected	Not Detected
Freon 114	0.50	3.6	Not Detected	Not Detected
Chloromethane	0.50	1.0	Not Detected	Not Detected
Vinyl Chloride	0.50	1.3	Not Detected	Not Detected
Bromomethane	0.50	2.0	Not Detected	Not Detected
Chloroethane	0.50	1.3	Not Detected	Not Detected
Freon 11	0.50	2.8	Not Detected	Not Detected
1,1-Dichloroethene	0.50	2.0	Not Detected	Not Detected
Freon 113	0.50	3.9	Not Detected	Not Detected
Methylene Chloride	0.50	1.8	Not Detected	Not Detected
1,1-Dichloroethane	0.50	2.0	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.50	2.0	Not Detected	Not Detected
Chloroform	0.50	2.5	Not Detected	Not Detected
1,1,1-Trichloroethane	0.50	2.8	Not Detected	Not Detected
Carbon Tetrachloride	0.50	3.2	Not Detected	Not Detected
Benzene	0.50	1.6	Not Detected	Not Detected
1,2-Dichloroethane	0.50	2.0	Not Detected	Not Detected
Trichloroethene	0.50	2.7	Not Detected	Not Detected
1,2-Dichloropropane	0.50	2.3	Not Detected	Not Detected
cis-1,3-Dichloropropene	0.50	2.3	Not Detected	Not Detected
Toluene	0.50	1.9	Not Detected	Not Detected
trans-1,3-Dichloropropene	0.50	2.3	Not Detected	Not Detected
1,1,2-Trichloroethane	0.50	2.8	Not Detected	Not Detected
Tetrachloroethene	0.50	3.4	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	0.50	3.9	Not Detected	Not Detected
Chlorobenzene	0.50	2.3	Not Detected	Not Detected
Ethyl Benzene	0.50	2.2	Not Detected	Not Detected
m,p-Xylene	0.50	2.2	Not Detected	Not Detected
o-Xylene	0.50	2.2	Not Detected	Not Detected
Styrene	0.50	2.2	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.50	3.5	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.50	2.5	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.50	2.5	Not Detected	Not Detected
1,3-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
1,4-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
alpha-Chlorotoluene	0.50	2.6	Not Detected	Not Detected
1,2-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
1,2,4-Trichlorobenzene	2.0	15	Not Detected	Not Detected
Hexachlorobutadiene	2.0	22	Not Detected	Not Detected
Propylene	2.0	3.5	Not Detected	Not Detected
1,3-Butadiene	2.0	4.5	Not Detected	Not Detected
Acetone	2.0	4.8	Not Detected	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0210375-08B

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r102006	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 10/20/02	

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	2.0	6.3	Not Detected	Not Detected
2-Propanol	2.0	5.0	Not Detected	Not Detected
trans-1,2-Dichloroethene	2.0	8.0	Not Detected	Not Detected
Vinyl Acetate	2.0	7.2	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	6.0	Not Detected	Not Detected
Hexane	2.0	7.2	Not Detected	Not Detected
Tetrahydrofuran	2.0	6.0	Not Detected	Not Detected
Cyclohexane	2.0	7.0	Not Detected	Not Detected
1,4-Dioxane	2.0	7.3	Not Detected	Not Detected
Bromodichloromethane	2.0	14	Not Detected	Not Detected
4-Methyl-2-pentanone	2.0	8.3	Not Detected	Not Detected
2-Hexanone	2.0	8.3	Not Detected	Not Detected
Dibromochloromethane	2.0	17	Not Detected	Not Detected
Bromoform	2.0	21	Not Detected	Not Detected
4-Ethyltoluene	2.0	10	Not Detected	Not Detected
Ethanol	2.0	3.8	Not Detected	Not Detected
Methyl tert-Butyl Ether	2.0	7.3	Not Detected	Not Detected
Heptane	2.0	8.3	Not Detected	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	111	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	94	70-130

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0210375-09A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101903	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 10/19/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	%Recovery
Freon 12	0.50	2.5	136 Q
Freon 114	0.50	3.6	128
Chloromethane	0.50	1.0	107
Vinyl Chloride	0.50	1.3	95
Bromomethane	0.50	2.0	130
Chloroethane	0.50	1.3	130
Freon 11	0.50	2.8	130
1,1-Dichloroethene	0.50	2.0	118
Freon 113	0.50	3.9	113
Methylene Chloride	0.50	1.8	109
1,1-Dichloroethane	0.50	2.0	114
cis-1,2-Dichloroethene	0.50	2.0	122
Chloroform	0.50	2.5	120
1,1,1-Trichloroethane	0.50	2.8	116
Carbon Tetrachloride	0.50	3.2	121
Benzene	0.50	1.6	124
1,2-Dichloroethane	0.50	2.0	120
Trichloroethene	0.50	2.7	116
1,2-Dichloropropane	0.50	2.3	116
cis-1,3-Dichloropropene	0.50	2.3	98
Toluene	0.50	1.9	123
trans-1,3-Dichloropropene	0.50	2.3	104
1,1,2-Trichloroethane	0.50	2.8	111
Tetrachloroethene	0.50	3.4	108
1,2-Dibromoethane (EDB)	0.50	3.9	102
Chlorobenzene	0.50	2.3	108
Ethyl Benzene	0.50	2.2	118
m,p-Xylene	0.50	2.2	113
o-Xylene	0.50	2.2	111
Styrene	0.50	2.2	99
1,1,2,2-Tetrachloroethane	0.50	3.5	106
1,3,5-Trimethylbenzene	0.50	2.5	98
1,2,4-Trimethylbenzene	0.50	2.5	94
1,3-Dichlorobenzene	0.50	3.0	96
1,4-Dichlorobenzene	0.50	3.0	90
alpha-Chlorotoluene	0.50	2.6	92
1,2-Dichlorobenzene	0.50	3.0	95
1,2,4-Trichlorobenzene	2.0	15	78
Hexachlorobutadiene	2.0	22	79
Propylene	2.0	3.5	105
1,3-Butadiene	2.0	4.5	94
Acetone	2.0	4.8	140

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0210375-09A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r101903	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 10/19/02	

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	%Recovery
Carbon Disulfide	2.0	6.3	142 Q
2-Propanol	2.0	5.0	138
trans-1,2-Dichloroethene	2.0	8.0	142 Q
Vinyl Acetate	2.0	7.2	127
2-Butanone (Methyl Ethyl Ketone)	2.0	6.0	113
Hexane	2.0	7.2	125
Tetrahydrofuran	2.0	6.0	115
Cyclohexane	2.0	7.0	119
1,4-Dioxane	2.0	7.3	120
Bromodichloromethane	2.0	14	124
4-Methyl-2-pentanone	2.0	8.3	116
2-Hexanone	2.0	8.3	107
Dibromochloromethane	2.0	17	105
Bromoform	2.0	21	96
4-Ethyltoluene	2.0	10	138
Ethanol	2.0	3.8	118
Methyl tert-Butyl Ether	2.0	7.3	122
Heptane	2.0	8.3	117

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	101	70-130

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0210375-09B

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r102004	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 10/20/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	%Recovery
Freon 12	0.50	2.5	133 Q
Freon 114	0.50	3.6	125
Chloromethane	0.50	1.0	107
Vinyl Chloride	0.50	1.3	95
Bromomethane	0.50	2.0	128
Chloroethane	0.50	1.3	127
Freon 11	0.50	2.8	125
1,1-Dichloroethene	0.50	2.0	115
Freon 113	0.50	3.9	111
Methylene Chloride	0.50	1.8	107
1,1-Dichloroethane	0.50	2.0	111
cis-1,2-Dichloroethene	0.50	2.0	120
Chloroform	0.50	2.5	116
1,1,1-Trichloroethane	0.50	2.8	112
Carbon Tetrachloride	0.50	3.2	119
Benzene	0.50	1.6	118
1,2-Dichloroethane	0.50	2.0	114
Trichloroethene	0.50	2.7	111
1,2-Dichloropropane	0.50	2.3	110
cis-1,3-Dichloropropene	0.50	2.3	92
Toluene	0.50	1.9	117
trans-1,3-Dichloropropene	0.50	2.3	98
1,1,2-Trichloroethane	0.50	2.8	106
Tetrachloroethene	0.50	3.4	106
1,2-Dibromoethane (EDB)	0.50	3.9	97
Chlorobenzene	0.50	2.3	104
Ethyl Benzene	0.50	2.2	112
m,p-Xylene	0.50	2.2	109
o-Xylene	0.50	2.2	109
Styrene	0.50	2.2	95
1,1,2,2-Tetrachloroethane	0.50	3.5	102
1,3,5-Trimethylbenzene	0.50	2.5	100
1,2,4-Trimethylbenzene	0.50	2.5	91
1,3-Dichlorobenzene	0.50	3.0	94
1,4-Dichlorobenzene	0.50	3.0	88
alpha-Chlorotoluene	0.50	2.6	89
1,2-Dichlorobenzene	0.50	3.0	94
1,2,4-Trichlorobenzene	2.0	15	77
Hexachlorobutadiene	2.0	22	80
Propylene	2.0	3.5	105
1,3-Butadiene	2.0	4.5	94
Acetone	2.0	4.8	137

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0210375-09B

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	r102004		Date of Collection: NA
Dil. Factor:	1.00		Date of Analysis: 10/20/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	%Recovery
Carbon Disulfide	2.0	6.3	139
2-Propanol	2.0	5.0	135
trans-1,2-Dichloroethene	2.0	8.0	140
Vinyl Acetate	2.0	7.2	127
2-Butanone (Methyl Ethyl Ketone)	2.0	6.0	112
Hexane	2.0	7.2	124
Tetrahydrofuran	2.0	6.0	115
Cyclohexane	2.0	7.0	117
1,4-Dioxane	2.0	7.3	112
Bromodichloromethane	2.0	14	117
4-Methyl-2-pentanone	2.0	8.3	110
2-Hexanone	2.0	8.3	104
Dibromochloromethane	2.0	17	104
Bromoform	2.0	21	96
4-Ethyltoluene	2.0	10	134
Ethanol	2.0	3.8	121
Methyl tert-Butyl Ether	2.0	7.3	119
Heptane	2.0	8.3	114

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	99	70-130

Analysis Report

Lancaster Laboratories
Where quality is a science.

ANALYTICAL RESULTS

Prepared for:

Delta Environmental
3164 Gold Camp Drive
Suite 200
Rancho Cordova CA 95670
916-536-2612

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 830073. Samples arrived at the laboratory on Friday, November 08, 2002. The PO# for this group is 99011184 and the release number is STREICH.

Client Description	Lancaster Labs Number
SPA-1 Soil Sample	3936941
SPA-2 Soil Sample	3936942

1 COPY TO Delta Environmental Attn: Mr. Todd Del Frate

Questions? Contact your Client Services Representative
Teresa M Lis at (717) 656-2300.

Respectfully Submitted,

Robert E. Mellinger
Sr. Chemist/Coordinator

Analysis Report

Lancaster Laboratories
Where quality is a science.

Lancaster Laboratories Sample No. SW 3936941

Collected:10/17/2002 11:00 by WS

Account Number: 10900

Submitted: 11/08/2002 09:10
Reported: 11/27/2002 at 13:19
Discard: 12/28/2002
SPA-1 Soil Sample

Delta Environmental
3164 Gold Camp Drive
Suite 200
Rancho Cordova CA 95670

Facility# 91153
3135 Gibbons Dr-Alameda, CA

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Units	Dilution Factor
09158	Fraction of Organic Carbon	n.a.	See Attached			1
09487	Total Porosity	n.a.	See Attached			1
09505	Bulk Density	n.a.	See Attached			1
09506	Moisture	n.a.	See Attached			1

The analysis for TOC, Bulk Density & Total Porosity was subcontracted to another laboratory.
State of California Lab Certification No. 2116

MEMBER ACIL
Lancaster Laboratories, Inc.
2425 New Holland Pike
PO Box 12425
Lancaster, PA 17605-2425
717-656-2300 Fax: 717-656-2681

Analysis Report

Lancaster Laboratories
Where quality is a science.

Lancaster Laboratories Sample No. SW 3936942

Collected:10/17/2002 15:55 by WS

Submitted: 11/08/2002 09:10
Reported: 11/27/2002 at 13:19
Discard: 12/28/2002
SPA-2 Soil Sample

Facility# 91153
3135 Gibbons Dr-Alameda, CA

Account Number: 10900

Delta Environmental
3164 Gold Camp Drive
Suite 200
Rancho Cordova CA 95670

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Units	Dilution Factor
09158	Fraction of Organic Carbon	n.a.	See Attached			1
09487	Total Porosity	n.a.	See Attached			1
09505	Bulk Density	n.a.	See Attached			1
09506	Moisture	n.a.	See Attached			1

The analysis for TOC, Bulk Density & Total Porosity was subcontracted to another laboratory.
State of California Lab Certification No. 2116

MEMBER ACIL
Lancaster Laboratories, Inc.
2425 New Holland Pike
PO Box 12425
Lancaster, PA 17605-2425
717-656-2300 Fax: 717-656-2681

Lancaster Laboratories
Where quality is a science.

For Lancaster Laboratories use only
Acct. #: 10900 Sample #: 393694 1-2 SCR#:

gr #890073

Facility #: FORMER CHEVRON 9-1153
Site Address: 3135 Gibbons Dr., Alameda, California
Chevron PM: Streich Lead Consultant: Delta
Consultant/Office: 3164 Gold Camp Dr. Ste200, Rancho Cordova, CA 95670
Consultant Prj. Mgr.: Todd Del Frate
Consultant Phone #: (916) 536-2612 Fax #: (916) 638-8385
Sampler: William Slowik
Service Order #: ☐ Non SAR:

Field Point Name	Matrix	Repeat Sample	Top Depth	Year Month Day	Time Collected	New Field Pt	Grab	Composite	Total Number of Containers
SPA-1	SOIL			02 10 17	11:00				
SPA-2	SOIL			02 10 17	15:55				

Analyses Requested

Preservation Codes

BTEX + MTBE 8260 ☐ 8021 ☐	TPH 8015 MOD GRO	TPH 8015 MOD DRO ☐ Silica Gel Cleanup ☐	8260 full scan	Oxygenates	Lead 7420 ☐ 7421 ☐	Fraction of organic carbon	bulk density	total soil porosity			
						X	X	X			
						X	X	X			

Preservative Codes
H = HCl T = Thiosulfate
N = HNO_3 B = NaOH
S = H_2SO_4 O = Other

☐ J value reporting needed
☐ Must meet lowest detection limits possible for 8260 compounds

8021 MTBE Confirmation
☐ Confirm highest hit by 8260
☐ Confirm all hits by 8260
☐ Run ____ oxy's on highest hit
☐ Run ____ oxy's on all hits

Comments / Remarks

Turnaround Time Requested (TAT) (please circle)
STD. TAT 72 hour 48 hour
24 hour 4 day 5 day

Data Package Options (please circle if required)
QC Summary Type I – Full
Type VI (Raw Data) ☐ Coelt Deliverable not needed
WIP (RWQCB)
Disk

Relinquished by:	Date	Time	Received by:	Date	Time
William Slowik	11/7/02	12:00			
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by Commercial Carrier: UPS FedEx Other			Received by: Jason P. Berger 1480	Date 11/8/02	Time 0930
Temperature Upon Receipt 3.0 C°			Custody Seals Intact? Yes No		

#3 IPB 11/8/02

3460 Rev. 10/04/01

Lancaster Laboratories, Inc., 2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 (717) 656-2300
Copies: White and yellow should accompany samples to Lancaster Laboratories. The pink copy should be retained by the client.

12/03/2002 12:24 I:AA

PTS Laboratories, Inc.

Lancaster Laboratories
PTS FILE NO: 32526

PHYSICAL PROPERTIES DATA

PROJECT NAME: n/a
PROJECT NO: 220901

METHODOLOGY:	ASTM D2216	API RP40	API RP40	WALKLEY-BLACK

SAMPLE ID.	DEPTH, ft.	SAMPLE ORIENT. (1)	MOISTURE CONTENT (% wt)	DENSITY		POROSITY, %Vb (2)	TOTAL ORGANIC CARBON mg/kg
				BULK (g/cc)	GRAIN (g/cc)	TOTAL	
3936941	n/a	V	12.0	1.69	2.67	36.7	2900
3936942	n/a	V	13.4	1.72	2.66	35.2	2200

(1) Sample Orientation: H = horizontal; V = vertical (2) Total Porosity = no pore fluids in place; all interconnected pore channels; Air Filled = pore channels not occupied by pore fluids Vb = Bulk Volume, cc; Pv = Pore Volume, cc; ND = Not Detected

APPENDIX B

USEPA SG-SCREEN MODEL CALCULATION SHEETS

INTERMEDIATE CALCULATIONS SHEET

1,2,4-Trimethylbenzene

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	6.74E-09	0.014	9.69E-11	3,844	8.77E+02	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	11,711	2.00E-03	8.61E-02	1.75E-04	1.99E-05	76.44

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	8.77E+02	0.10	9.36E-02	1.99E-05	3.84E+02	9.46E+79	1.19E-06	1.05E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	6.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

1,3,5-Trimethylbenzene

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^v (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	6.74E-09	0.014	9.69E-11	3,844	1.16E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	11,669	2.72E-03	1.17E-01	1.75E-04	1.46E-05	76.44

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	1.16E+03	0.10	9.36E-02	1.46E-05	3.84E+02	3.85E+108	1.09E-06	1.26E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	6.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

BENZENE

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	6.74E-09	0.014	9.69E-11	3,844	1.04E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	2.04E-05	76.44

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) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	1.04E+03	0.10	9.36E-02	2.04E-05	3.84E+02	5.39E+77	1.20E-06	1.25E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.9E-05	6.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

2-Butanone

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	6.74E-09	0.014	9.69E-11	3,844	9.70E+00	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,304	1.30E-05	5.61E-04	1.75E-04	4.20E-03	76.44

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^T) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	9.70E+00	0.10	9.36E-02	4.20E-03	3.84E+02	2.39E+00	2.85E-06	2.76E-05

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	1.0E+00

END

INTERMEDIATE CALCULATIONS SHEET

Acetone

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	6.74E-09	0.014	9.69E-11	3,844	3.90E+01	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	7,559	1.97E-05	8.50E-04	1.75E-04	3.23E-03	76.44

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^I) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	3.90E+01	0.10	9.36E-02	3.23E-03	3.84E+02	3.10E+00	2.44E-06	9.53E-05

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	3.5E-01

END

INTERMEDIATE CALCULATIONS SHEET

Chloroform

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	6.74E-09	0.014	9.69E-11	3,844	6.50E+00	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	7,554	1.86E-03	8.02E-02	1.75E-04	3.01E-05	76.44

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	6.50E+00	0.10	9.36E-02	3.01E-05	3.84E+02	6.02E+52	1.32E-06	8.59E-06

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
5.4E-06	3.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

Cyclohexane

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	6.74E-09	0.014	9.69E-11	3,844	3.82E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,494	9.36E-02	4.03E+00	1.75E-04	5.45E-07	76.44

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	3.82E+03	0.10	9.36E-02	5.45E-07	3.84E+02	#NUM!	1.09E-07	4.16E-04

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	2.0E+01

END

INTERMEDIATE CALCULATIONS SHEET

Ethylbenzene

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	6.74E-09	0.014	9.69E-11	3,844	9.87E+02	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	10,155	3.18E-03	1.37E-01	1.75E-04	1.38E-05	76.44

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	9.87E+02	0.10	9.36E-02	1.38E-05	3.84E+02	2.17E+115	1.06E-06	1.05E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
1.1E-06	1.0E+00

END

INTERMEDIATE CALCULATIONS SHEET

Hexane

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	6.74E-09	0.014	9.69E-11	3,844	1.30E+04	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,339	5.69E-02	2.45E+00	1.75E-04	7.70E-07	76.44

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	1.30E+04	0.10	9.36E-02	7.70E-07	3.84E+02	#NUM!	1.50E-07	1.95E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	2.0E-01

END

INTERMEDIATE CALCULATIONS SHEET

Toluene

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	6.74E-09	0.014	9.69E-11	3,844	2.56E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	9,154	2.92E-03	1.26E-01	1.75E-04	1.65E-05	76.44

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	2.56E+03	0.10	9.36E-02	1.65E-05	3.84E+02	1.83E+96	1.13E-06	2.89E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	3.9E-01

END

INTERMEDIATE CALCULATIONS SHEET

Xylenes

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	6.74E-09	0.014	9.69E-11	3,844	3.10E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm-m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	10,248	2.89E-03	1.24E-01	1.75E-04	1.64E-05	76.44

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, $\exp(Pe^I)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	3.10E+03	0.10	9.36E-02	1.64E-05	3.84E+02	1.05E+97	1.13E-06	3.49E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	1.0E-01

END

APPENDIX C

USEPA SG-SCREEN MODEL CALCULATION SHEETS FOR SOIL TYPE SENSITIVITY ANALYSIS

INTERMEDIATE CALCULATIONS SHEET

Benzene - Sand

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^v (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	9.92E-08	0.001	1.40E-10	3,844	1.04E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	2.04E-05	76.44

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	1.04E+03	0.10	1.36E-01	2.04E-05	3.84E+02	3.69E+112	1.55E-06	1.61E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.9E-05	6.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

Benzene - Loamy Sand

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	1.62E-08	0.012	1.94E-10	3,844	1.04E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	2.04E-05	76.44

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	1.04E+03	0.10	1.88E-01	2.04E-05	3.84E+02	6.04E+155	1.89E-06	1.96E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.9E-05	6.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

Benzene - Sandy Loam

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.978	5.93E-09	0.028	1.66E-10	3,844	1.04E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of /aporization a ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	2.04E-05	76.44

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	1.04E+03	0.10	1.61E-01	2.04E-05	3.84E+02	3.15E+133	1.73E-06	1.79E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.9E-05	6.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

Benzene - Sandy Clay Loam

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.976	2.04E-09	0.047	9.56E-11	3,844	1.04E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	2.04E-05	76.44

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	1.04E+03	0.10	9.23E-02	2.04E-05	3.84E+02	4.59E+76	1.19E-06	1.23E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.9E-05	6.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

Benzene - Sandy Clay

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^v (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.971	1.74E-09	0.090	1.56E-10	3,844	1.04E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	2.04E-05	76.44

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	1.04E+03	0.10	1.51E-01	2.04E-05	3.84E+02	1.12E+125	1.66E-06	1.72E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.9E-05	6.0E-03

END

how do these mesh w/ tox factors in Table 4?

INTERMEDIATE CALCULATIONS SHEET

Benzene - Loam

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	1.85E-09	0.028	5.21E-11	3,844	1.04E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	2.04E-05	76.44

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') (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	1.04E+03	0.10	5.03E-02	2.04E-05	3.84E+02	5.68E+41	7.41E-07	7.67E-04

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.9E-05	6.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

Benzene - Clay Loam

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.975	1.26E-09	0.036	4.58E-11	3,844	1.04E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	2.04E-05	76.44

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	1.04E+03	0.10	4.42E-02	2.04E-05	3.84E+02	5.69E+36	6.66E-07	6.89E-04

Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.9E-05	6.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

Benzene - Silt Loam

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.976	2.82E-09	0.016	4.51E-11	3,844	1.04E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	2.04E-05	76.44

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	1.04E+03	0.10	4.35E-02	2.04E-05	3.84E+02	1.42E+36	6.57E-07	6.80E-04

Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)
2.9E-05	6.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

Benzene - Clay

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.973	2.26E-09	0.071	1.60E-10	3,844	1.04E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	2.04E-05	76.44

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	1.04E+03	0.10	1.54E-01	2.04E-05	3.84E+02	1.50E+128	1.69E-06	1.74E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.9E-05	6.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

Benzene - Silty Clay Loam

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.974	1.70E-09	0.027	4.61E-11	3,844	1.04E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	2.04E-05	76.44

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	1.04E+03	0.10	4.45E-02	2.04E-05	3.84E+02	8.49E+36	6.69E-07	6.92E-04

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.9E-05	6.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

Benzene - Silt

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.977	6.74E-09	0.014	9.69E-11	3,844	1.04E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm-m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	2.04E-05	76.44

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	1.04E+03	0.10	9.36E-02	2.04E-05	3.84E+02	5.39E+77	1.20E-06	1.25E-03

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.9E-05	6.0E-03

END

INTERMEDIATE CALCULATIONS SHEET

Benzene - Silty Clay

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
76.44	0.007	0.972	1.48E-09	0.058	8.53E-11	3,844	1.04E+03	5.63E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	2.04E-05	76.44

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	1.04E+03	0.10	8.23E-02	2.04E-05	3.84E+02	2.48E+68	1.10E-06	1.13E-03

Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.9E-05	6.0E-03

END