PIEDMONT UNIFIED SCHOOL DISTRICT
ADMINISTRATION BUILDING
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March 25, 2011

Alameda County
Health Care Services Agency
Environmental Health Department
Environmental Protection
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Dear Environmental Health Department,

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

Sincerely,

Michael Brady
Asst. Superintendent

MILLENNIUM
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August 3, 2010
Project No. 16033.2013

Mellan P. Songco, MPA
Project Manager
Brownfields & Environmental Restoration Program
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, California 95826

Subject: PEA SAP Work Plan Addendum
Passive and Active Soil Gas Investigation Report and
Vapor Intrusion Pathway Screening Risk Assessment
Frank C. Havens Elementary School
Piedmont Unified School District
1800 Oakland Avenue
Piedmont, California 94611

Dear Ms. Songco:

INTRODUCTION

This letter report presents Millennium Consulting Associates' report covering the passive soil gas and active soil gas investigations conducted at the Havens Elementary School Site (Havens). This report also presents a Vapor Intrusion Screening Risk Assessment (VISRA) for the Havens site. The Havens Elementary School is located at 1800 Oakland Avenue in Piedmont, California. The school is owned and operated by the Piedmont Unified School District (PUSD).

The passive soil gas (PSG) survey was performed pursuant to the PEA Sampling and Analysis (PEA-SAP) Work Plan. The PEA-SAP Work Plan was approved in correspondence dated March 24, 2010. The data obtained for the PSG survey was used to develop the scope for the active soil gas investigation. The analytical data obtained from the active soil gas investigation was used in the developing the VISRA The active soil gas investigation and VISRA were performed under a PEA Work Plan Addendum. The PEA Work Plan addendum amended the previously approved PEA Sampling and Analysis (PEA-SAP) Work Plan. The PEA Work Plan Addendum was approved by DTSC on May 13, 2010.

Tables and figures referenced in the report are included in the tabbed Tables and Figures sections of the report. Copies of the passive soil gas and active soil gas analytical reports are included in Appendix A. Appendix B includes copies of model data used in the vapor intrusion risk assessment.

SOIL GAS SAMPLING AND SCREENING RISK ASSESSMENT GUIDANCE DOCUMENTS

The following documents were utilized to implement the PEA Work Plan Addendum and to conduct the VISRA:

1. Interim Guidance – Evaluating Human Health Risks from Total Petroleum Hydrocarbons, Department of Toxic Substances Control, Human and Ecological Risk Division, dated June 16, 2009

2. Geotechnical Study Report, Havens Elementary School Replacement, prepared by AMEC Geomatrix, dated October 24, 2008.
3. Advisory – Active Soil Gas Investigation (Draft), March 2010, prepared by California Environmental Protection Agency
4. Advisory – Active Soil Gas Investigations, January 28, 2003, prepared by California Environmental Protection Agency
5. Interim Guidance for Active Soil Gas Investigations, February 25, 1997, prepared by California Regional Water Quality Control Board –Los Angeles Regions
6. Vapor Intrusion Pathway: A Practical Guide, January 2007, prepared by the Interstate Technology and Regulatory Council Vapor Intrusion Team, and
7. Use of California Human Health Screening Levels (CHSSLs) for Evaluating Contaminated Properties, January 2005, prepared by California Environmental Protection Agency.

PASSIVE SOIL GAS INVESTIGATION

Scope

The scope of the passive soil gas investigation was presented in the PEA-SAP Work Plan that was submitted to DTSC for review and approval. The PEA SAP Work Plan Addendum was dated March 15, 2010, and was approved by DTSC on March 24, 2010.

Objective

The primary objective of the passive soil gas investigation was to obtain sufficient TPH and fuel VOC data to determine if soil gas migration could result in potential vapor intrusion. If PSG survey indicated that soil gas migration could result in potential vapor intrusion, the PSG data would be used to determine the scope of an active soil gas investigation.

Passive Soil Gas Field Investigation Summary

Permitting - Soil borings were advanced using hand auger drilling methods. The shallow sampling depths did not require obtaining a drilling permit.

Public Notice - A PEA Field Notification was prepared in conformance with the public notification requirements under the PEA. The PEA Field Notice was distributed to all residences and commercial business within direct line of site to the project site at least five (5) days prior to the field work. In addition, the general contractor was notified of the subsurface investigation to be performed, and the field work was coordinated through the general contractor's Site Safety Officer.

Boring and Passive Soil Gas Survey Reconnaissance – A pre-site characterization reconnaissance to field locate the soil boring and passive soil gas survey sample locations was conducted. The field locations were marked by stakes and flagging, and were coordinated with the general contractor's SSO.

Site Health and Safety Plan - Millennium prepared a project health and safety plan (HASP). The HASP addressed the potential physical and chemical hazards and identified specific work practices and personal protective equipment for the associated hazards. The drilling was performed in Level D personal protective equipment (PPE).

Passive Soil Gas Field Investigation

As part of current approved PEA SAP, Millennium conducted a passive soil gas survey at the Havens ES site. The passive soil gas survey consisted of installing thirteen passive soil gas (PSG) samplers across the Havens site. The PSG samplers were provided by Millennium's PSG subcontractor, Beacon Environmental Services (Beacon). The PSG sample locations are identified as PSG1-1 through PSG1-13. Additional information regarding the PSG sample locations is presented in Table 1A; the PSG sample locations are shown on the attached Figure 1. The PSG samples were installed between March 25 and March 26, 2010 and were retrieved on April 5, 2010.

After retrieval, the PSG samples were forwarded to Beacon for analysis under chain of custody. The results are summarized in the following Tables 2a, 2b, and 2c. The TPH data are presented as TPHg, TPHd, TPHmo, and the aromatic and aliphatic ranges identified in the TPH Risk Assessment Guidance developed by DTSC (Reference 1). All PSG data is representative of captured mass in nanograms (ng). A copy of the analytical report is included in Appendix A.

Passive Soil Gas Findings

Based on review of the data the following findings were made from the PSG survey:

- PSG – TPH (Table 2a) - TPHg was detected in only 2 of 13 PSG samples, TPHd was detected in 7 of the 13 PSG samples. TPHmo was not detected in the 13 PSG samples. The largest TPH mass capture was for TPHd (PSG1-2) at 4,129 ng (4.13 micrograms)
- PSG – VOCs (Table 2b) – Benzene, MTBE, and Naphthalene were not detected in any of the PSG samples. The largest VOC mass capture was for toluene (PSG1-5) at 611 ng (0.611 micrograms)
- PSG – SVOCs (Table 2c) – No SVOCs on Beacon's Target SVOC list were detected.

Selected data presented in Tables 2a (TPHd) and 2b (Total BTEX) are presented graphically on Figures 2 and 3.

QA/QC and Data Evaluation

All passive soil gas samplers were received intact. The PSG samplers met the analytical laboratory's QA/QC requirements. One field duplicate passive soil gas sample was analyzed at PSG1-5 and one trip blank. Analytical QA/QC conformed to the analytical laboratory's QA/QC and specific method requirements. RPDs were within acceptable QA/QC range.

ACTIVE SOIL GAS INVESTIGATION

Scope

The scope of the active soil gas investigation was presented in a PEA Work Plan Addendum that was submitted to DTSC for review and approval. The PEA Work Plan Addendum was dated May 12, 2010. The PEA Work Plan Addendum was approved by DTSC on May 13, 2010.

The PSG data were used to determine sample locations for the active soil gas investigation. Based on review of the data and graphical plots of TPHd and total BTEX data (Figures 2 and 3), six locations were identified for the active soil gas investigation. The locations were identified as ASG-1 though ASG-6, and are shown relative to the Havens ES site on the Active Soil Gas Site Plan, Figure 4.

Objective

The primary objective of the active soil gas investigation was to obtain sufficient soil gas data to prepare a screening risk assessment for the vapor intrusion pathway. Established screening level risk assessment protocols developed by the Department of Toxic Substances Control, Human and Ecological Risk Division were used to estimate an incremental cancer risk and incremental hazard index for identified chemical of potential concern (COPCs) and for selected TPH fractions.

Active Soil Gas Field Investigation Summary

Permitting - The soil gas borings were permitted through the Alameda County Department of Public Works, Water Resources Section. Copies of the completed drilling permit were presented in Appendix A in the PEA Work Plan Addendum.

Public Notice – Based on discussions with DTSC, a supplemental public notice was required. A previous public notice was distributed prior to performing the previous field work conducted under the PEA Work Plan.

Site Health and Safety Plan - Millennium previously prepared a project health and safety plan (HASP). The field work performed as part of the PEA Work Plan Addendum was performed in conformance with the requirements in the HASP. The drilling was performed in Level D personal protective equipment (PPE).

Active Soil Gas Field Investigation – The active soil gas investigation was performed on Monday, May 17, 2010. Active soil gas sampling was performed at six (6) soil gas sample locations in conformance with the approved PEA Work Plan Addendum. The active soil gas sample locations are identified as ASG-1 through ASG-6, and are shown on the Passive and Active Soil Gas Sample Location Plan, Figure 4. ASG-1 and ASG-2 were located near the previous passive soil gas sample location PSG1-5. ASG-3 and ASG-4 were located near PSG-2; while ASG-5 and ASG-6 were located near PSG1-12.

The soil gas probe was advanced to depths between five (5) feet bgs and 10 feet (bgs) using a direct push procedure at each soil gas sample location. The specific soil gas depths at each active soil gas location are identified in Table 1.

At the target depth, the soil gas collection point was be exposed by pulling back on the drive rod. After the drive rod had been fully withdrawn, the soil gas collection point was covered with a sand pack (about 12 inches). The remaining annulus was sealed with hydrated bentonite to the ground surface. The bentonite seal was allowed to hydrate for at least 30 minutes before conducting soil gas collection at the sample point.

Following installation of the soil gas probe, the sampling train for the 6L Summa Canister was made up. A shut-in test was performed to verify that all connections were air-tight. The shut-in test was held for a minimum of five (5) minutes. The shut-in test vacuum was generated using a summa purge canister. The summa sample canister was not opened during the shut-in test. If the shut-in vacuum (about 29 in-Hg) was maintained, the sample train was considered tight. All sample trains were determined to be vapor tight.

Following the shut-in test, the sample train was connected to the soil gas probe tubing. Purging of the tubing and collection of the soil gas samples for TPH APH and Fuel VOCs was performed in conformance with March 2010 DTSC Advisory for Active Soil Investigations. Since the soil gas samples

were collected in a 6L Summa Canister, a three volume purge of the sand pack and tubing was performed before the soil gas sample was collected. The three volume purge was performed using a 6L Summa purge canister.

Following purging, a shroud was installed around the sample train and summa canister for helium tracer testing. Helium was released into shroud and a hand-held helium detector was used to monitor and maintain a reasonably steady concentration of helium within the shroud. The helium concentration in the shroud was maintained at concentration at least 10% above the helium reporting limit for laboratory helium analysis (ASTM D1945-03 RL = 0.05%).

Following completion of the helium tracer staging, the valve on the summa canister was opened. The flow controller was set a 167 ml/minute by the laboratory to enable 30- minute collection duration. The initial vacuum on the summa canister was recorded at the start of the soil gas sample collection period. The final vacuum on the summa canister was recorded at the completion of the sample period. A minimum final vacuum of about 5 in Hg was maintained in each summa canister upon completion of the soil gas collection.

The summa canisters were forwarded to the analytical laboratory (Air Toxics Laboratory [ATL]) under chain of custody by Millennium personnel. The soil gas analyses were analyzed at 2 day turn around time (TAT) at client request.

Active Soil Gas Findings

The following findings were made based on the active soil gas investigation:

- Only two of the three active soil gas borings that were targeted for a depth between 8 and 12 feet were able to be completed due to shallow bedrock. All the remaining soil gas borings were able to be completed within the 5 to 8 foot target depth.
- Helium was used for the leak detection agent. All the sample trains passed the vacuum shut-in test and were able to maintain vacuum for greater than 5 minutes.
- Helium was not detected in the samples for ASG-4 and ASG-5. Helium was detected at very low concentration in samples ASG-1 and ASG-6.
- Helium was detected at moderate concentration in samples ASG-2 and ASG-3, indicating that some leakage occurred either around the drill rod or through the aggregate base surface soils. ASG-2 was also the shallowest of the all the soil gas boring (5 feet) due to shallow bedrock (refusal). In addition, boring ASG-2 had to manually driven since there was no access for the drill rig. Leakage around the drill rod, while possible, is considered unlikely since there was a good bentonite seal at the ground surface. In addition, the full depth of all the soil gas drill holes was backfilled with hydrated bentonite above the sand pack and soil gas collection point.
- The TPH fractionation results are shown on Table 3A. The fractionization is generally consistent with the passive soil gas fractionation (see Table 2A). Table 3B shows the VOCs that were detected. MTBE and Naphthalene were not detected which is consistent with the passive soil gas. The toluene, ethylbenzene, xylenes were all very low and significantly below their corresponding screening values. This is consistent with the passive soil gas results.
- In contrast to the passive soil gas, benzene was detected in all six soil gas samples. The concentrations at two locations slightly exceeded the screening concentration; the remaining sample concentrations were below the soil gas (CHSSL) screening limit established by DTSC.
- Because the TO-15 is a full scan analysis, other VOCs were detected. Additional VOCs that were consistently detected in six active soil gas samples included Hexane, Propylbenzene, 1,3,5 Trimetylbenzene and 1,2,4 Trimethylbenzene. The additional VOCs do not have established CHSSL soil gas screening limits. The detected concentrations were also low.

- Two chlorinated solvents, TCE and PCE were detected in selected samples. PCE was detected only in the active soil gas sample collected from ASG-1. TCE was detected in the active soil gas samples collected from ASG-5 and ASG-6. The detected concentrations were all below the regulatory soil gas (CHSSL) screening limit. None of the other VOC compounds detected have established soil gas (DTSC CHSSL) screening limits. The detected concentrations for these compounds were also very low. Consequently, TCE and PCE were not included as chemicals of potential concern (COPC) in the screening risk assessment

- 1, 3-Butadiene was detected in selected active soil gas samples. This compound is a combustion by-product of fuels (gasoline and diesel), and would not be found in soil gas since it would be formed during operation of equipment that discharge to the open atmosphere. Consequently, it was not included as a COPC in the screening risk assessment.

QA/QC and Data Evaluation

All soil gas samples were received intact. The remaining vacuum in the summa canisters met the analytical laboratory's QA/QC requirements. One field duplicate soil gas sample was collected at ASG-3. Analytical QA/QC conformed to the analytical laboratory's QA/QC and specific method requirements. The analytical laboratory also performed a laboratory duplicate on the soil gas sample collected at ASG-3. The field and lab RPDs for ASG-3 were within acceptable QA/QC range.

The soil gas analytical data are summarized in Tables 3A and 3B. Table 3A presents the soil gas results for the various TPH fractions identified in the previously referenced TPH Risk Assessment Guidance. Table 3B presents the soil gas results by individual COPCs. A copy of the analytical report is included in Appendix A.

While Hexane, Propylbenzene, 1,3,5 Trimetylbenzene and 1,2,4 Trimethylbenzene do not have established CHSSLs for soil gas, they were included in Table 3B for risk assessment purposes since these chemicals are included in Soil Gas Screening Risk Assessment Model Database.

SCREENING VAPOR INTRUSION RISK ASSESSMENT

Conceptual Site Model (CSM)

A Conceptual Site Model (CSM) was developed as part of the PEA-SAP Work Plan. The CSM development included identifying potential onsite sources that could have impacted site soils and offsite sources that could impact the site via subsurface transport mechanisms. The CSM also discussed potential exposure pathways and potential receptors. The CSM included vapor intrusion (VI) as a potential exposure pathway.

The CSM identified the following potential exposure pathways at the site:

1. Exposure to impacted surficial soils through inhalation, ingestion or direct contact
2. Exposure to impacted surficial soil by leaching to groundwater, where it is ingested
3. Exposure to impacted groundwater through ingestion or exposure through use
4. Migration of impacted groundwater or impacted surficial soils to surface waters or sediments creating an ecological exposure,
5. Exposure to impacted soil and groundwater by onsite construction workers during site modernization activities, and
6. Exposure to soil vapor from potentially impacted groundwater through unsaturated site soil or volatilization from shallow groundwater.

Based on the previous investigations, the only potential exposure pathway that is considered complete is migration of soil vapor from potentially impacted groundwater. Investigations conducted as part of the PEA have found that no onsite source appears to be present, and that if petroleum impacted groundwater is present, it is believed to have migrated from an unidentified up gradient source. While the petroleum hydrocarbon groundwater concentrations are considered low, there is the potential for volatilization of the petroleum hydrocarbons to occur with subsequent lateral and up-ward migration of soil vapor containing petroleum hydrocarbons to the ground surface. The upward migration could result in vapor intrusion into the new buildings being constructed as part of the Havens Modernization. This pathway was evaluated using both passive and active soil gas investigative methods. The active soil gas investigation confirmed the presence of TPH and Fuel VOCs in soil gas. The potential risk associated with the VI exposure pathway will be evaluated through a screening level risk assessment.

Potential Receptors

Potential receptors under the VI exposure pathway are limited to human receptors. Because the site and vicinity are fully developed and there are no ecologically sensitive areas or habitats in proximity to the site, the VI exposure pathway will not impact ecological receptors. VI exposure pathway will not impact onsite construction workers since these receptors are temporary and the building finishes are not complete. Following completion of the modernization, receptors will include students, school staff, school site visitors and local residents and commercial tenants in immediate proximity to the site.

Screening Level Risk Assessment Methodology

The vapor intrusion screening risk assessment followed the protocols in the interim guidance document (Reference 1) for evaluating human health risks from total petroleum hydrocarbons. This document was developed by the Department of Toxic Substances Control, Human and Ecological Risk Division. The specific incremental cancer risk and incremental hazard index were estimated using the US EPA Johnson & Ettinger Model for soil vapor intrusion.

The Human and Ecological Risk Division has taken this model and incorporated human health criteria specific to California, as developed by the Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA). The model input parameters are summarized in Table 4. Soil data used in the model was based on data presented in the geotechnical investigation report. A copy of the geotechnical investigation report was included a previous Phase I Environmental Site Assessment conducted at the Havens site.

The modified J&E Model was run for the various TPH fractions and for the specific COPC identified in Table 4. Copies of the model spreadsheets are included in Appendix A. The results of the modeling including results of incremental cancer risk and incremental hazard index are summarized in Table 4. Modeling using the modified J&E Model was also performed for Hexane, Propylbenzene, 1,2,4 Trimethylbenzene and 1,3,5 Trimethylbenzene. The Incremental Hazard Index is reported in Table 4 but not included in the overall Incremental Hazard Index since they are already accounted for in TPH Incremental Hazard Index.

It should be noted that models used COPC input concentrations that were the highest measured active soil gas concentrations and assumed a residential receptor scenario. Both are conservative data input assumptions and result in conservative values for incremental cancer risk and hazard index. In addition, the model does not reflect following vapor intrusion mitigation systems that were incorporated into the new buildings:

- All buildings have a shallow groundwater collection system around the perimeter of the building that is designed to intercept shallow groundwater and divert the water around the building footprint,

- The individual building foundation slabs were constructed with a vapor barrier to prevent vapor intrusion and into the building interior, and

- The individual building foundation slabs were constructed with a concrete additives designed to retard vapor transmission through the concrete slab and into the building interior.

The above systems would further reduce the potential for vapor intrusion into the new buildings constructed as part of the modernization program at Havens ES. Additional data on the vapor barrier and concrete additive is presented in Appendix C.

Screening Level Risk Assessment Findings and Conclusions

Based on the results of the screening risk assessment, the cumulative incremental cancer risk was estimated to be 5.6×10^{-7} which is substantially less than the 1×10^{-6} standard and the cumulative Hazard Index was less than 1 (5.4×10^{-3}).

Based on the results of the risk assessment, Millennium concludes that no further investigation is necessary at Havens ES, and that no remedial action or remediation of the subsurface soil vapors is necessary to mitigate risks associated with vapor intrusion.

LIMITATIONS

The services performed by Millennium Consulting Associates have been provided in accordance with generally accepted professional practices for the nature and conditions of similar work completed in the same or similar localities, at the time the work was performed. Soil gas samples represent conditions at a specific depth and location. Conditions should be anticipated to vary between sample locations. Soil gas analytical testing was performed by others; results were used as reported.

The scope of work for the project was conducted within the limitations prescribed by the client. This report is not meant to represent a legal opinion. No other warranty, expressed or implied, is made. This report was prepared for the sole use of Vila Construction and Piedmont Unified School District.

If you have any questions, please contact the undersigned.

Millennium Consulting Associates
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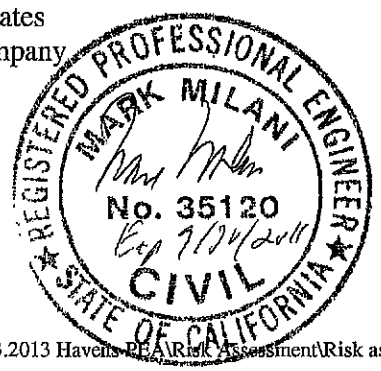


Mark Milani, P.E.
CE 35120 exp 9/30/2011
Principal Engineer

Michael Noel, CIH
CIH 3941 exp 6/1/2011
President

Attachments: Tables
Figures
Appendix A – Passive and Active Soil Analytical Reports
Appendix B – J&E Soil Vapor Intrusion Model Run Summary Spreadsheets
Appendix C – Vapor Barrier and Concrete Additive Data.

Copies: Pete Palmer, Vila Construction

TABLES

Table 1
Havens Elementary School - PEA Screening Risk Assessment
Passive and Active Soil Gas Sample Data Summary Table

Boring/Test Pit Identification	Status	Boring/Soil Sample Data		
		Target Depth (ft)	Actual Depth (ft)	Analytical Summary
PEA Investigation Passive Soil Gas				
PSG1-1	Completed	3 feet	3	TPH (gasoline, diesel, motor oil), VOCs (8260), SVOCs (8270) , Aliphatics ((C5-C18, C9-C18), Aromatics (C6-C8, C9-C16)
PSG1-2	Completed	3 feet	3	TPH (gasoline, diesel, motor oil), VOCs (8260), SVOCs (8270) , Aliphatics ((C5-C18, C9-C18), Aromatics (C6-C8, C9-C16)
PSG1-3	Completed	3 feet	3	TPH (gasoline, diesel, motor oil), VOCs (8260), SVOCs (8270) , Aliphatics ((C5-C18, C9-C18), Aromatics (C6-C8, C9-C16)
PSG1-4	Completed	3 feet	3	TPH (gasoline, diesel, motor oil), VOCs (8260), SVOCs (8270) , Aliphatics ((C5-C18, C9-C18), Aromatics (C6-C8, C9-C16)
PSG1-5	Completed	3 feet	3	TPH (gasoline, diesel, motor oil), VOCs (8260), SVOCs (8270) , Aliphatics ((C5-C18, C9-C18), Aromatics (C6-C8, C9-C16)
PSG1-6	Completed	3 feet	3	TPH (gasoline, diesel, motor oil), VOCs (8260), SVOCs (8270) , Aliphatics ((C5-C18, C9-C18), Aromatics (C6-C8, C9-C16)
PSG1-7	Completed	3 feet	3	TPH (gasoline, diesel, motor oil), VOCs (8260), SVOCs (8270) , Aliphatics ((C5-C18, C9-C18), Aromatics (C6-C8, C9-C16)
PSG1-8	Completed	3 feet	3	TPH (gasoline, diesel, motor oil), VOCs (8260), SVOCs (8270) , Aliphatics ((C5-C18, C9-C18), Aromatics (C6-C8, C9-C16)
PSG1-9	Completed	3 feet	3	TPH (gasoline, diesel, motor oil), VOCs (8260), SVOCs (8270) , Aliphatics ((C5-C18, C9-C18), Aromatics (C6-C8, C9-C16)
PSG1-10	Completed	3 feet	3	TPH (gasoline, diesel, motor oil), VOCs (8260), SVOCs (8270) , Aliphatics ((C5-C18, C9-C18), Aromatics (C6-C8, C9-C16)
PSG1-11	Completed	3 feet	3	TPH (gasoline, diesel, motor oil), VOCs (8260), SVOCs (8270) , Aliphatics ((C5-C18, C9-C18), Aromatics (C6-C8, C9-C16)
SPG1-12	Completed	3 feet	3	TPH (gasoline, diesel, motor oil), VOCs (8260), SVOCs (8270) , Aliphatics ((C5-C18, C9-C18), Aromatics (C6-C8, C9-C16)
PSG1-13	Completed	3 feet	3	TPH (gasoline, diesel, motor oil), VOCs (8260), SVOCs (8270) , Aliphatics ((C5-C18, C9-C18), Aromatics (C6-C8, C9-C16)
PSG1-1 to PSG1-13	Completed	3 feet	3	TPH (gasoline, diesel, motor oil), VOCs (8260), SVOCs (8270) , Aliphatics ((C5-C18, C9-C18), Aromatics (C6-C8, C9-C16)
PEASupplemental Work Plan - Active Soil Gas				
ASG-1	Completed	8 to 12 feet	5.5	TO-15 + APH+ ASTM D1946
ASG-2	Completed	5 to 8 feet	5.0	TO-15 + APH+ ASTM D1946
ASG-3	Completed	8 to 12 feet	10.0	TO-15 + APH+ ASTM D1946
ASG-4	Completed	5 to 8 feet	8.0	TO-15 + APH+ ASTM D1946
ASG-5	Completed	8 to 12 feet	6.0	TO-15 + APH+ ASTM D1946
ASG-6	Completed	5 to 8 feet	6.0	TO-15 + APH+ ASTM D1946

Notes:
1. PSG1-1 to PSG1-13 samples installed per Beacon Environmental PSG SOP
2 ASG samples collected per latest DTSC soil gas Advusory

Table 2A
Analytical Summary Table for Passive Soil Gas - TPH
Havens Elementary School PEA Investigation

Sample Location	Sample Interval (feet bgs)	Analyte Mass (nanograms)								
		TPHg	TPHd	TPHmo	C5 to C8 Aliphatics	C9 to C18 Aliphatics	C19+ Aliphatics	C6 to C8 Aromatics	C9 to C16 Aromatics	C17+ Aromatics
PSG1-1	0.4 to 3	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	**137**	**122**	<25
PSG1-2	0.4 to 3	<1,000	**4,129**	<1,000	<1,000	**4,019**	<1,000	**434**	**110**	<25
PSG1-3	0.4 to 3	**5,606**	**2,335**	<1,000	**5,199**	**2,260**	<1,000	**408**	**76**	<25
PSG1-4	0.4 to 3	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<25	<25	<25
PSG1-5	0.4 to 3	<1,000	**3,480**	<1,000	<1,000	**3,389**	<1,000	**732**	**91**	<25
PSG1-5 (duplicate)	0.4 to 3	<1,000	**3,760**	<1,000	<1,000	**3,648**	<1,000	**668**	**112**	<25
PSG1-6	0.4 to 3	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<25	<25	<25
PSG1-7	0.4 to 3	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<25	<25	<25
PSG1-8	0.4 to 3	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	**99**	<25	<25
PSG1-9	0.4 to 3	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	**26**	<25	<25
PSG1-10	0.4 to 3	**2,137**	**1,143**	<1,000	**1,893**	**1,109**	<1,000	**244**	**34**	<25
PSG1-11	0.4 to 3	<1,000	**1,252**	<1,000	<1,000	**1,209**	<1,000	**288**	**42**	<25
PSG1-12	0.4 to 3	<1,000	**1,783**	<1,000	<1,000	**1,783**	<1,000	**659**	<25	<25
PSG1-13	0.4 to 3	<1,000	**1,400**	<1,000	<1,000	**1,400**	<1,000	**402**	<25	<25
Trip Blank	NA	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<25	<25	<25
Method Blank	NA	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<25	<25	<25

Notes
1. N/A = Not Analyzed
2. NA = Not Applicable
3. Cells highlighted where captured mass exceeds method detection limit

Table 2B
Analytical Summary Table for Passive Soil Gas - VOCs
Havens Elementary School PEA Investigation

Sample Location	Sample Interval (feet bgs)	Analyte Mass (nanograms)								
		MTBE	Hexane	Benzene	Toluene	Ethylbenzene	p,m - Xylene	o-Xylene	Naphthalene	2-Methylnaphthalene
PSG1-1	0.4 to 3	<25	<25	<25	33	<25	55	48	<25	34
PSG1-2	0.4 to 3	<25	<25	<25	395	<25	<25	39	<25	<25
PSG1-3	0.4 to 3	<25	167	<25	266	25	<25	42	<25	<25
PSG1-4	0.4 to 3	<25	<25	<25	<25	<25	<25	<25	<25	<25
PSG1-5	0.4 to 3	<25	<25	<25	611	25	79	41	<25	<25
PSG1-5 (duplicate)	0.4 to 3	<25	<25	<25	477	32	106	53	<25	<25
PSG1-6	0.4 to 3	<25	<25	<25	<25	<25	<25	<25	<25	<25
PSG1-7	0.4 to 3	<25	<25	<25	<25	<25	<25	<25	<25	<25
PSG1-8	0.4 to 3	<25	<25	<25	99	<25	<25	<25	<25	<25
PSG1-9	0.4 to 3	<25	<25	<25	26	<25	<25	<25	<25	<25
PSG1-10	0.4 to 3	<25	130	<25	120	26	55	44	<25	<25
PSG1-11	0.4 to 3	<25	123	<25	195	<25	59	34	<25	<25
PSG1-12	0.4 to 3	<25	102	<25	531	<25	28	<25	<25	<25
PSG1-13	0.4 to 3	<25	<25	<25	218	47	77	61	<25	<25
Trip Blank		<25	<25	<25	<25	<25	<25	<25	<25	<25
Method Blank		<25	<25	<25	<25	<25	<25	<25	<25	<25

Notes
1. N/A = Not Analyzed
2. NA = Not Applicable
3. Cells shaded where captured mass exceeds method detection limit

Table 2C
Analytical Summary Table for Passive Soil Gas - SVOCs
Havens Elementary School PEA Investigation

Sample Location	Sample Interval (feet bgs)	Analyte Mass (nanograms)							
		Acenaphthylene	Acenaphthene	Anthracene	Flourene	Naphthalene	Phenanthrene	Flouranthene	Pyrene
PSG1-1	0.4 to 3	<25	<25	<25	<25	<25	<25	<50	<50
PSG1-2	0.4 to 3	<25	<25	<25	<25	<25	<25	<50	<50
PSG1-3	0.4 to 3	<25	<25	<25	<25	<25	<25	<50	<50
PSG1-4	0.4 to 3	<25	<25	<25	<25	<25	<25	<50	<50
PSG1-5	0.4 to 3	<25	<25	<25	<25	<25	<25	<50	<50
PSG1-5 (duplicate)	0.4 to 3	<25	<25	<25	<25	<25	<25	<50	<50
PSG1-6	0.4 to 3	<25	<25	<25	<25	<25	<25	<50	<50
PSG1-7	0.4 to 3	<25	<25	<25	<25	<25	<25	<50	<50
PSG1-8	0.4 to 3	<25	<25	<25	<25	<25	<25	<50	<50
PSG1-9	0.4 to 3	<25	<25	<25	<25	<25	<25	<50	<50
PSG1-10	0.4 to 3	<25	<25	<25	<25	<25	<25	<50	<50
PSG1-11	0.4 to 3	<25	<25	<25	<25	<25	<25	<50	<50
PSG1-12	0.4 to 3	<25	<25	<25	<25	<25	<25	<50	<50
PSG1-13	0.4 to 3	<25	<25	<25	<25	<25	<25	<50	<50
Trip Blank	NA	<25	<25	<25	<25	<25	<25	<50	<50
Method Blank	NA	<25	<25	<25	<25	<25	<25	<50	<50

Notes
1. N/A = Not Analyzed
2. NA = Not Applicable
3. Cells shaded where captured mass exceeds method detection limit

Table 3A
Analytical Summary Table for Active Soil Gas - TPH Fractionation
Havens Elementary School PEA Soil Gas Screening Risk Assessment

Sample Location	Sample Interval (feet bgs)	Analyte Concentration (ug/m3)					
		C5 to C6 Aliphatics	C6 to C8 Aliphatics	C8 toC10 Aliphatics	C10 toC12 Aliphatics	C8 to C10 Aromatics	C10 to C12 Aromatics
Field Samples							
ASG-1	5.5	110	370	230	160	420	ND(93)
ASG-2	5.0	360	950	340	ND(110)	310	ND(88)
ASG-3	10.0	1,900	1,800	870	390	540	ND(94)
ASG-4	8.0	370	230	110	ND(110)	84	ND(86)
ASG-5	6.0	1,300	2,400	840	460	430	ND(91)
ASG-6	6.0	1,300	1,500	1,000	610	ND(78)	ND(87)
QA/QC Samples							
ASG-3 Field Duplicate	10.0	1,500	1,800	940	400	580	ND(93)
ASG-3 Lab Duplicate	10.0	1,700	1,900	990	450	580	ND(93)

Notes
1. ND(3.0) = Not Detected, reporting limit in ()
2. ASG-1/ASG-2 by PSG1-5, ASG-3/ASD-4 by PSG1-2, ASG-5/ASG-6 by PSG1-12 (see site plan for locations)

Table 3B
Analytical Summary Table for Active Soil Gas - VOCs
Havens Elementary School PEA Soil Gas Screening Risk Assessment

Sample Location	Sample Interval (feet bgs)	Analyte Concentration (ug/m3)										
		Benzene	Toluene	Ethylbenzene	p,m - Xylene	o-Xylene	MTBE	Naphthalene	Hexane	Propylbenzene	1,3,5-Trimethylbenzene	1,2,4-Trimethylbenzene
Field Samples												
ASG-1	5.5	9.2	150	30	140	48	ND(3.0)	ND(18)	8.3	7.4	19	50
ASG-2	5.0	18	140	24	110	34	ND(2.9)	ND(17)	26	5.6	13	35
ASG-3	10.0	47	130	36	170	54	ND(3.1)	ND(18)	88	10	26	77
ASG-4	8.0	24	60	11	17	17	ND(2.9)	ND(16)	99	11	28	81
ASG-5	6.0	39	180	34	150	45	ND(2.9)	ND(17)	260	7.6	17	49
ASG-6	6.0	35	39	52	140	57	ND(2.9)	ND(16)	230	ND(3.9)	11	23
QA/QC Samples												
ASG-3 Field Duplicate	10.0	48	130	38	180	59	ND(3.1)	ND(18)	97	11	28	81
ASG-3 Lab Duplicate	10.0	49	130	39	180	57	ND(3.1)	ND(18)	97	11	29	84
Statistics												
Max Concentration		49	180	52	180	57			260	11	29	84
Average Concentration		29	117	31	121	43	—	—	118	6	19	53
Standard Deviation		14	55	14	55	17	—	—	105	2	7	23
Cal EPA CHHSLS		36.2	135,000	1,100	317,000	315,000	4,000	31.9	—	—	—	—

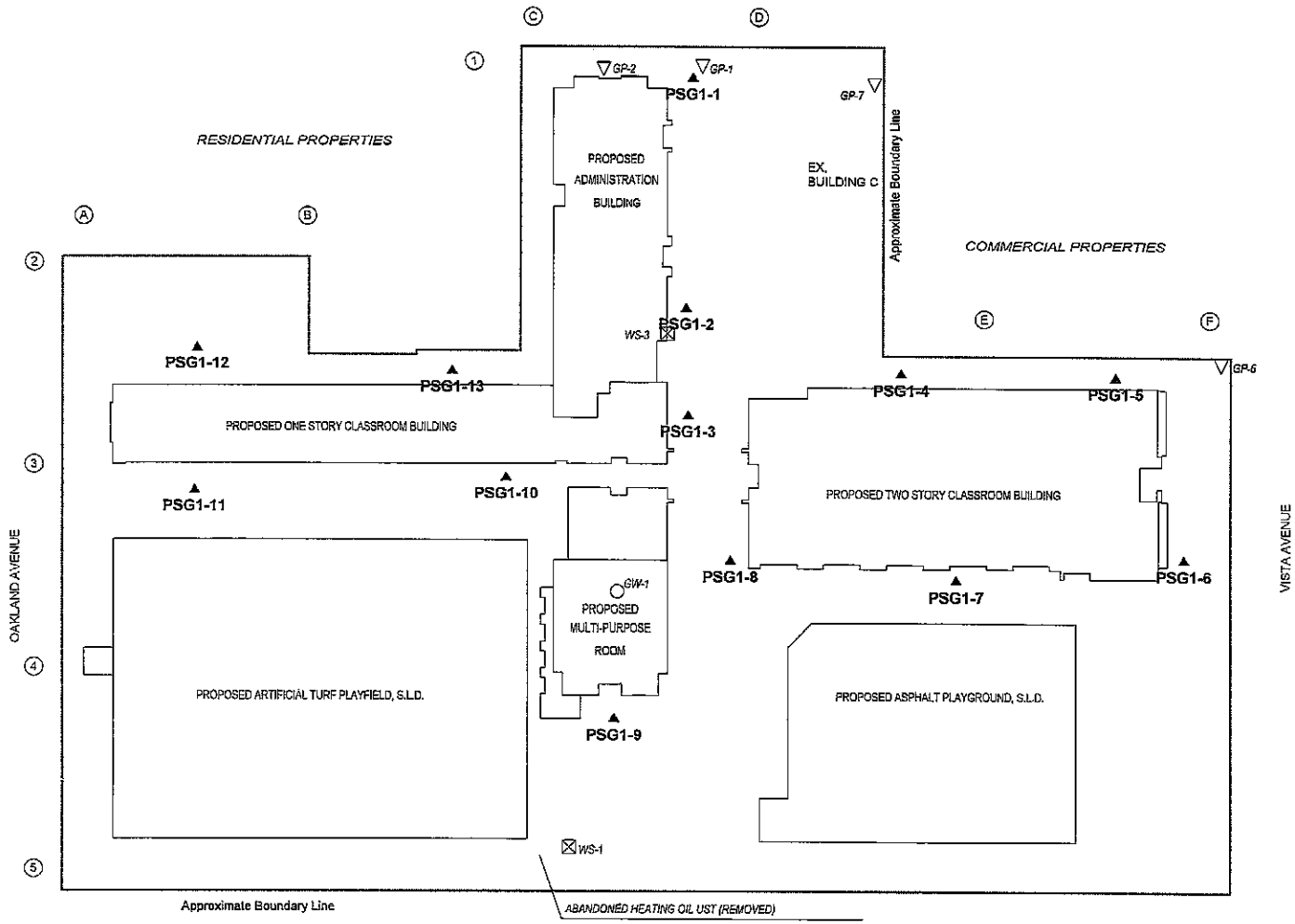
Notes
1. ND(3.0) = Not Detected, reporting limit in ()
2. CHSSL for Ethylbenzene per California Screening Levels for Ethylbenzene, Draft Report dated November 2009, prepared by CAL EPA Office of Environental Health Hazard Assessment. CHSSLs for other VOCs per 2005 CHSSL Guide
—— = CHSSL not established for chemical compound.
3. Cells shaded where captured mass exceeds CHSSL Vapor Intrusion Screening Level (Residential)

Table 4
Screening Risk Assessment Data Summary Table
Havens Elementary School PEA - Screening Risk Assessment

Chemical of Concern	Risk Assessment Method	Soil Input Parameter (SCS)	Soil Gas Concentration (ug/m3)	Incremental Cancer Risk	Incremental Hazard Index
		TPH Fractions			
TPH C5 to C8 Aliphatics	HERD TPH Guidance, J&E Soil Gas Screening Model	Sandy Clay (SC)	3700	—	2.30E-03
TPH C9 to C18 Aliphatics	HERD TPH Guidance, J&E Soil Gas Screening Model	Sandy Clay (SC)	1610	—	2.30E-03
TPH C19+ Aliphatics	HERD TPH Guidance, J&E Soil Gas Screening Model	Sandy Clay (SC)	Non Detect	—	—
TPH C6 to C8 Aromatics	HERD TPH Guidance, J&E Soil Gas Screening Model	Sandy Clay (SC)	See Individual Chemical Below		
TPH C9 to C16 Aromatics	HERD TPH Guidance, J&E Soil Gas Screening Model	Sandy Clay (SC)	580	—	5.00E-03
TPH C17+ Aromatics	HERD TPH Guidance, J&E Soil Gas Screening Model	Sandy Clay (SC)	Non Detect	—	—
		Individual Chemicals			
Benzene	HERO Soil Gas Screening J&E Soil Gas Screening Model	Sandy Clay (SC)	49	5.20E-07	1.40E-03
Ethylbenzene	HERO Soil Gas Screening J&E Soil Gas Screening Model	Sandy Clay (SC)	52	4.40E-08	4.10E-05
Toluene	HERO Soil Gas Screening J&E Soil Gas Screening Model	Sandy Clay (SC)	180	—	5.30E-04
m -Xylenes	HERO Soil Gas Screening J&E Soil Gas Screening Model	Sandy Clay (SC)	180	—	1.40E-03
p -Xylenes	HERO Soil Gas Screening J&E Soil Gas Screening Model	Sandy Clay (SC)	180	—	1.50E-03
o-Xylene	HERO Soil Gas Screening J&E Soil Gas Screening Model	Sandy Clay (SC)	67	—	5.90E-04
Hexane	HERO Soil Gas Screening J&E Soil Gas Screening Model	Sandy Clay (SC)	260	—	5.10E-04
Propylbenzene	HERO Soil Gas Screening J&E Soil Gas Screening Model	Sandy Clay (SC)	110	—	5.40E-05
1,2,4 Trimethylbenzene	HERO Soil Gas Screening J&E Soil Gas Screening Model	Sandy Clay (SC)	84	—	8.30E-03
1,3,5 Trimethylbenzene	HERO Soil Gas Screening J&E Soil Gas Screening Model	Sandy Clay (SC)	29	—	3.30E-03
Estimated total risk				5.64E-07	5.46E-03

Notes:
1. Individual Incremental Hazard Index was calculated for Hexane, Propylbenzene, 1,2,4 Trimethylbenzene and 1,3, 5 Trimethylbenzene. However, these compounds already included TPH C9 to C16 Aromatics or C9 to C18 Aliphatics.

FIGURES



LEGEND

▲ PSG1-8 PASSIVE SOIL-GAS SAMPLE LOCATION

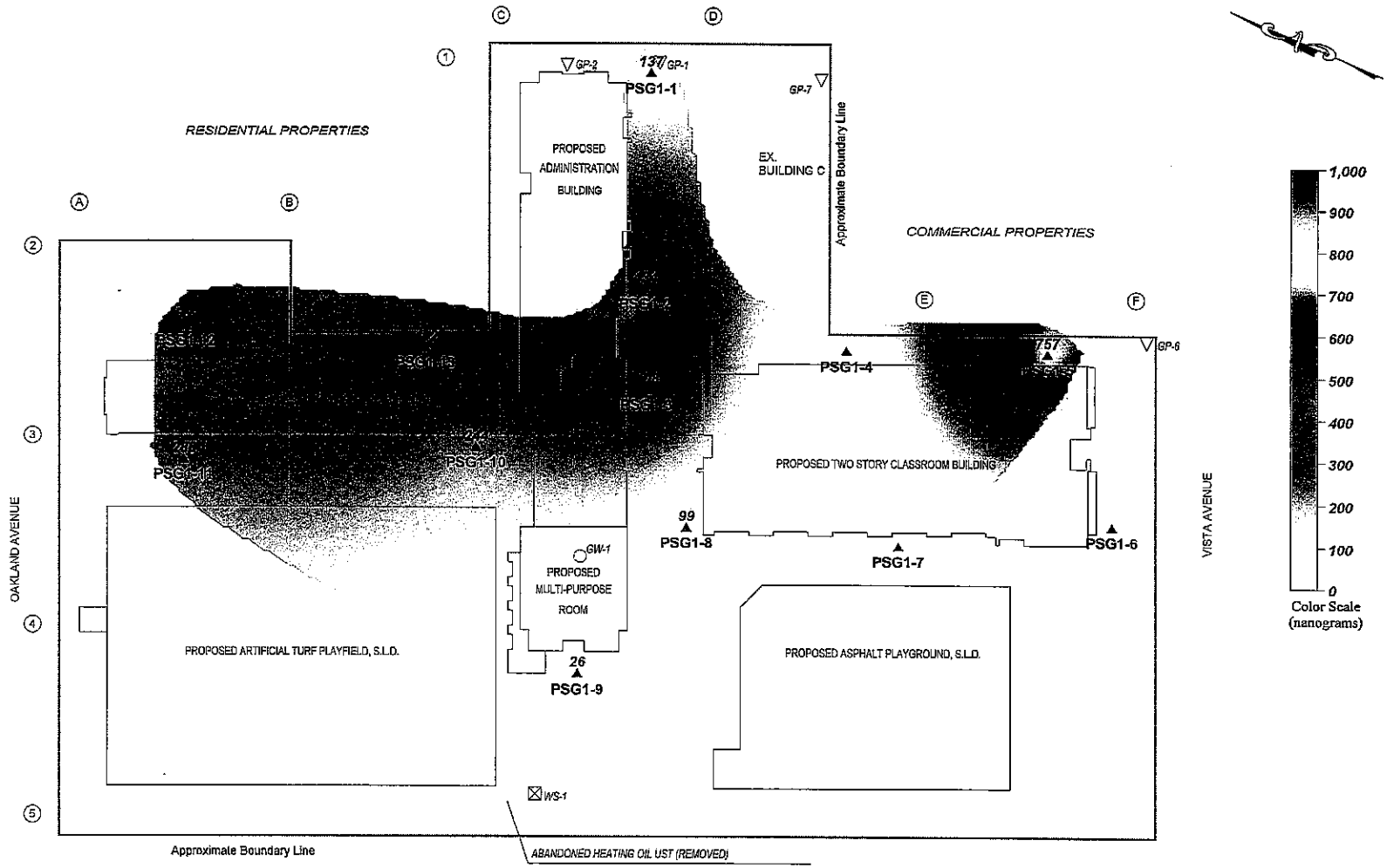
Scale in Feet

0 50 100

BEACON ENVIRONMENTAL SERVICES, INC.
323 Williams Street, Bel Air, MD, 800-878-5510
Beacon Project No. 2294, May 2010

Figure 1
Passive Soil-Gas Survey
Sample Locations

Havens Elementary School
Oakland, CA



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323 Williams Street, Bel Air, MD, 800-878-5510
Beacon Project No. 2294, May 2010

Scale in Feet
0 50 100

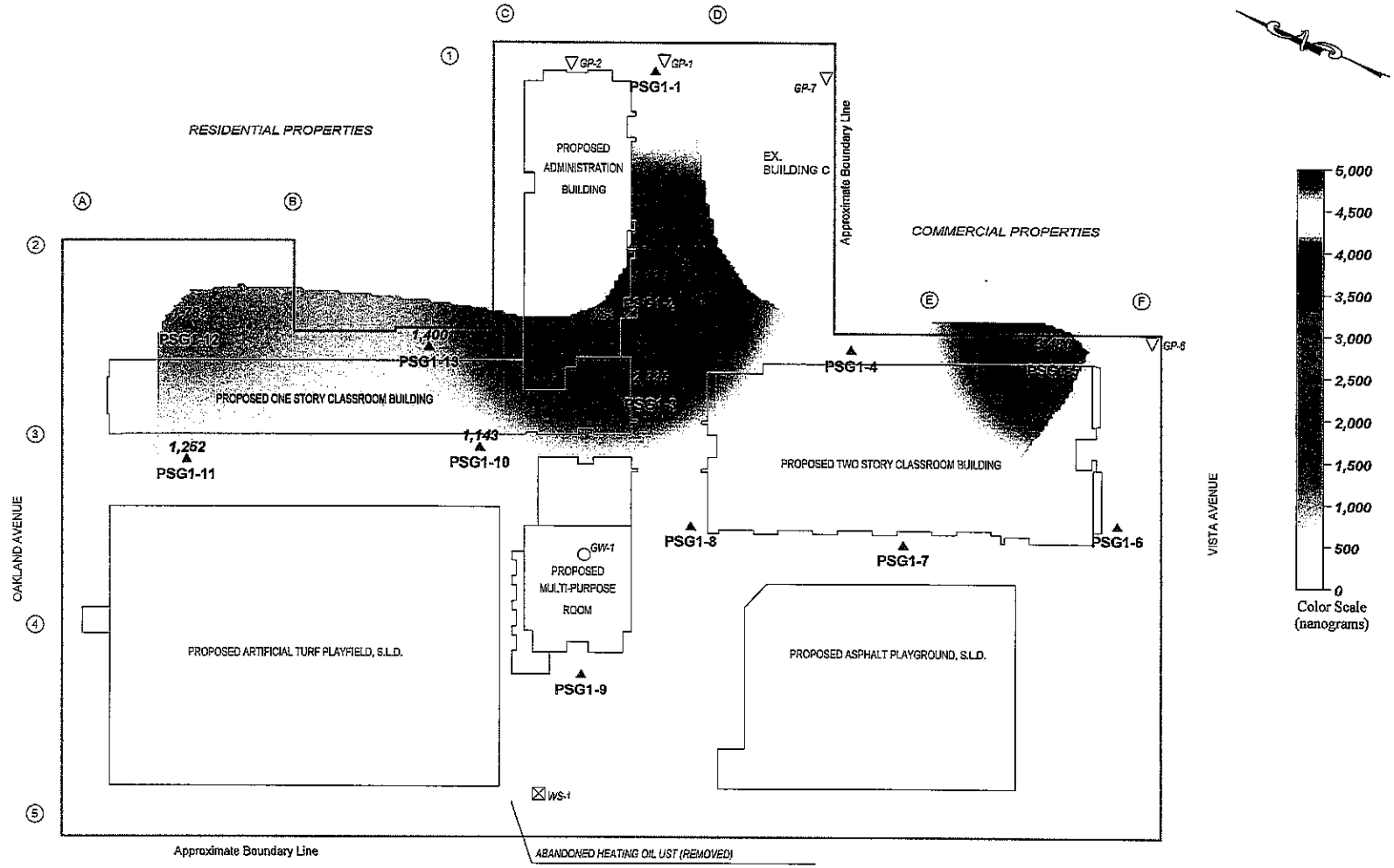
LEGEND

1,000 TOTAL BTEX (nanograms)

▲ PSG1-8 PASSIVE SOIL-GAS SAMPLE LOCATION

Figure 2
Passive Soil-Gas Survey
Total BTEX

Havens Elementary School
Oakland, CA



LEGEND

1,000 TPH diesel (nanograms)

▲ PSG1-8 PASSIVE SOIL-GAS SAMPLE LOCATION

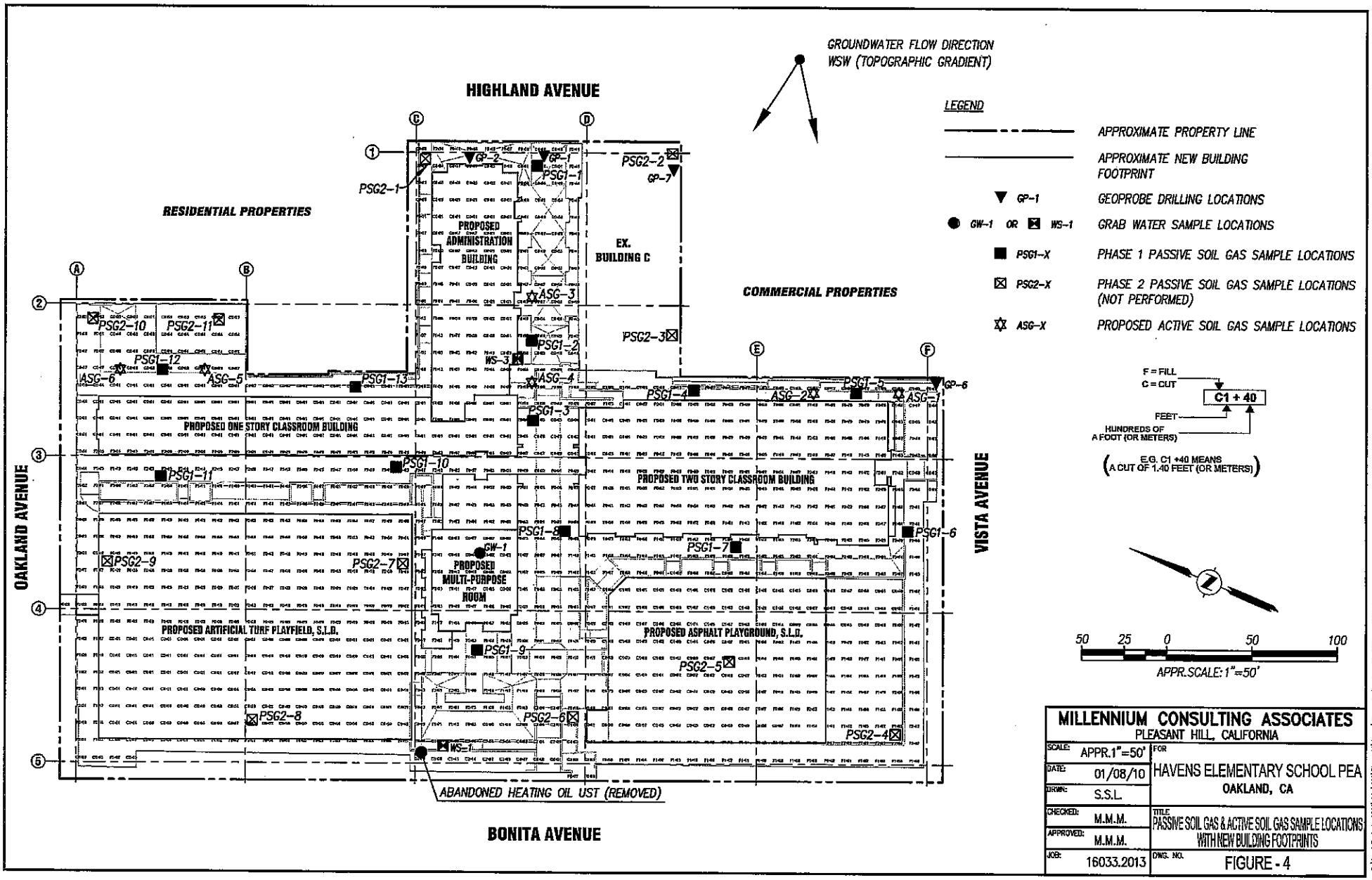
Scale in Feet

0 50 100

BEACON ENVIRONMENTAL SERVICES, INC.
323 Williams Street, Bel Air, MD, 800-878-5516
Beacon Project No. 2294, May 2010

Figure 3
Passive Soil-Gas Survey
TPH Diesel

Havens Elementary School
Oakland, CA



MILLENNIUM CONSULTING ASSOCIATES PLEASANT HILL, CALIFORNIA	
SCALE: APPR.1"=50'	FOR: HAVENS ELEMENTARY SCHOOL PEA OAKLAND, CA
DATE: 01/08/10	
DRWN: S.S.L.	
CHECKED: M.M.M.	TITLE: PASSIVE SOIL GAS & ACTIVE SOIL GAS SAMPLE LOCATIONS WITH NEW BUILDING FOOTPRINTS
APPROVED: M.M.M.	
JOB: 16033.2013	DWG. NO. FIGURE - 4

APPENDIX A

Passive Soil Gas Analytical Report

Active Soil Gas Analytical Report

BEACON ENVIRONMENTAL SERVICES, INC.

The Leaders in Soil Gas Surveys and Vapor Intrusion Monitoring

Millenium Consulting Associates
620 Contra Costa Boulevard, Suite 102
Pleasant Hill, CA 94523
Attn: Mr. Mark Milani

Passive Soil Gas Survey – Analytical Report
Date: May 20, 2010

Beacon Project No. 2294

Project Reference:	Havens Elementary School, Oakland, CA
Date(s) Samplers Installed:	March 25 and 26, 2010
Date(s) Samplers Retrieved:	April 5, 2010
Date Samples Received by BEACON:	April 7, 2010
Date Analyses Completed:	April 8, 2010

EPA Method 8260/8270
All samples were analyzed using thermal desorption-gas chromatography/mass spectrometry (TD-GC/MS) instrumentation to target a custom compound list following EPA Method 8260/8270. Laboratory results are reported in nanograms (ng) of specific compound per sample.

Laboratory QA/QC procedures included internal standards, surrogates, and blanks appropriate to EPA Method 8260/8270. Analyses and reporting were done in accordance with BEACON's Quality Assurance Program Plan.

Reporting limits for EPA Method 8260/8270
The contract required quantification limit (CRQL) is 25 ng for individual compounds and 1,000 ng for compound groups. **Table 1** provides survey results in nanograms per cartridge by sample-point number and compound name. The quantification limits (<25 ng and <1,000 ng) represent baselines above which results exceed laboratory-determined limits of precision and accuracy.

Calibration Verification
The continuing calibration verification (CCV) values for the analytes were all within ±30% of the true value as defined by the initial six point calibration and met the requirements specified in Beacon Environmental's Quality Assurance Project Plan.

Method Blanks/Trip Blanks
Laboratory method blanks are run with each sample batch to identify contamination present in the laboratory. If contamination is detected on a method blank, measurements of identical compounds in that sample batch are flagged in the laboratory report. The laboratory method blank analyzed in connection with the present samples revealed no contamination.

The trip blank is a sampling cartridge prepared, transported, and analyzed with other samples but intentionally not exposed. Any target compounds identified on the trip blanks are reported in the laboratory data. The analysis of the trip blank (labeled Trip-1 in Table 1) reported none of the targeted compounds.

Passive Soil-Gas Survey Notes

When sample locations are covered with or near the edge of an artificial surface (*e.g.*, asphalt or concrete), the concentrations of compounds in soil gas are often significantly higher than the concentrations would be if the surfacing were not present. Thus, a reading taken below or near an impermeable surface is much higher than it would be in the absence of such a cap. Therefore, the sample location conditions should be evaluated when comparing results between locations.

Survey findings are exclusive to this project and when the spatial relationships are compared with results of other BEACON Surveys it is necessary to incorporate survey and site information from both investigations (*e.g.*, depth to sources, soil types, porosity, soil moisture, presence of impervious surfacing, sample collection times). BEACON recommends the guidelines stated in **Attachment 1** to establish a relationship between reported soil-gas measurements and actual subsurface contaminant concentrations, which will indicate those measurements representing significant subsurface contamination.

BEACON's passive soil-gas samplers are prepared with two sets of cartridges for subsequent duplicate or confirmatory sample analysis. At MILLENIUM's request, duplicate analysis was performed for sample PSG-5, designated PSG-5 Dup in **Table 1.** When comparing quantitative results, a duplicate correspondence should be considered when the relative percent difference (RPD) between the two samples is less than or equal to 100%. For the purpose of calculating correspondences, all non-detections should be assigned, as a baseline value, the CRQL for the specific contaminant. Based on these assumptions, a 100% correlation was found between the duplicate samples and their base samples.

Project Details

Samplers were deployed on March 25 and 26, 2010, and were retrieved on April 5, 2010. **Attachment 2** describes the field procedures used. Individual deployment and retrieval times will be found in the Field Deployment Report (**Attachment 3**).

Thirteen (13) field samples, one (1) duplicate sample, and one (1) trip blank were received by BEACON on April 7, 2010. Adsorbent cartridges from the passive samplers were thermally desorbed, then analyzed using gas chromatography/mass spectrometry (GC/MS) equipment, in accordance with EPA Method 8260/8270 (Modified), as described in **Attachment 4.** BEACON's laboratory analyzed each cartridge for the targeted compounds; analyses were completed on April 8, 2010. Following a laboratory review, results were provided to MILLENIUM on April 14, 2010. The Chain-of-Custody form, which was shipped with the samples for this survey, is supplied as **Attachment 5.**

ALL DATA MEET REQUIREMENTS AS SPECIFIED IN THE BEACON ENVIRONMENTAL SERVICES, INC. QUALITY ASSURANCE PROJECT PLAN. RELEASE OF THE DATA CONTAINED IN THIS DATA PACKAGE HAS BEEN AUTHORIZED BY THE LABORATORY DIRECTOR OR HIS SIGNEE, AS VERIFIED BY THE FOLLOWING SIGNATURE:

Steven C. Thornley

Steven C. Thornley
Laboratory Director

Sample locations are shown in Figure 1. The following table lists frequency of detections from the number of samples analyzed, the reporting limit, the maximum value measured and the order of magnitude over the reporting limit (OMRL) for each compound. The table also includes the transformation and interpolation method for the compound distribution maps provided.

Compound	Total BTEX	TPH_{diesel}
Frequency	10	7
Reporting Limit (nanograms)	25	25
Max Value (nanograms)	757	4,129
OMRL	1.48	0.62
Transformation Method	None	None
Interpolation Method	Kriging	Kriging

Note: OMRL is the order of magnitude over the reporting limit, which is defined as log (Max Value/Reporting Limit).

Attachments:

-1- Applying Results From Passive Soil-Gas Surveys
-2- Field Procedures
-3- Field Deployment Report
-4- Laboratory Procedures
-5- Chain-of-Custody Form

Table 1

Beacon Environmental Services, Inc.
323 Williams Street
Bel Air, MD 21014

Analysis by EPA Method 8260/8270 (Modified)

	Client Sample ID:	MB01	Trip-1	PSG-1	PSG-2	PSG-3	PSG-4
	Project Number:	2294 P1	2294 P1	2294 P1	2294 P1	2294 P1	2294 P1
	Lab File ID:	10040704	10040709	10040710	10040711	10040712	10040713
	Received Date:		4/7/2010	4/7/2010	4/7/2010	4/7/2010	4/7/2010
	Analysis Date:	4/7/2010	4/7/2010	4/7/2010	4/7/2010	4/7/2010	4/7/2010
	Analysis Time:	13:27	16:44	17:16	17:49	18:21	18:53
	Units:	ng	ng	ng	ng	ng	ng
COMPOUNDS							
TPH_g		<1,000	<1,000	<1,000	<1,000	**5,606**	<1,000
TPH_{diesel}		<1,000	<1,000	<1,000	**4,129**	**2,335**	<1,000
$TPH_{mo/residual\ range}$		<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
C5 to C8 Aliphatics		<1,000	<1,000	<1,000	<1,000	**5,199**	<1,000
C9 to C18 Aliphatics		<1,000	<1,000	<1,000	**4,019**	**2,260**	<1,000
C19+ Aliphatics		<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
C6 to C8 Aromatics		<25	<25	**137**	**434**	**408**	<25
C9 to C16 Aromatics		<25	<25	**122**	**110**	**76**	<25
C17+ Aromatics		<25	<25	<25	<25	<25	<25
Methyl-t-butyl ether		<25	<25	<25	<25	<25	<25
Hexane		<25	<25	<25	<25	**167**	<25
Benzene		<25	<25	<25	<25	<25	<25
Toluene		<25	<25	**33**	**395**	**266**	<25
Ethylbenzene		<25	<25	<25	<25	**25**	<25
p & m-Xylene		<25	<25	**55**	<25	**74**	<25
o-Xylene		<25	<25	**48**	**39**	**42**	<25
Naphthalene		<25	<25	<25	<25	<25	<25
2-Methylnaphthalene		<25	<25	**34**	<25	<25	<25
Acenaphthylene		<25	<25	<25	<25	<25	<25
Acenaphthene		<25	<25	<25	<25	<25	<25
Fluorene		<25	<25	<25	<25	<25	<25
Phenanthrene		<25	<25	<25	<25	<25	<25
Anthracene		<25	<25	<25	<25	<25	<25
Fluoroanthene		<50	<50	<50	<50	<50	<50
Pyrene		<50	<50	<50	<50	<50	<50

Results in nanograms (ng). J = Estimated value less than five (5) times the method detection limit. B = Detected in method blank.

Table 1

Beacon Environmental Services, Inc.
323 Williams Street
Bel Air, MD 21014

Analysis by EPA Method 8260/8270 (Modified)

	Client Sample ID:	PSG-5	PSG-5 Dup	PSG-6	PSG-7	PSG-8	PSG-9
	Project Number:	2294 P1	2294 P1	2294 P1	2294 P1	2294 P1	2294 P1
	Lab File ID:	10040714	10040715	10040716	10040717	10040718	10040719
	Received Date:	4/7/2010	4/7/2010	4/7/2010	4/7/2010	4/7/2010	4/7/2010
	Analysis Date:	4/7/2010	4/7/2010	4/7/2010	4/7/2010	4/7/2010	4/7/2010
	Analysis Time:	19:26	19:58	20:31	21:03	21:35	22:07
	Units:	ng	ng	ng	ng	ng	ng
COMPOUNDS							
TPH_g		<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
TPH_{diesel}		**3,480**	**3,760**	<1,000	<1,000	<1,000	<1,000
$TPH_{mo/rosidual\ range}$		<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
C5 to C8 Aliphatics		<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
C9 to C18 Aliphatics		**3,389**	**3,648**	<1,000	<1,000	<1,000	<1,000
C19+ Aliphatics		<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
C6 to C8 Aromatics		**732**	**668**	<25	<25	**99**	**26**
C9 to C16 Aromatics		**91**	**112**	<25	<25	<25	<25
C17+ Aromatics		<25	<25	<25	<25	<25	<25
Methyl-t-butyl ether		<25	<25	<25	<25	<25	<25
Hexane		<25	<25	<25	<25	<25	<25
Benzene		<25	<25	<25	<25	<25	<25
Toluene		**611**	**477**	<25	<25	**99**	**26**
Ethylbenzene		**25**	**32**	<25	<25	<25	<25
p & m-Xylene		**79**	**106**	<25	<25	<25	<25
o-Xylene		**41**	**53**	<25	<25	<25	<25
Naphthalene		<25	<25	<25	<25	<25	<25
2-Methylnaphthalene		<25	<25	<25	<25	<25	<25
Acenaphthylene		<25	<25	<25	<25	<25	<25
Acenaphthene		<25	<25	<25	<25	<25	<25
Fluorene		<25	<25	<25	<25	<25	<25
Phenanthrene		<25	<25	<25	<25	<25	<25
Anthracene		<25	<25	<25	<25	<25	<25
Fluoroanthene		<50	<50	<50	<50	<50	<50
Pyrene		<50	<50	<50	<50	<50	<50

Results in nanograms (ng). J = Estimated value less than five (5) times the method detection limit. B = Detected in method blank.

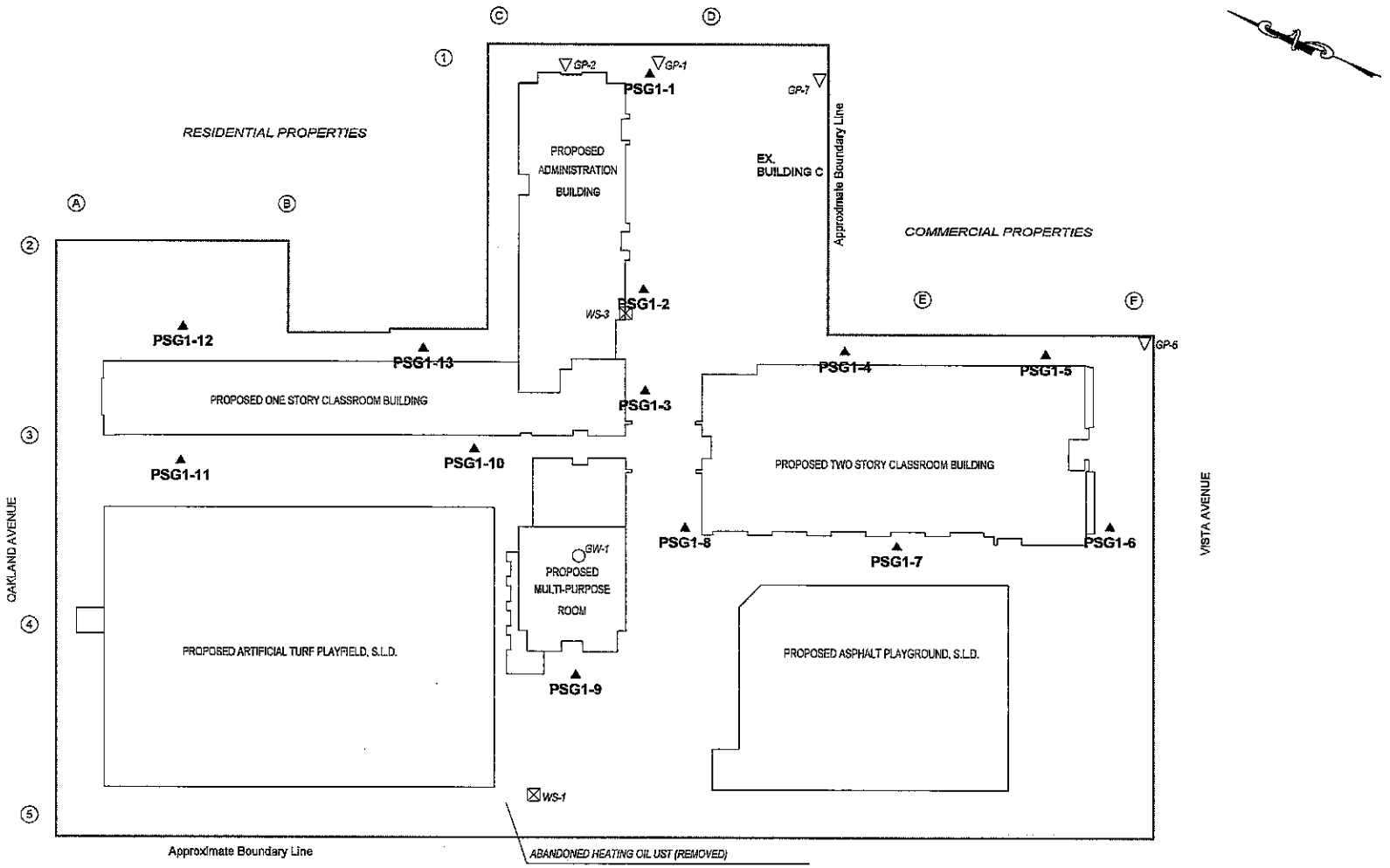
Table 1

Beacon Environmental Services, Inc.
323 Williams Street
Bel Air, MD 21014

Analysis by EPA Method 8260/8270 (Modified)

	Client Sample ID:	PSG-10	PSG-11	PSG-12	PSG-13
	Project Number:	2294 P1	2294 P1	2294 P1	2294 P1
	Lab File ID:	10040720	10040721	10040722	10040723
	Received Date:	4/7/2010	4/7/2010	4/7/2010	4/7/2010
	Analysis Date:	4/7/2010	4/7/2010	4/7/2010	4/8/2010
	Analysis Time:	22:40	23:12	23:44	12:17
	Units:	ng	ng	ng	ng
COMPOUNDS					
TPH_g		**2,137**	<1,000	<1,000	<1,000
TPH_{diesel}		**1,143**	**1,252**	**1,783**	**1,400**
$TPH_{mo/residual\ range}$		<1,000	<1,000	<1,000	<1,000
C5 to C8 Aliphatics		**1,893**	<1,000	<1,000	<1,000
C9 to C18 Aliphatics		**1,109**	**1,209**	**1,783**	**1,400**
C19+ Aliphatics		<1,000	<1,000	<1,000	<1,000
C6 to C8 Aromatics		**244**	**288**	**559**	**402**
C9 to C16 Aromatics		**34**	**42**	<25	<25
C17+ Aromatics		<25	<25	<25	<25
Methyl-t-butyl ether		<25	<25	<25	<25
Hexane		**130**	**123**	**109**	<25
Benzene		<25	<25	<25	<25
Toluene		**120**	**195**	**531**	**218**
Ethylbenzene		**26**	<25	<25	**47**
p & m-Xylene		**55**	**59**	**28**	**77**
o-Xylene		**44**	**34**	<25	**61**
Naphthalene		<25	<25	<25	<25
2-Methylnaphthalene		<25	<25	<25	<25
Acenaphthylene		<25	<25	<25	<25
Acenaphthene		<25	<25	<25	<25
Fluorene		<25	<25	<25	<25
Phenanthrene		<25	<25	<25	<25
Anthracene		<25	<25	<25	<25
Fluoroanthene		<50	<50	<50	<50
Pyrene		<50	<50	<50	<50

Results in nanograms (ng). J = Estimated value less than five (5) times the method detection limit. B = Detected in method blank.



LEGEND

▲ PSG1-8 PASSIVE SOIL-GAS SAMPLE LOCATION

Scale in Feet

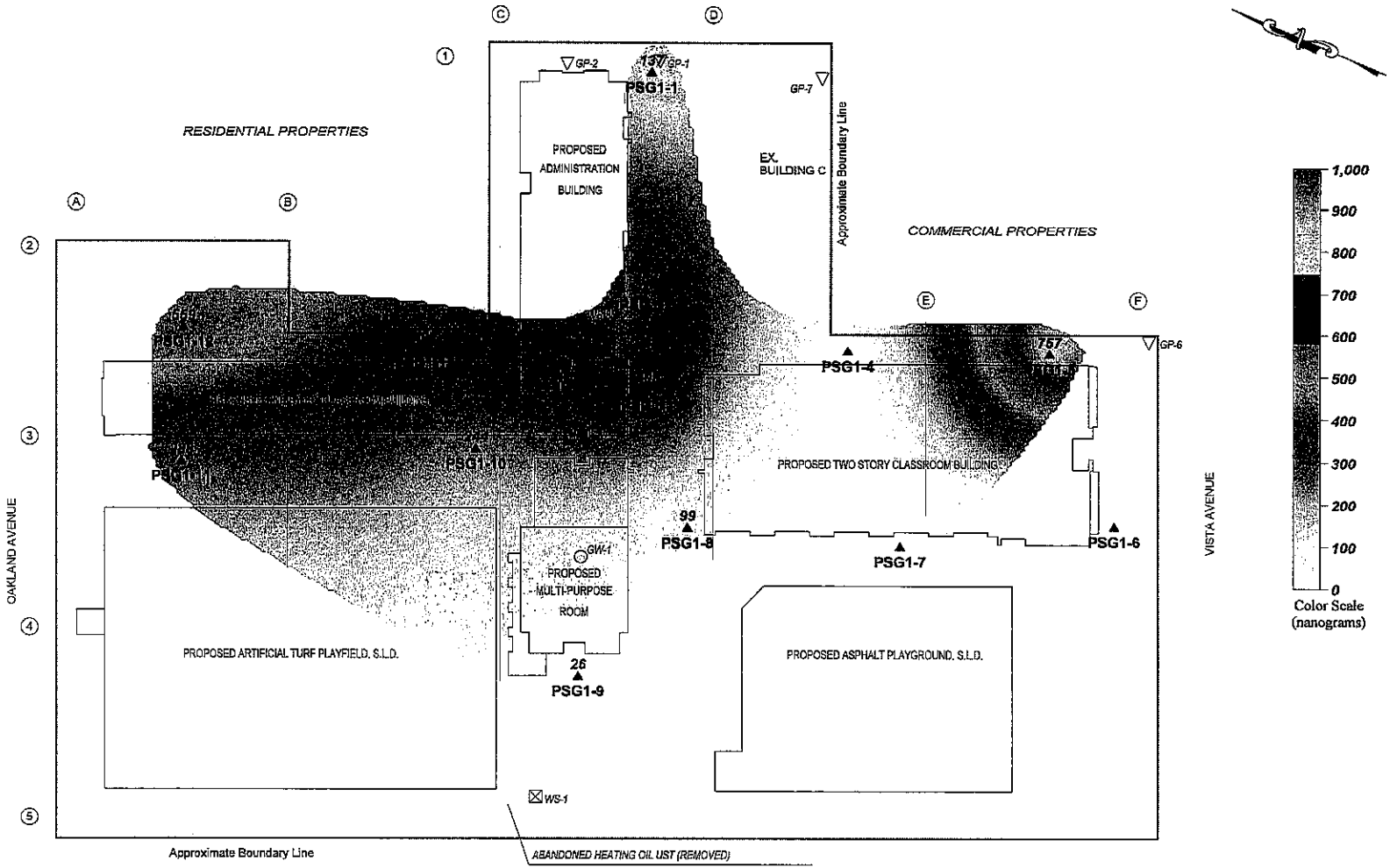
0 50 100

BEACON ENVIRONMENTAL SERVICES, INC.
323 Williams Street, Bel Air, MD, 800-878-5510

Beacon Project No. 2294, May 2010

Figure 1
Passive Soil-Gas Survey
Sample Locations

Havens Elementary School
Oakland, CA



LEGEND

1,000 TOTAL BTEX (nanograms)

▲ PSG1-8 PASSIVE SOIL-GAS SAMPLE LOCATION

Scale in Feet

0 50 100

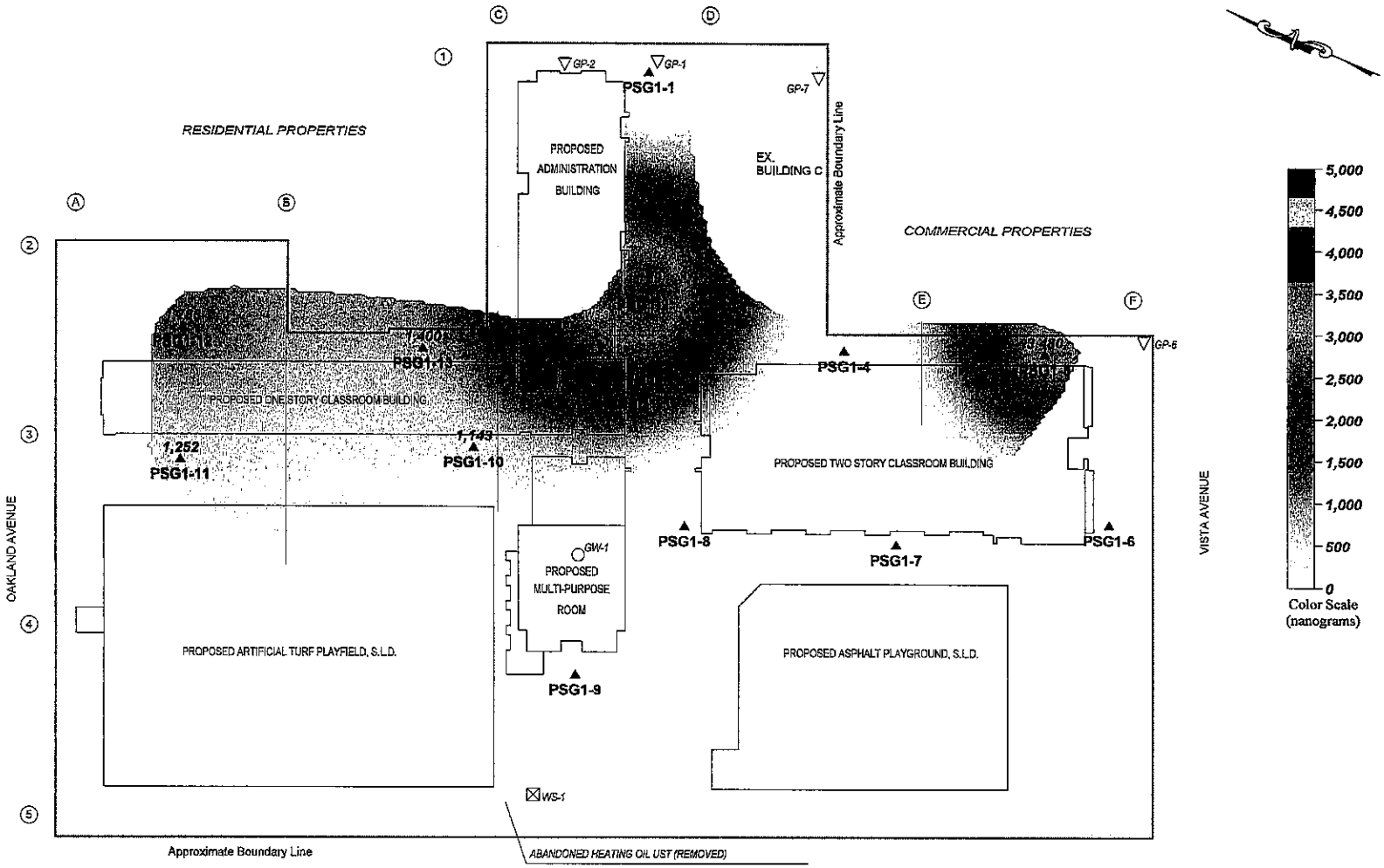
BEACON ENVIRONMENTAL SERVICES, INC.

323 Williams Street, Bel Air, MD, 800-878-5510

Beacon Project No. 2294, May 2010

Figure 2
Passive Soil-Gas Survey
Total BTEX

Havens Elementary School
Oakland, CA



LEGEND

1,000 TPH diesel (nanograms)

▲ PSG1-8 PASSIVE SOIL-GAS SAMPLE LOCATION

Scale in Feet

0 50 100

BEACON ENVIRONMENTAL SERVICES, INC.

323 Williams Street, Bel Air, MD, 800-878-5510

Beacon Project No. 2294, May 2010

Figure 3
Passive Soil-Gas Survey
TPH Diesel

Havens Elementary School
Oakland, CA

Attachments

Attachment 1

APPLYING RESULTS FROM PASSIVE SOIL-GAS SURVEYS

The utility of soil-gas surveys is directly proportional to their accuracy in reflecting and representing changes in the subsurface concentrations of source compounds. Passive soil-gas survey results are the mass collected from the vapor-phase emanating from the source(s). The vapor-phase is merely a fractional trace of the source(s) and, as a matter of convenience, the units used in reporting detection values from passive soil-gas surveys are smaller than those employed for source-compound concentrations.

The critical fact is that, whatever the relative concentrations of source and associated soil gas, best results are realized when the ratio of soil-gas measurements to actual subsurface concentrations remains as close to constant as the real world permits. It is the reliability and consistency of this ratio, not the particular units of mass (*e.g.*, nanograms) that determine usefulness. Thus, BEACON emphasizes the necessity of conducting — at minimum — follow-on intrusive sampling in areas that show relatively high soil-gas measurements to obtain corresponding concentrations of soil and groundwater contaminants. These correspondent values furnish the basis for approximating a relationship. For extrapolating passive soil gas results to vapor intrusion evaluations, we recommend a minimum of three passive soil gas locations be converted to a shallow vapor well then sampled using an active soil gas method. Once a relationship is established, it can be used in conjunction with the remaining soil-gas measurements to estimate subsurface contaminant concentrations across the survey field. (See www.beacon-usa.com/passivesoilgas.html, Publication 1: *Mass to Concentration Tie-In for PSG Surveys* and Publication 4: *Groundwater and PSG Correlation.*) It is important to keep in mind, however, that specific conditions at individual sample points, including soil porosity and permeability, depth to contamination, and perched ground water, can have an impact on soil-gas measurements at those locations.

When passive soil-gas surveys are utilized as described above, the data provide information that can yield substantial savings in drilling costs and in time. They furnish, among other things, a checklist of compounds expected at each survey location and help to determine how and where drilling budgets can most effectively be spent. Passive soil-gas surveys can also be used as a remediation or general site monitoring tool that can be implemented on a quarterly, semi-annual or annual basis.

Attachment 2

FIELD PROCEDURES FOR PASSIVE SOIL-GAS SURVEYS

The following field procedures are routinely used during a BEACON Passive Soil-Gas Survey. Modifications can be and are incorporated from time to time in response to individual project requirements. In all instances, BEACON adheres to EPA-approved Quality Assurance and Quality Control practices.

A. Field personnel carry a BESURE Sample Collection Kit™ and support equipment to the site and deploy the passive samplers in a prearranged survey pattern. A passive sampler consists of a borosilicate glass vial containing hydrophobic adsorbent cartridges with a length of wire attached to the vial for retrieval. Although samplers require only one person for emplacement and retrieval, the specific number of field personnel required depends upon the scope and schedule of the project. Each Sampler emplacement generally takes less than two minutes.

B. At each survey point a field technician clears vegetation as needed and, using a hammer drill with a 1"- to 1½"-diameter bit, creates a hole 12 to 14 inches deep. [Note: For locations covered with asphalt, concrete, or gravel surfacing, the field technician drills a 1"- to 1½"-diameter hole through the surfacing to the soils beneath]. The technician then, using a hammer drill with a ½" diameter bit, creates a hole three-feet deep. The hole is then sleeved with a 1"-diameter metal sleeve.

C. The technician then removes the solid plastic cap from a sampler and replaces it with a Sampling Cap (a plastic cap with a hole covered by screen meshing). The technician inserts the sampler, with the Sampling Cap end facing down, into the hole **(see attached figure)**. The sampler is then covered with an aluminum foil plug and soils for uncapped locations or, for capped locations, an aluminum foil plug and a concrete patch. The sampler's location, time and date of emplacement, and other relevant information are recorded on the Field Deployment Form.

D. One or more trip blanks are included as part of the quality-control procedures.

E. Once all the samplers have been deployed, field personnel schedule sampler recovery and depart, taking all other equipment and materials with them.

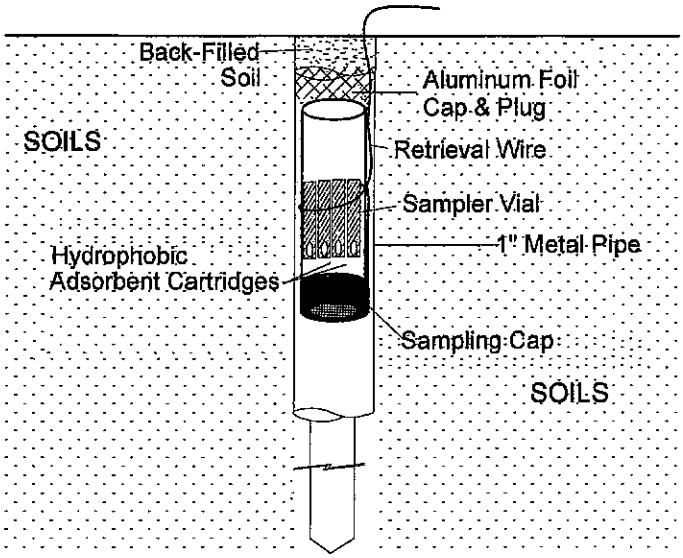
F. Field personnel retrieve the samplers at the end of the exposure period. At each location, a field technician withdraws the sampler from its hole, removes the retrieval wire, and wipes the outside of the vial clean using gauze cloth; following removal of the Sampling Cap, the threads of the vial are also cleaned. A solid plastic cap is screwed onto the vial and the sample location number is written on the label. The technician then records sample-point location, date, time, etc. on the Field Deployment Form.

G. Sampling holes are refilled with soil, sand, or other suitable material. If samplers have been installed through asphalt or concrete, the hole is filled to grade with a plug of cold patch or cement.

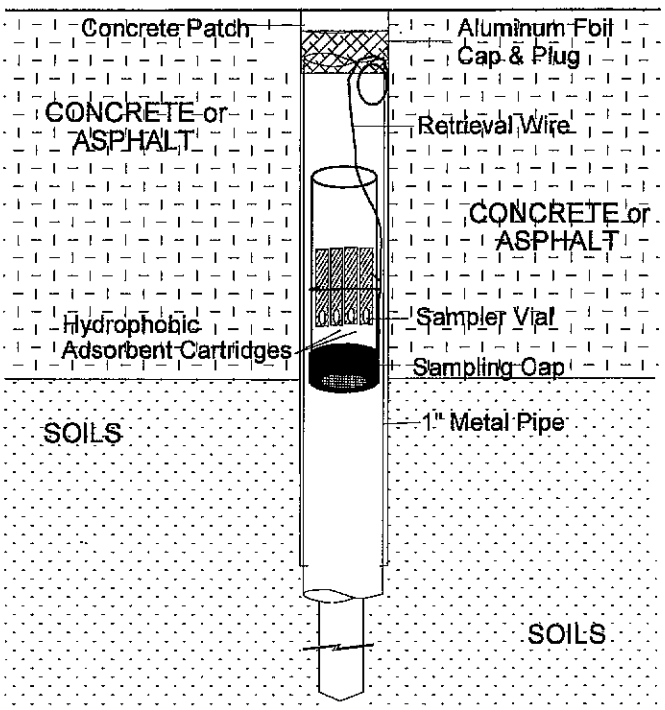
H. Following retrieval, field personnel ship or transport the passive samplers to BEACON's laboratory.

BEACON'S PASSIVE SOIL-GAS SAMPLER

DEPLOYMENT THROUGH SOILS



DEPLOYMENT THROUGH AN ASPHALT/CONCRETE CAP



Attachment 3

Field Deployment Report

PASSIVE SOIL-GAS SURVEY
FIELD DEPLOYMENT REPORT

Project Information	
Beacon Project No.:	2294 – Phase I
Site Name:	Havens Elementary School
Site Location:	Oakland, CA

BEACON ENVIRONMENTAL SERVICES, INC
[illegible]

Client Information	
Company Name:	Millennium Consulting Associates
Office Location:	Pleasant Hill, CA
Samples Collected By:	Ramil Arcia

FIELD SAMPLE ID	Date Emplaced / Time Emplaced	Date Retrieved / Time Retrieved	Sampling Hole Depth (inches)	FIELD NOTES (e.g., asphalt/concrete/gravel, description of sample location, PID/FID readings)
	3/25 or 3/26/10	4/5/10		
PSG1-13	3/25/10 10:20 am	11:10 am	36	East side one story classroom, ~~Fill~~ Cut PID: 0-1 ppm (background)
3/25 PSG1-12	3/25/10 11:06 am	13:04 pm	36	East side one story classroom, ~~Fill~~ Cut Sample location submerged PID - 0-1 ppm (background)
PSG1-11	3/25/10 11:45 am	11:21 am	36	West side one story classroom, Fill PID: 0-1 ppm
PSG1-10	3/25/10 12:52 pm	11:31 am	36	West side one story classroom, Fill PID = 0-1 ppm
PSG1-5	3/26/10 9:18 am	12:31 pm	36	South East side two story classroom, Cut PID: 0-1 ppm
3/26 PSG1-4	3/26/10 9:48 am	12:22 pm	24	Refusal @ 24", bedrock, North East side two story classroom, Cut PID: 0-1 ppm
PSG1-1	3/26/10 10:17 am	12:02 pm	36	East corner Admin Bldg, Cut PID = 0-1 ppm
PSG1-2	3/26/10 10:52 am	12:14 pm	36	South Admin Bldg, Cut PID = 0-1 ppm
PSG1-3	3/26/10 11:19 am	12:45 pm	36	SW Corner Admin Bldg, Cut PID - 0-1 ppm
PSG1-6	3/26/10 11:48 am	11:55 am	36	SW Corner 2 Story Bldg, Fill PID: 0-1 ppm
PSG1-7	3/26/10 12:20 pm	11:48 am	36	W side 2 story Bldg, Fill PID: 0-1 ppm
PSG1-8	3/26/10 1:15 pm	11:43 am	36	NW Corner 2 Story Bldg, Fill PID = 0-1 ppm
PSG1-9	3/26/10 1:35 pm	11:37 am	36	W MPR, Fill PID = 0-1 ppm
PSG1-5 Dup	3/26/10 9:18 am	12:31 pm	36	See PSG1-5 above

Attachment 4

LABORATORY PROCEDURES FOR PASSIVE SOIL-GAS SAMPLES

Following are laboratory procedures used with BEACON Passive Soil-Gas Surveys, a screening technology for expedited site investigation. After exposure, adsorbent cartridges from the passive samplers are analyzed using U.S. EPA Method 8260/8270 as described in the Solid Waste Manual (SW-846), a capillary gas chromatographic/mass spectrometric method, modified to accommodate high temperature thermal desorption of the adsorbent cartridges. This procedure is summarized as follows:

A. The adsorbent cartridges are loaded with internal standards and surrogates prior to loading the autosampler with the cartridges. The loaded cartridges are purged in a helium flow. Then the cartridges are thermally desorbed in a helium flow onto a focusing trap. Any analytes in the helium stream are adsorbed onto a focusing trap.

B. Following trap focusing, the trap is thermally desorbed onto a DB-VRX 20 m, 0.18 mm ID, 1.00 micron filament thickness capillary column.

C. The GC/MS is scanned between 35 and 270 Atomic Mass Units (AMU) at 3.12 scans per second.

D. BFB tuning criteria and the initial five-point calibration procedures are those stated in method SW846-8260/8270. System performance and calibration check criteria are met prior to analysis of samples. A laboratory method blank is analyzed after the daily standard to determine that the system is contaminant-free.

E. The instrumentation used for these analyses includes:

- Agilent 6890-5973 Gas Chromatograph/Mass Spectrometer;
- Markes Unity thermal desorber;
- Markes UltrA autosampler; and
- Markes Mass Flow Controller Module.

Attachment 5

Chain-of-Custody Form

CHAIN-OF-CUSTODY
PASSIVE SOIL-GAS SAMPLES

Project Information	
Beacon Project No.:	2294 – Phase I
Site Name:	Havens Elementary School
Site Location:	Oakland, CA
Analytical Method:	EPA Method 8260B
Target Compounds:	Beacon Project Number 2294 Target Compound List

BEACON ENVIRONMENTAL SERVICES, INC.

Client Information	
Company Name:	Millennium Consulting Associates
Office Location:	Pleasant Hill, CA
Samples Submitted By:	M Miler
Contact Phone No.:	925-303-6700

Field Sample ID	Lab Sample ID (for lab use only)	Comments (only necessary if problem or discrepancy) Condition of sample or vial	Date	Time	Initial
Trip-1	2294-P1 Trip1				
PSG1-13	2294.P1 PSG1-13		3/25/10	1020am	[illegible]
PSG1-12	2294.P1 PSG1-12	Sample location in standing water area, bucket water, possible submission of PSG1-12		1106a	mm
PSG1-11	2294.P1 PSG1-11			1146a	mm
PSG1-10	2294.P1 PSG1-10			1252p	mm
PSG1-5	2294.P1 PSG1-5		3/26/10	12:21p	mm
PSG1-4	2294.P1 PSG1-4		3/26/10	12:22pm	mm
PSG1-1	2294.P1 PSG1-1		3/26/10	12:02pm	mm
PSG1-2	2294.P1 PSG1-2		3/26/10	12:14pm	mm
PSG1-3	2294.P1 PSG1-3		3/26/10	12:45pm	mm
PSG1-6	2294.P1 PSG1-6		3/26/10	11:55am	mm
PSG1-7	2294.P1 PSG1-7		3/26/10	11:42am	mm
PSG1-8	2294.P1 PSG1-8		3/26/10	11:43am	mm
PSG1-9	2294.P1 PSG1-9		3/26/10	11:37am	mm
PSG1-5 Dup	2294.P1 PSG1-5 Dup		3/26/10	12:21pm	mm
			3/26/10		

Shipment of Field Kit to Site — Custody Seal # 1036857 Intact? (Y) N

Relinquished by:	Date/Time	Courier	Received by:	Date/Time
Ryan Schiel		Fed Ex	M Miler / M Miler	3/23/10 @ 1:00 pm

Shipment of Field Kit to Laboratory — Custody Seal # 1036856 Intact? (Y) N

Relinquished by:	Date/Time	Courier	Received by:	Date/Time
M Miler	4/5/2010 5:30 p.m	Fed Ex	Steven Thornley	4.7.2010 / 10:10 am

Air Toxics LTD.
Laboratory Services Since 1989

5/20/2010
Mr. Mark Milani
Millennium Consulting Associates (MECA)
620 Contra Costa Blvd.
Suite 102
Pleasant Hill CA 94523

Project Name: Piedmont Havins ES PEA
Project #: 16033.2013
Workorder #: 1005416A

Dear Mr. Mark Milani

The following report includes the data for the above referenced project for sample(s) received on 5/18/2010 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 APH are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kyle Vagadori at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kyle Vagadori
Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1005416A

Work Order Summary

CLIENT:	Mr. Mark Milani Millennium Consulting Associates (MECA) 620 Contra Costa Blvd. Suite 102 Pleasant Hill, CA 94523	**BILL TO:**	Mr. Mark Milani Millennium Consulting Associates (MECA) 620 Contra Costa Blvd. Suite 102
PHONE:	925-808-6700	**P.O. #**	
FAX:	925-808-6708	**PROJECT #**	16033.2013 Piedmont Havins ES PEA
DATE RECEIVED:	05/18/2010	**CONTACT:**	Kyle Vagadori
DATE COMPLETED:	05/20/2010		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	Havins ASG-1	Modified TO-15 APH	6.2 "Hg	5 psi
02A	Havins ASG-2	Modified TO-15 APH	5.0 "Hg	5 psi
03A	Havins ASG-3	Modified TO-15 APH	6.6 "Hg	5 psi
04A	Havins ASG-3 (Dup)	Modified TO-15 APH	6.4 "Hg	5 psi
04AA	Havins ASG-3 (Dup) Lab Duplicate	Modified TO-15 APH	6.4 "Hg	5 psi
05A	Havins ASG-4	Modified TO-15 APH	4.2 "Hg	5 psi
06A	Havins ASG-5	Modified TO-15 APH	5.8 "Hg	5 psi
07A	Havins ASG-6	Modified TO-15 APH	4.6 "Hg	5 psi
08A	Lab Blank	Modified TO-15 APH	NA	NA
09A	CCV	Modified TO-15 APH	NA	NA
10A	LCS	Modified TO-15 APH	NA	NA

CERTIFIED BY: Linda A. Freeman DATE: 05/20/10

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763,
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/10
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

Air Toxics LTD.
Laboratory Services Since 1989

LABORATORY NARRATIVE
Modified TO-15
Millennium Consulting Associates (MECA)
Workorder# 1005416A

Seven 6 Liter Summa Canister (100% Certified) samples were received on May 18, 2010. The laboratory performed analysis via modified EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	*TO-15*	*ATL Modifications*
Daily CCV	</= 30% Difference	</= 30% Difference; Compounds exceeding this criterion and associated data are flagged and narrated.
Sample collection media	Summa canister	ATL recommends use of summa canisters to insure data defensibility, but will report results from Tedlar bags at client request
Method Detection Limit	Follow 40CFR Pt.136 App. B	The MDL met all relevant requirements in Method TO-15 (statistical MDL less than the LOQ). The concentration of the spiked replicate may have exceeded 10X the calculated MDL in some cases

Receiving Notes

The Chain of Custody (COC) information for sample Havens ASG-6 did not match the entry on the sample tag with regard to sample identification. The information on the COC was used to process and report the sample.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: Havins ASG-1

Lab ID#: 1005416A-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.84	1.4	1.9	3.1
Freon 11	0.84	0.98	4.7	5.5
Ethanol	3.4	38	6.4	72
Acetone	3.4	69	8.0	160
Carbon Disulfide	0.84	2.1	2.6	6.5
Hexane	0.84	1.8	3.0	6.3
2-Butanone (Methyl Ethyl Ketone)	0.84	4.4	2.5	13
Tetrahydrofuran	0.84	4.2	2.5	12
Chloroform	0.84	1.2	4.1	5.7
1,1,1-Trichloroethane	0.84	1.1	4.6	6.0
Cyclohexane	0.84	2.4	2.9	8.3
Benzene	0.84	2.9	2.7	9.2
Heptane	0.84	3.0	3.5	12
4-Methyl-2-pentanone	0.84	1.3	3.5	5.4
Toluene	0.84	40	3.2	150
Tetrachloroethene	0.84	0.99	5.7	6.7
Ethyl Benzene	0.84	7.0	3.7	30
m,p-Xylene	0.84	34	3.7	140
o-Xylene	0.84	9.9	3.7	43
Propylbenzene	0.84	1.5	4.2	7.4
4-Ethyltoluene	0.84	9.3	4.2	46
1,3,5-Trimethylbenzene	0.84	3.8	4.2	19
1,2,4-Trimethylbenzene	0.84	10	4.2	50

Client Sample ID: Havins ASG-2

Lab ID#: 1005416A-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.80	1.7	1.8	3.7
Ethanol	3.2	72	6.1	140
Acetone	3.2	55	7.6	130
Carbon Disulfide	0.80	3.4	2.5	11
Hexane	0.80	7.5	2.8	26
2-Butanone (Methyl Ethyl Ketone)	0.80	2.7	2.4	7.9
Tetrahydrofuran	0.80	3.4	2.4	10
Chloroform	0.80	30	3.9	140
Cyclohexane	0.80	24	2.8	83

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: Havins ASG-2

Lab ID#: 1005416A-02A

Benzene	0.80	5.8	2.6	18
Heptane	0.80	8.4	3.3	35
Toluene	0.80	36	3.0	140
Ethyl Benzene	0.80	5.6	3.5	24
m,p-Xylene	0.80	26	3.5	110
o-Xylene	0.80	7.7	3.5	34
Propylbenzene	0.80	1.1	4.0	5.6
4-Ethyltoluene	0.80	7.0	4.0	34
1,3,5-Trimethylbenzene	0.80	2.6	4.0	13
1,2,4-Trimethylbenzene	0.80	7.1	4.0	35

Client Sample ID: Havins ASG-3

Lab ID#: 1005416A-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.86	12	1.9	28
Ethanol	3.4	6.1	6.5	12
Acetone	3.4	42	8.2	100
Carbon Disulfide	0.86	6.2	2.7	19
Hexane	0.86	25	3.0	88
2-Butanone (Methyl Ethyl Ketone)	0.86	7.8	2.5	23
1,1,1-Trichloroethane	0.86	1.0	4.7	5.5
Cyclohexane	0.86	52	3.0	180
2,2,4-Trimethylpentane	0.86	2.1	4.0	9.8
Benzene	0.86	15	2.7	47
Heptane	0.86	16	3.5	66
Toluene	0.86	34	3.2	130
Ethyl Benzene	0.86	8.3	3.7	36
m,p-Xylene	0.86	39	3.7	170
o-Xylene	0.86	12	3.7	54
Propylbenzene	0.86	2.1	4.2	10
4-Ethyltoluene	0.86	13	4.2	66
1,3,5-Trimethylbenzene	0.86	5.3	4.2	26
1,2,4-Trimethylbenzene	0.86	16	4.2	77

Client Sample ID: Havins ASG-3 (Dup)

Lab ID#: 1005416A-04A

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: Havins ASG-3 (Dup)

Lab ID#: 1005416A-04A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.85	10	1.9	23
Ethanol	3.4	8.7	6.4	16
Acetone	3.4	49	8.1	120
Carbon Disulfide	0.85	6.3	2.6	20
Hexane	0.85	28	3.0	97
2-Butanone (Methyl Ethyl Ketone)	0.85	8.7	2.5	26
1,1,1-Trichloroethane	0.85	1.0	4.6	5.7
Cyclohexane	0.85	56	2.9	190
2,2,4-Trimethylpentane	0.85	2.4	4.0	11
Benzene	0.85	15	2.7	48
Heptane	0.85	18	3.5	73
Toluene	0.85	35	3.2	130
Ethyl Benzene	0.85	8.8	3.7	38
m,p-Xylene	0.85	41	3.7	180
o-Xylene	0.85	14	3.7	59
Cumene	0.85	0.86	4.2	4.2
Propylbenzene	0.85	2.3	4.2	11
4-Ethyltoluene	0.85	14	4.2	68
1,3,5-Trimethylbenzene	0.85	5.6	4.2	28
1,2,4-Trimethylbenzene	0.85	16	4.2	81

Client Sample ID: Havins ASG-3 (Dup) Lab Duplicate

Lab ID#: 1005416A-04AA

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.85	10	1.9	23
Ethanol	3.4	8.4	6.4	16
Acetone	3.4	49	8.1	120
Carbon Disulfide	0.85	6.4	2.6	20
Hexane	0.85	27	3.0	97
2-Butanone (Methyl Ethyl Ketone)	0.85	9.4	2.5	28
1,1,1-Trichloroethane	0.85	1.0	4.6	5.6
Cyclohexane	0.85	56	2.9	190
2,2,4-Trimethylpentane	0.85	2.4	4.0	11
Benzene	0.85	15	2.7	49
Heptane	0.85	18	3.5	76

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: Havins ASG-3 (Dup) Lab Duplicate

Lab ID#: 1005416A-04AA

Toluene	0.85	36	3.2	130
Ethyl Benzene	0.85	8.9	3.7	39
m,p-Xylene	0.85	41	3.7	180
o-Xylene	0.85	13	3.7	57
Propylbenzene	0.85	2.3	4.2	11
4-Ethyltoluene	0.85	14	4.2	72
1,3,5-Trimethylbenzene	0.85	5.8	4.2	29
1,2,4-Trimethylbenzene	0.85	17	4.2	84

Client Sample ID: Havins ASG-4

Lab ID#: 1005416A-05A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.78	4.2	1.7	9.4
Ethanol	3.1	29	5.9	54
Acetone	3.1	3.9	7.4	9.4
Hexane	0.78	28	2.7	99
Cyclohexane	0.78	1.6	2.7	5.6
2,2,4-Trimethylpentane	0.78	5.6	3.6	26
Benzene	0.78	7.4	2.5	24
Heptane	0.78	1.9	3.2	7.8
Toluene	0.78	16	2.9	60
Ethyl Benzene	0.78	2.6	3.4	11
m,p-Xylene	0.78	12	3.4	53
o-Xylene	0.78	3.9	3.4	17
4-Ethyltoluene	0.78	3.4	3.8	17
1,3,5-Trimethylbenzene	0.78	1.2	3.8	5.9
1,2,4-Trimethylbenzene	0.78	3.8	3.8	19

Client Sample ID: Havins ASG-5

Lab ID#: 1005416A-06A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.83	98	1.8	220
Freon 11	0.83	4.2	4.7	24
Ethanol	3.3	18	6.2	35
Acetone	3.3	38	7.9	90
2-Propanol	3.3	7.7	8.2	19

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: Havins ASG-5

Lab ID#: 1005416A-06A

Carbon Disulfide	0.83	7.8	2.6	24
Hexane	0.83	73	2.9	260
2-Butanone (Methyl Ethyl Ketone)	0.83	7.1	2.4	21
1,1,1-Trichloroethane	0.83	12	4.5	64
Cyclohexane	0.83	59	2.8	200
2,2,4-Trimethylpentane	0.83	8.7	3.9	41
Benzene	0.83	12	2.6	39
Heptane	0.83	25	3.4	100
Trichloroethene	0.83	1.2	4.5	6.6
4-Methyl-2-pentanone	0.83	4.9	3.4	20
Toluene	0.83	48	3.1	180
Ethyl Benzene	0.83	7.7	3.6	34
m,p-Xylene	0.83	34	3.6	150
o-Xylene	0.83	10	3.6	45
Propylbenzene	0.83	1.5	4.1	7.6
4-Ethyltoluene	0.83	9.6	4.1	47
1,3,5-Trimethylbenzene	0.83	3.4	4.1	17
1,2,4-Trimethylbenzene	0.83	10	4.1	49

Client Sample ID: Havins ASG-6

Lab ID#: 1005416A-07A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.79	13	1.7	28
Freon 11	0.79	6.1	4.4	34
Ethanol	3.2	67	6.0	130
Acetone	3.2	45	7.5	110
Carbon Disulfide	0.79	4.3	2.5	13
Hexane	0.79	66	2.8	230
2-Butanone (Methyl Ethyl Ketone)	0.79	4.0	2.3	12
Chloroform	0.79	1.6	3.8	7.7
1,1,1-Trichloroethane	0.79	15	4.3	82
Cyclohexane	0.79	33	2.7	110
2,2,4-Trimethylpentane	0.79	19	3.7	88
Benzene	0.79	11	2.5	36
Heptane	0.79	18	3.2	75
Trichloroethene	0.79	1.6	4.2	8.9
4-Methyl-2-pentanone	0.79	0.97	3.2	4.0
Toluene	0.79	10	3.0	39

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: Havins ASG-6

Lab ID#: 1005416A-07A

Tetrachloroethene	0.79	2.2	5.4	15
Ethyl Benzene	0.79	12	3.4	52
m,p-Xylene	0.79	33	3.4	140
o-Xylene	0.79	15	3.4	67
Cumene	0.79	2.3	3.9	11
4-Ethyltoluene	0.79	3.9	3.9	19
1,3,5-Trimethylbenzene	0.79	2.2	3.9	11
1,2,4-Trimethylbenzene	0.79	4.7	3.9	23

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-1

Lab ID#: 1005416A-01A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051926**	**Date of Collection:**	**5/17/10 1:50:00 PM**
Dil. Factor:	**1.69**	**Date of Analysis:**	**5/19/10 09:42 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.84	Not Detected	4.2	Not Detected
Freon 114	0.84	Not Detected	5.9	Not Detected
Chloromethane	3.4	Not Detected	7.0	Not Detected
Vinyl Chloride	0.84	Not Detected	2.2	Not Detected
1,3-Butadiene	0.84	1.4	1.9	3.1
Bromomethane	0.84	Not Detected	3.3	Not Detected
Chloroethane	0.84	Not Detected	2.2	Not Detected
Freon 11	0.84	0.98	4.7	5.5
Ethanol	3.4	38	6.4	72
Freon 113	0.84	Not Detected	6.5	Not Detected
1,1-Dichloroethene	0.84	Not Detected	3.4	Not Detected
Acetone	3.4	69	8.0	160
2-Propanol	3.4	Not Detected	8.3	Not Detected
Carbon Disulfide	0.84	2.1	2.6	6.5
3-Chloropropene	3.4	Not Detected	10	Not Detected
Methylene Chloride	0.84	Not Detected	2.9	Not Detected
Methyl tert-butyl ether	0.84	Not Detected	3.0	Not Detected
trans-1,2-Dichloroethene	0.84	Not Detected	3.4	Not Detected
Hexane	0.84	1.8	3.0	6.3
1,1-Dichloroethane	0.84	Not Detected	3.4	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.84	4.4	2.5	13
cis-1,2-Dichloroethene	0.84	Not Detected	3.4	Not Detected
Tetrahydrofuran	0.84	4.2	2.5	12
Chloroform	0.84	1.2	4.1	5.7
1,1,1-Trichloroethane	0.84	1.1	4.6	6.0
Cyclohexane	0.84	2.4	2.9	8.3
Carbon Tetrachloride	0.84	Not Detected	5.3	Not Detected
2,2,4-Trimethylpentane	0.84	Not Detected	3.9	Not Detected
Benzene	0.84	2.9	2.7	9.2
1,2-Dichloroethane	0.84	Not Detected	3.4	Not Detected
Heptane	0.84	3.0	3.5	12
Trichloroethene	0.84	Not Detected	4.5	Not Detected
1,2-Dichloropropane	0.84	Not Detected	3.9	Not Detected
1,4-Dioxane	3.4	Not Detected	12	Not Detected
Bromodichloromethane	0.84	Not Detected	5.7	Not Detected
cis-1,3-Dichloropropene	0.84	Not Detected	3.8	Not Detected
4-Methyl-2-pentanone	0.84	1.3	3.5	5.4
Toluene	0.84	40	3.2	150
trans-1,3-Dichloropropene	0.84	Not Detected	3.8	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-1

Lab ID#: 1005416A-01A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051926**	**Date of Collection:**	**5/17/10 1:50:00 PM**
Dil. Factor:	**1.69**	**Date of Analysis:**	**5/19/10 09:42 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,2-Trichloroethane	0.84	Not Detected	4.6	Not Detected
Tetrachloroethene	0.84	0.99	5.7	6.7
2-Hexanone	3.4	Not Detected	14	Not Detected
Dibromochloromethane	0.84	Not Detected	7.2	Not Detected
1,2-Dibromoethane (EDB)	0.84	Not Detected	6.5	Not Detected
Chlorobenzene	0.84	Not Detected	3.9	Not Detected
Ethyl Benzene	0.84	7.0	3.7	30
m,p-Xylene	0.84	34	3.7	140
o-Xylene	0.84	9.9	3.7	43
Styrene	0.84	Not Detected	3.6	Not Detected
Bromoform	0.84	Not Detected	8.7	Not Detected
Cumene	0.84	Not Detected	4.2	Not Detected
1,1,2,2-Tetrachloroethane	0.84	Not Detected	5.8	Not Detected
Propylbenzene	0.84	1.5	4.2	7.4
4-Ethyltoluene	0.84	9.3	4.2	46
1,3,5-Trimethylbenzene	0.84	3.8	4.2	19
1,2,4-Trimethylbenzene	0.84	10	4.2	50
1,3-Dichlorobenzene	0.84	Not Detected	5.1	Not Detected
1,4-Dichlorobenzene	0.84	Not Detected	5.1	Not Detected
alpha-Chlorotoluene	0.84	Not Detected	4.4	Not Detected
1,2-Dichlorobenzene	0.84	Not Detected	5.1	Not Detected
1,2,4-Trichlorobenzene	3.4	Not Detected	25	Not Detected
Hexachlorobutadiene	3.4	Not Detected	36	Not Detected
Naphthalene	3.4	Not Detected	18	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

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

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-2

Lab ID#: 1005416A-02A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051927**	**Date of Collection:**	**5/17/10 2:12:00 PM**
Dil. Factor:	**1.61**	**Date of Analysis:**	**5/19/10 10:02 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.80	Not Detected	4.0	Not Detected
Freon 114	0.80	Not Detected	5.6	Not Detected
Chloromethane	3.2	Not Detected	6.6	Not Detected
Vinyl Chloride	0.80	Not Detected	2.0	Not Detected
1,3-Butadiene	0.80	1.7	1.8	3.7
Bromomethane	0.80	Not Detected	3.1	Not Detected
Chloroethane	0.80	Not Detected	2.1	Not Detected
Freon 11	0.80	Not Detected	4.5	Not Detected
Ethanol	3.2	72	6.1	140
Freon 113	0.80	Not Detected	6.2	Not Detected
1,1-Dichloroethene	0.80	Not Detected	3.2	Not Detected
Acetone	3.2	55	7.6	130
2-Propanol	3.2	Not Detected	7.9	Not Detected
Carbon Disulfide	0.80	3.4	2.5	11
3-Chloropropene	3.2	Not Detected	10	Not Detected
Methylene Chloride	0.80	Not Detected	2.8	Not Detected
Methyl tert-butyl ether	0.80	Not Detected	2.9	Not Detected
trans-1,2-Dichloroethene	0.80	Not Detected	3.2	Not Detected
Hexane	0.80	7.5	2.8	26
1,1-Dichloroethane	0.80	Not Detected	3.2	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.80	2.7	2.4	7.9
cis-1,2-Dichloroethene	0.80	Not Detected	3.2	Not Detected
Tetrahydrofuran	0.80	3.4	2.4	10
Chloroform	0.80	30	3.9	140
1,1,1-Trichloroethane	0.80	Not Detected	4.4	Not Detected
Cyclohexane	0.80	24	2.8	83
Carbon Tetrachloride	0.80	Not Detected	5.1	Not Detected
2,2,4-Trimethylpentane	0.80	Not Detected	3.8	Not Detected
Benzene	0.80	5.8	2.6	18
1,2-Dichloroethane	0.80	Not Detected	3.2	Not Detected
Heptane	0.80	8.4	3.3	35
Trichloroethene	0.80	Not Detected	4.3	Not Detected
1,2-Dichloropropane	0.80	Not Detected	3.7	Not Detected
1,4-Dioxane	3.2	Not Detected	12	Not Detected
Bromodichloromethane	0.80	Not Detected	5.4	Not Detected
cis-1,3-Dichloropropene	0.80	Not Detected	3.6	Not Detected
4-Methyl-2-pentanone	0.80	Not Detected	3.3	Not Detected
Toluene	0.80	36	3.0	140
trans-1,3-Dichloropropene	0.80	Not Detected	3.6	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-2

Lab ID#: 1005416A-02A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051927**	**Date of Collection:**	**5/17/10 2:12:00 PM**
Dil. Factor:	**1.61**	**Date of Analysis:**	**5/19/10 10:02 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,2-Trichloroethane	0.80	Not Detected	4.4	Not Detected
Tetrachloroethene	0.80	Not Detected	5.5	Not Detected
2-Hexanone	3.2	Not Detected	13	Not Detected
Dibromochloromethane	0.80	Not Detected	6.8	Not Detected
1,2-Dibromoethane (EDB)	0.80	Not Detected	6.2	Not Detected
Chlorobenzene	0.80	Not Detected	3.7	Not Detected
Ethyl Benzene	0.80	5.6	3.5	24
m,p-Xylene	0.80	26	3.5	110
o-Xylene	0.80	7.7	3.5	34
Styrene	0.80	Not Detected	3.4	Not Detected
Bromoform	0.80	Not Detected	8.3	Not Detected
Cumene	0.80	Not Detected	4.0	Not Detected
1,1,2,2-Tetrachloroethane	0.80	Not Detected	5.5	Not Detected
Propylbenzene	0.80	1.1	4.0	5.6
4-Ethyltoluene	0.80	7.0	4.0	34
1,3,5-Trimethylbenzene	0.80	2.6	4.0	13
1,2,4-Trimethylbenzene	0.80	7.1	4.0	35
1,3-Dichlorobenzene	0.80	Not Detected	4.8	Not Detected
1,4-Dichlorobenzene	0.80	Not Detected	4.8	Not Detected
alpha-Chlorotoluene	0.80	Not Detected	4.2	Not Detected
1,2-Dichlorobenzene	0.80	Not Detected	4.8	Not Detected
1,2,4-Trichlorobenzene	3.2	Not Detected	24	Not Detected
Hexachlorobutadiene	3.2	Not Detected	34	Not Detected
Naphthalene	3.2	Not Detected	17	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-3

Lab ID#: 1005416A-03A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051928**	**Date of Collection:**	**5/17/10 11:10:00 AM**
Dil. Factor:	**1.72**	**Date of Analysis:**	**5/19/10 10:22 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.86	Not Detected	4.2	Not Detected
Freon 114	0.86	Not Detected	6.0	Not Detected
Chloromethane	3.4	Not Detected	7.1	Not Detected
Vinyl Chloride	0.86	Not Detected	2.2	Not Detected
1,3-Butadiene	0.86	12	1.9	28
Bromomethane	0.86	Not Detected	3.3	Not Detected
Chloroethane	0.86	Not Detected	2.3	Not Detected
Freon 11	0.86	Not Detected	4.8	Not Detected
Ethanol	3.4	6.1	6.5	12
Freon 113	0.86	Not Detected	6.6	Not Detected
1,1-Dichloroethene	0.86	Not Detected	3.4	Not Detected
Acetone	3.4	42	8.2	100
2-Propanol	3.4	Not Detected	8.4	Not Detected
Carbon Disulfide	0.86	6.2	2.7	19
3-Chloropropene	3.4	Not Detected	11	Not Detected
Methylene Chloride	0.86	Not Detected	3.0	Not Detected
Methyl tert-butyl ether	0.86	Not Detected	3.1	Not Detected
trans-1,2-Dichloroethene	0.86	Not Detected	3.4	Not Detected
Hexane	0.86	25	3.0	88
1,1-Dichloroethane	0.86	Not Detected	3.5	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.86	7.8	2.5	23
cis-1,2-Dichloroethene	0.86	Not Detected	3.4	Not Detected
Tetrahydrofuran	0.86	Not Detected	2.5	Not Detected
Chloroform	0.86	Not Detected	4.2	Not Detected
1,1,1-Trichloroethane	0.86	1.0	4.7	5.5
Cyclohexane	0.86	52	3.0	180
Carbon Tetrachloride	0.86	Not Detected	5.4	Not Detected
2,2,4-Trimethylpentane	0.86	2.1	4.0	9.8
Benzene	0.86	15	2.7	47
1,2-Dichloroethane	0.86	Not Detected	3.5	Not Detected
Heptane	0.86	16	3.5	66
Trichloroethene	0.86	Not Detected	4.6	Not Detected
1,2-Dichloropropane	0.86	Not Detected	4.0	Not Detected
1,4-Dioxane	3.4	Not Detected	12	Not Detected
Bromodichloromethane	0.86	Not Detected	5.8	Not Detected
cis-1,3-Dichloropropene	0.86	Not Detected	3.9	Not Detected
4-Methyl-2-pentanone	0.86	Not Detected	3.5	Not Detected
Toluene	0.86	34	3.2	130
trans-1,3-Dichloropropene	0.86	Not Detected	3.9	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-3

Lab ID#: 1005416A-03A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051928**	**Date of Collection:**	**5/17/10 11:10:00 AM**
Dil. Factor:	**1.72**	**Date of Analysis:**	**5/19/10 10:22 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,2-Trichloroethane	0.86	Not Detected	4.7	Not Detected
Tetrachloroethene	0.86	Not Detected	5.8	Not Detected
2-Hexanone	3.4	Not Detected	14	Not Detected
Dibromochloromethane	0.86	Not Detected	7.3	Not Detected
1,2-Dibromoethane (EDB)	0.86	Not Detected	6.6	Not Detected
Chlorobenzene	0.86	Not Detected	4.0	Not Detected
Ethyl Benzene	0.86	8.3	3.7	36
m,p-Xylene	0.86	39	3.7	170
o-Xylene	0.86	12	3.7	54
Styrene	0.86	Not Detected	3.7	Not Detected
Bromoform	0.86	Not Detected	8.9	Not Detected
Cumene	0.86	Not Detected	4.2	Not Detected
1,1,2,2-Tetrachloroethane	0.86	Not Detected	5.9	Not Detected
Propylbenzene	0.86	2.1	4.2	10
4-Ethyltoluene	0.86	13	4.2	66
1,3,5-Trimethylbenzene	0.86	5.3	4.2	26
1,2,4-Trimethylbenzene	0.86	16	4.2	77
1,3-Dichlorobenzene	0.86	Not Detected	5.2	Not Detected
1,4-Dichlorobenzene	0.86	Not Detected	5.2	Not Detected
alpha-Chlorotoluene	0.86	Not Detected	4.4	Not Detected
1,2-Dichlorobenzene	0.86	Not Detected	5.2	Not Detected
1,2,4-Trichlorobenzene	3.4	Not Detected	26	Not Detected
Hexachlorobutadiene	3.4	Not Detected	37	Not Detected
Naphthalene	3.4	Not Detected	18	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	105	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	101	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-3 (Dup)

Lab ID#: 1005416A-04A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051929**	**Date of Collection:**	**5/17/10 11:10:00 AM**
Dil. Factor:	**1.70**	**Date of Analysis:**	**5/19/10 10:50 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.85	Not Detected	4.2	Not Detected
Freon 114	0.85	Not Detected	5.9	Not Detected
Chloromethane	3.4	Not Detected	7.0	Not Detected
Vinyl Chloride	0.85	Not Detected	2.2	Not Detected
1,3-Butadiene	0.85	10	1.9	23
Bromomethane	0.85	Not Detected	3.3	Not Detected
Chloroethane	0.85	Not Detected	2.2	Not Detected
Freon 11	0.85	Not Detected	4.8	Not Detected
Ethanol	3.4	8.7	6.4	16
Freon 113	0.85	Not Detected	6.5	Not Detected
1,1-Dichloroethene	0.85	Not Detected	3.4	Not Detected
Acetone	3.4	49	8.1	120
2-Propanol	3.4	Not Detected	8.4	Not Detected
Carbon Disulfide	0.85	6.3	2.6	20
3-Chloropropene	3.4	Not Detected	11	Not Detected
Methylene Chloride	0.85	Not Detected	3.0	Not Detected
Methyl tert-butyl ether	0.85	Not Detected	3.1	Not Detected
trans-1,2-Dichloroethene	0.85	Not Detected	3.4	Not Detected
Hexane	0.85	28	3.0	97
1,1-Dichloroethane	0.85	Not Detected	3.4	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.85	8.7	2.5	26
cis-1,2-Dichloroethene	0.85	Not Detected	3.4	Not Detected
Tetrahydrofuran	0.85	Not Detected	2.5	Not Detected
Chloroform	0.85	Not Detected	4.2	Not Detected
1,1,1-Trichloroethane	0.85	1.0	4.6	5.7
Cyclohexane	0.85	56	2.9	190
Carbon Tetrachloride	0.85	Not Detected	5.3	Not Detected
2,2,4-Trimethylpentane	0.85	2.4	4.0	11
Benzene	0.85	15	2.7	48
1,2-Dichloroethane	0.85	Not Detected	3.4	Not Detected
Heptane	0.85	18	3.5	73
Trichloroethene	0.85	Not Detected	4.6	Not Detected
1,2-Dichloropropane	0.85	Not Detected	3.9	Not Detected
1,4-Dioxane	3.4	Not Detected	12	Not Detected
Bromodichloromethane	0.85	Not Detected	5.7	Not Detected
cis-1,3-Dichloropropene	0.85	Not Detected	3.8	Not Detected
4-Methyl-2-pentanone	0.85	Not Detected	3.5	Not Detected
Toluene	0.85	35	3.2	130
trans-1,3-Dichloropropene	0.85	Not Detected	3.8	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-3 (Dup)

Lab ID#: 1005416A-04A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051929**	**Date of Collection:**	**5/17/10 11:10:00 AM**
Dil. Factor:	**1.70**	**Date of Analysis:**	**5/19/10 10:50 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,2-Trichloroethane	0.85	Not Detected	4.6	Not Detected
Tetrachloroethene	0.85	Not Detected	5.8	Not Detected
2-Hexanone	3.4	Not Detected	14	Not Detected
Dibromochloromethane	0.85	Not Detected	7.2	Not Detected
1,2-Dibromoethane (EDB)	0.85	Not Detected	6.5	Not Detected
Chlorobenzene	0.85	Not Detected	3.9	Not Detected
Ethyl Benzene	0.85	8.8	3.7	38
m,p-Xylene	0.85	41	3.7	180
o-Xylene	0.85	14	3.7	59
Styrene	0.85	Not Detected	3.6	Not Detected
Bromoform	0.85	Not Detected	8.8	Not Detected
Cumene	0.85	0.86	4.2	4.2
1,1,2,2-Tetrachloroethane	0.85	Not Detected	5.8	Not Detected
Propylbenzene	0.85	2.3	4.2	11
4-Ethyltoluene	0.85	14	4.2	68
1,3,5-Trimethylbenzene	0.85	5.6	4.2	28
1,2,4-Trimethylbenzene	0.85	16	4.2	81
1,3-Dichlorobenzene	0.85	Not Detected	5.1	Not Detected
1,4-Dichlorobenzene	0.85	Not Detected	5.1	Not Detected
alpha-Chlorotoluene	0.85	Not Detected	4.4	Not Detected
1,2-Dichlorobenzene	0.85	Not Detected	5.1	Not Detected
1,2,4-Trichlorobenzene	3.4	Not Detected	25	Not Detected
Hexachlorobutadiene	3.4	Not Detected	36	Not Detected
Naphthalene	3.4	Not Detected	18	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	104	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-3 (Dup) Lab Duplicate

Lab ID#: 1005416A-04AA

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051930**	**Date of Collection:**	**5/17/10 11:10:00 AM**
Dil. Factor:	**1.70**	**Date of Analysis:**	**5/19/10 11:22 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.85	Not Detected	4.2	Not Detected
Freon 114	0.85	Not Detected	5.9	Not Detected
Chloromethane	3.4	Not Detected	7.0	Not Detected
Vinyl Chloride	0.85	Not Detected	2.2	Not Detected
1,3-Butadiene	0.85	10	1.9	23
Bromomethane	0.85	Not Detected	3.3	Not Detected
Chloroethane	0.85	Not Detected	2.2	Not Detected
Freon 11	0.85	Not Detected	4.8	Not Detected
Ethanol	3.4	8.4	6.4	16
Freon 113	0.85	Not Detected	6.5	Not Detected
1,1-Dichloroethene	0.85	Not Detected	3.4	Not Detected
Acetone	3.4	49	8.1	120
2-Propanol	3.4	Not Detected	8.4	Not Detected
Carbon Disulfide	0.85	6.4	2.6	20
3-Chloropropene	3.4	Not Detected	11	Not Detected
Methylene Chloride	0.85	Not Detected	3.0	Not Detected
Methyl tert-butyl ether	0.85	Not Detected	3.1	Not Detected
trans-1,2-Dichloroethene	0.85	Not Detected	3.4	Not Detected
Hexane	0.85	27	3.0	97
1,1-Dichloroethane	0.85	Not Detected	3.4	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.85	9.4	2.5	28
cis-1,2-Dichloroethene	0.85	Not Detected	3.4	Not Detected
Tetrahydrofuran	0.85	Not Detected	2.5	Not Detected
Chloroform	0.85	Not Detected	4.2	Not Detected
1,1,1-Trichloroethane	0.85	1.0	4.6	5.6
Cyclohexane	0.85	56	2.9	190
Carbon Tetrachloride	0.85	Not Detected	5.3	Not Detected
2,2,4-Trimethylpentane	0.85	2.4	4.0	11
Benzene	0.85	15	2.7	49
1,2-Dichloroethane	0.85	Not Detected	3.4	Not Detected
Heptane	0.85	18	3.5	76
Trichloroethene	0.85	Not Detected	4.6	Not Detected
1,2-Dichloropropane	0.85	Not Detected	3.9	Not Detected
1,4-Dioxane	3.4	Not Detected	12	Not Detected
Bromodichloromethane	0.85	Not Detected	5.7	Not Detected
cis-1,3-Dichloropropene	0.85	Not Detected	3.8	Not Detected
4-Methyl-2-pentanone	0.85	Not Detected	3.5	Not Detected
Toluene	0.85	36	3.2	130
trans-1,3-Dichloropropene	0.85	Not Detected	3.8	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-3 (Dup) Lab Duplicate

Lab ID#: 1005416A-04AA

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051930**	**Date of Collection:**	**5/17/10 11:10:00 AM**
Dil. Factor:	**1.70**	**Date of Analysis:**	**5/19/10 11:22 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,2-Trichloroethane	0.85	Not Detected	4.6	Not Detected
Tetrachloroethene	0.85	Not Detected	5.8	Not Detected
2-Hexanone	3.4	Not Detected	14	Not Detected
Dibromochloromethane	0.85	Not Detected	7.2	Not Detected
1,2-Dibromoethane (EDB)	0.85	Not Detected	6.5	Not Detected
Chlorobenzene	0.85	Not Detected	3.9	Not Detected
Ethyl Benzene	0.85	8.9	3.7	39
m,p-Xylene	0.85	41	3.7	180
o-Xylene	0.85	13	3.7	57
Styrene	0.85	Not Detected	3.6	Not Detected
Bromoform	0.85	Not Detected	8.8	Not Detected
Cumene	0.85	Not Detected	4.2	Not Detected
1,1,2,2-Tetrachloroethane	0.85	Not Detected	5.8	Not Detected
Propylbenzene	0.85	2.3	4.2	11
4-Ethyltoluene	0.85	14	4.2	72
1,3,5-Trimethylbenzene	0.85	5.8	4.2	29
1,2,4-Trimethylbenzene	0.85	17	4.2	84
1,3-Dichlorobenzene	0.85	Not Detected	5.1	Not Detected
1,4-Dichlorobenzene	0.85	Not Detected	5.1	Not Detected
alpha-Chlorotoluene	0.85	Not Detected	4.4	Not Detected
1,2-Dichlorobenzene	0.85	Not Detected	5.1	Not Detected
1,2,4-Trichlorobenzene	3.4	Not Detected	25	Not Detected
Hexachlorobutadiene	3.4	Not Detected	36	Not Detected
Naphthalene	3.4	Not Detected	18	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	103	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-4

Lab ID#: 1005416A-05A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051931**	**Date of Collection:**	**5/17/10 9:22:00 AM**
Dil. Factor:	**1.56**	**Date of Analysis:**	**5/20/10 01:41 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.78	Not Detected	3.8	Not Detected
Freon 114	0.78	Not Detected	5.4	Not Detected
Chloromethane	3.1	Not Detected	6.4	Not Detected
Vinyl Chloride	0.78	Not Detected	2.0	Not Detected
1,3-Butadiene	0.78	4.2	1.7	9.4
Bromomethane	0.78	Not Detected	3.0	Not Detected
Chloroethane	0.78	Not Detected	2.0	Not Detected
Freon 11	0.78	Not Detected	4.4	Not Detected
Ethanol	3.1	29	5.9	54
Freon 113	0.78	Not Detected	6.0	Not Detected
1,1-Dichloroethene	0.78	Not Detected	3.1	Not Detected
Acetone	3.1	3.9	7.4	9.4
2-Propanol	3.1	Not Detected	7.7	Not Detected
Carbon Disulfide	0.78	Not Detected	2.4	Not Detected
3-Chloropropene	3.1	Not Detected	9.8	Not Detected
Methylene Chloride	0.78	Not Detected	2.7	Not Detected
Methyl tert-butyl ether	0.78	Not Detected	2.8	Not Detected
trans-1,2-Dichloroethene	0.78	Not Detected	3.1	Not Detected
Hexane	0.78	28	2.7	99
1,1-Dichloroethane	0.78	Not Detected	3.2	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.78	Not Detected	2.3	Not Detected
cis-1,2-Dichloroethene	0.78	Not Detected	3.1	Not Detected
Tetrahydrofuran	0.78	Not Detected	2.3	Not Detected
Chloroform	0.78	Not Detected	3.8	Not Detected
1,1,1-Trichloroethane	0.78	Not Detected	4.2	Not Detected
Cyclohexane	0.78	1.6	2.7	5.6
Carbon Tetrachloride	0.78	Not Detected	4.9	Not Detected
2,2,4-Trimethylpentane	0.78	5.6	3.6	26
Benzene	0.78	7.4	2.5	24
1,2-Dichloroethane	0.78	Not Detected	3.2	Not Detected
Heptane	0.78	1.9	3.2	7.8
Trichloroethene	0.78	Not Detected	4.2	Not Detected
1,2-Dichloropropane	0.78	Not Detected	3.6	Not Detected
1,4-Dioxane	3.1	Not Detected	11	Not Detected
Bromodichloromethane	0.78	Not Detected	5.2	Not Detected
cis-1,3-Dichloropropene	0.78	Not Detected	3.5	Not Detected
4-Methyl-2-pentanone	0.78	Not Detected	3.2	Not Detected
Toluene	0.78	16	2.9	60
trans-1,3-Dichloropropene	0.78	Not Detected	3.5	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-4

Lab ID#: 1005416A-05A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051931**	**Date of Collection:**	**5/17/10 9:22:00 AM**
Dil. Factor:	**1.56**	**Date of Analysis:**	**5/20/10 01:41 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,2-Trichloroethane	0.78	Not Detected	4.2	Not Detected
Tetrachloroethene	0.78	Not Detected	5.3	Not Detected
2-Hexanone	3.1	Not Detected	13	Not Detected
Dibromochloromethane	0.78	Not Detected	6.6	Not Detected
1,2-Dibromoethane (EDB)	0.78	Not Detected	6.0	Not Detected
Chlorobenzene	0.78	Not Detected	3.6	Not Detected
Ethyl Benzene	0.78	2.6	3.4	11
m,p-Xylene	0.78	12	3.4	53
o-Xylene	0.78	3.9	3.4	17
Styrene	0.78	Not Detected	3.3	Not Detected
Bromoform	0.78	Not Detected	8.1	Not Detected
Cumene	0.78	Not Detected	3.8	Not Detected
1,1,2,2-Tetrachloroethane	0.78	Not Detected	5.4	Not Detected
Propylbenzene	0.78	Not Detected	3.8	Not Detected
4-Ethyltoluene	0.78	3.4	3.8	17
1,3,5-Trimethylbenzene	0.78	1.2	3.8	5.9
1,2,4-Trimethylbenzene	0.78	3.8	3.8	19
1,3-Dichlorobenzene	0.78	Not Detected	4.7	Not Detected
1,4-Dichlorobenzene	0.78	Not Detected	4.7	Not Detected
alpha-Chlorotoluene	0.78	Not Detected	4.0	Not Detected
1,2-Dichlorobenzene	0.78	Not Detected	4.7	Not Detected
1,2,4-Trichlorobenzene	3.1	Not Detected	23	Not Detected
Hexachlorobutadiene	3.1	Not Detected	33	Not Detected
Naphthalene	3.1	Not Detected	16	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	101	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-5

Lab ID#: 1005416A-06A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051935**	**Date of Collection:**	**5/17/10 11:25:00 AM**
Dil. Factor:	**1.66**	**Date of Analysis:**	**5/20/10 04:42 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.83	Not Detected	4.1	Not Detected
Freon 114	0.83	Not Detected	5.8	Not Detected
Chloromethane	3.3	Not Detected	6.8	Not Detected
Vinyl Chloride	0.83	Not Detected	2.1	Not Detected
1,3-Butadiene	0.83	98	1.8	220
Bromomethane	0.83	Not Detected	3.2	Not Detected
Chloroethane	0.83	Not Detected	2.2	Not Detected
Freon 11	0.83	4.2	4.7	24
Ethanol	3.3	18	6.2	35
Freon 113	0.83	Not Detected	6.4	Not Detected
1,1-Dichloroethene	0.83	Not Detected	3.3	Not Detected
Acetone	3.3	38	7.9	90
2-Propanol	3.3	7.7	8.2	19
Carbon Disulfide	0.83	7.8	2.6	24
3-Chloropropene	3.3	Not Detected	10	Not Detected
Methylene Chloride	0.83	Not Detected	2.9	Not Detected
Methyl tert-butyl ether	0.83	Not Detected	3.0	Not Detected
trans-1,2-Dichloroethene	0.83	Not Detected	3.3	Not Detected
Hexane	0.83	73	2.9	260
1,1-Dichloroethane	0.83	Not Detected	3.4	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.83	7.1	2.4	21
cis-1,2-Dichloroethene	0.83	Not Detected	3.3	Not Detected
Tetrahydrofuran	0.83	Not Detected	2.4	Not Detected
Chloroform	0.83	Not Detected	4.0	Not Detected
1,1,1-Trichloroethane	0.83	12	4.5	64
Cyclohexane	0.83	59	2.8	200
Carbon Tetrachloride	0.83	Not Detected	5.2	Not Detected
2,2,4-Trimethylpentane	0.83	8.7	3.9	41
Benzene	0.83	12	2.6	39
1,2-Dichloroethane	0.83	Not Detected	3.4	Not Detected
Heptane	0.83	25	3.4	100
Trichloroethene	0.83	1.2	4.5	6.6
1,2-Dichloropropane	0.83	Not Detected	3.8	Not Detected
1,4-Dioxane	3.3	Not Detected	12	Not Detected
Bromodichloromethane	0.83	Not Detected	5.6	Not Detected
cis-1,3-Dichloropropene	0.83	Not Detected	3.8	Not Detected
4-Methyl-2-pentanone	0.83	4.9	3.4	20
Toluene	0.83	48	3.1	180
trans-1,3-Dichloropropene	0.83	Not Detected	3.8	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-5

Lab ID#: 1005416A-06A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051935**	**Date of Collection:**	**5/17/10 11:25:00 AM**
Dil. Factor:	**1.66**	**Date of Analysis:**	**5/20/10 04:42 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,2-Trichloroethane	0.83	Not Detected	4.5	Not Detected
Tetrachloroethene	0.83	Not Detected	5.6	Not Detected
2-Hexanone	3.3	Not Detected	14	Not Detected
Dibromochloromethane	0.83	Not Detected	7.1	Not Detected
1,2-Dibromoethane (EDB)	0.83	Not Detected	6.4	Not Detected
Chlorobenzene	0.83	Not Detected	3.8	Not Detected
Ethyl Benzene	0.83	7.7	3.6	34
m,p-Xylene	0.83	34	3.6	150
o-Xylene	0.83	10	3.6	45
Styrene	0.83	Not Detected	3.5	Not Detected
Bromoform	0.83	Not Detected	8.6	Not Detected
Cumene	0.83	Not Detected	4.1	Not Detected
1,1,2,2-Tetrachloroethane	0.83	Not Detected	5.7	Not Detected
Propylbenzene	0.83	1.5	4.1	7.6
4-Ethyltoluene	0.83	9.6	4.1	47
1,3,5-Trimethylbenzene	0.83	3.4	4.1	17
1,2,4-Trimethylbenzene	0.83	10	4.1	49
1,3-Dichlorobenzene	0.83	Not Detected	5.0	Not Detected
1,4-Dichlorobenzene	0.83	Not Detected	5.0	Not Detected
alpha-Chlorotoluene	0.83	Not Detected	4.3	Not Detected
1,2-Dichlorobenzene	0.83	Not Detected	5.0	Not Detected
1,2,4-Trichlorobenzene	3.3	Not Detected	25	Not Detected
Hexachlorobutadiene	3.3	Not Detected	35	Not Detected
Naphthalene	3.3	Not Detected	17	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	101	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-6

Lab ID#: 1005416A-07A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051933**	**Date of Collection:**	**5/17/10 12:18:00 PM**
Dil. Factor:	**1.58**	**Date of Analysis:**	**5/20/10 02:29 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.79	Not Detected	3.9	Not Detected
Freon 114	0.79	Not Detected	5.5	Not Detected
Chloromethane	3.2	Not Detected	6.5	Not Detected
Vinyl Chloride	0.79	Not Detected	2.0	Not Detected
1,3-Butadiene	0.79	13	1.7	28
Bromomethane	0.79	Not Detected	3.1	Not Detected
Chloroethane	0.79	Not Detected	2.1	Not Detected
Freon 11	0.79	6.1	4.4	34
Ethanol	3.2	67	6.0	130
Freon 113	0.79	Not Detected	6.0	Not Detected
1,1-Dichloroethene	0.79	Not Detected	3.1	Not Detected
Acetone	3.2	45	7.5	110
2-Propanol	3.2	Not Detected	7.8	Not Detected
Carbon Disulfide	0.79	4.3	2.5	13
3-Chloropropene	3.2	Not Detected	9.9	Not Detected
Methylene Chloride	0.79	Not Detected	2.7	Not Detected
Methyl tert-butyl ether	0.79	Not Detected	2.8	Not Detected
trans-1,2-Dichloroethene	0.79	Not Detected	3.1	Not Detected
Hexane	0.79	66	2.8	230
1,1-Dichloroethane	0.79	Not Detected	3.2	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.79	4.0	2.3	12
cis-1,2-Dichloroethene	0.79	Not Detected	3.1	Not Detected
Tetrahydrofuran	0.79	Not Detected	2.3	Not Detected
Chloroform	0.79	1.6	3.8	7.7
1,1,1-Trichloroethane	0.79	15	4.3	82
Cyclohexane	0.79	33	2.7	110
Carbon Tetrachloride	0.79	Not Detected	5.0	Not Detected
2,2,4-Trimethylpentane	0.79	19	3.7	88
Benzene	0.79	11	2.5	36
1,2-Dichloroethane	0.79	Not Detected	3.2	Not Detected
Heptane	0.79	18	3.2	75
Trichloroethene	0.79	1.6	4.2	8.9
1,2-Dichloropropane	0.79	Not Detected	3.6	Not Detected
1,4-Dioxane	3.2	Not Detected	11	Not Detected
Bromodichloromethane	0.79	Not Detected	5.3	Not Detected
cis-1,3-Dichloropropene	0.79	Not Detected	3.6	Not Detected
4-Methyl-2-pentanone	0.79	0.97	3.2	4.0
Toluene	0.79	10	3.0	39
trans-1,3-Dichloropropene	0.79	Not Detected	3.6	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-6

Lab ID#: 1005416A-07A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051933**	**Date of Collection: 5/17/10 12:18:00 PM**	
Dil. Factor:	**1.58**	**Date of Analysis: 5/20/10 02:29 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,2-Trichloroethane	0.79	Not Detected	4.3	Not Detected
Tetrachloroethene	0.79	2.2	5.4	15
2-Hexanone	3.2	Not Detected	13	Not Detected
Dibromochloromethane	0.79	Not Detected	6.7	Not Detected
1,2-Dibromoethane (EDB)	0.79	Not Detected	6.1	Not Detected
Chlorobenzene	0.79	Not Detected	3.6	Not Detected
Ethyl Benzene	0.79	12	3.4	52
m,p-Xylene	0.79	33	3.4	140
o-Xylene	0.79	15	3.4	67
Styrene	0.79	Not Detected	3.4	Not Detected
Bromoform	0.79	Not Detected	8.2	Not Detected
Cumene	0.79	2.3	3.9	11
1,1,2,2-Tetrachloroethane	0.79	Not Detected	5.4	Not Detected
Propylbenzene	0.79	Not Detected	3.9	Not Detected
4-Ethyltoluene	0.79	3.9	3.9	19
1,3,5-Trimethylbenzene	0.79	2.2	3.9	11
1,2,4-Trimethylbenzene	0.79	4.7	3.9	23
1,3-Dichlorobenzene	0.79	Not Detected	4.8	Not Detected
1,4-Dichlorobenzene	0.79	Not Detected	4.8	Not Detected
alpha-Chlorotoluene	0.79	Not Detected	4.1	Not Detected
1,2-Dichlorobenzene	0.79	Not Detected	4.7	Not Detected
1,2,4-Trichlorobenzene	3.2	Not Detected	23	Not Detected
Hexachlorobutadiene	3.2	Not Detected	34	Not Detected
Naphthalene	3.2	Not Detected	16	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	103	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1005416A-08A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051925**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/19/10 09:05 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.50	Not Detected	2.5	Not Detected
Freon 114	0.50	Not Detected	3.5	Not Detected
Chloromethane	2.0	Not Detected	4.1	Not Detected
Vinyl Chloride	0.50	Not Detected	1.3	Not Detected
1,3-Butadiene	0.50	Not Detected	1.1	Not Detected
Bromomethane	0.50	Not Detected	1.9	Not Detected
Chloroethane	0.50	Not Detected	1.3	Not Detected
Freon 11	0.50	Not Detected	2.8	Not Detected
Ethanol	2.0	Not Detected	3.8	Not Detected
Freon 113	0.50	Not Detected	3.8	Not Detected
1,1-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Acetone	2.0	Not Detected	4.8	Not Detected
2-Propanol	2.0	Not Detected	4.9	Not Detected
Carbon Disulfide	0.50	Not Detected	1.6	Not Detected
3-Chloropropene	2.0	Not Detected	6.3	Not Detected
Methylene Chloride	0.50	Not Detected	1.7	Not Detected
Methyl tert-butyl ether	0.50	Not Detected	1.8	Not Detected
trans-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Hexane	0.50	Not Detected	1.8	Not Detected
1,1-Dichloroethane	0.50	Not Detected	2.0	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.50	Not Detected	1.5	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Chloroform	0.50	Not Detected	2.4	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Cyclohexane	0.50	Not Detected	1.7	Not Detected
Carbon Tetrachloride	0.50	Not Detected	3.1	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Benzene	0.50	Not Detected	1.6	Not Detected
1,2-Dichloroethane	0.50	Not Detected	2.0	Not Detected
Heptane	0.50	Not Detected	2.0	Not Detected
Trichloroethene	0.50	Not Detected	2.7	Not Detected
1,2-Dichloropropane	0.50	Not Detected	2.3	Not Detected
1,4-Dioxane	2.0	Not Detected	7.2	Not Detected
Bromodichloromethane	0.50	Not Detected	3.4	Not Detected
cis-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
4-Methyl-2-pentanone	0.50	Not Detected	2.0	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
trans-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1005416A-08A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051925**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/19/10 09:05 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,1,2-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Tetrachloroethene	0.50	Not Detected	3.4	Not Detected
2-Hexanone	2.0	Not Detected	8.2	Not Detected
Dibromochloromethane	0.50	Not Detected	4.2	Not Detected
1,2-Dibromoethane (EDB)	0.50	Not Detected	3.8	Not Detected
Chlorobenzene	0.50	Not Detected	2.3	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
Styrene	0.50	Not Detected	2.1	Not Detected
Bromoform	0.50	Not Detected	5.2	Not Detected
Cumene	0.50	Not Detected	2.4	Not Detected
1,1,2,2-Tetrachloroethane	0.50	Not Detected	3.4	Not Detected
Propylbenzene	0.50	Not Detected	2.4	Not Detected
4-Ethyltoluene	0.50	Not Detected	2.4	Not Detected
1,3,5-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,2,4-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,3-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,4-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
alpha-Chlorotoluene	0.50	Not Detected	2.6	Not Detected
1,2-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,2,4-Trichlorobenzene	2.0	Not Detected	15	Not Detected
Hexachlorobutadiene	2.0	Not Detected	21	Not Detected
Naphthalene	2.0	Not Detected	10	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	95	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1005416A-09A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051922**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/19/10 07:45 PM**	

Compound	%Recovery
Freon 12	122
Freon 114	115
Chloromethane	108
Vinyl Chloride	112
1,3-Butadiene	127
Bromomethane	114
Chloroethane	90
Freon 11	115
Ethanol	99
Freon 113	116
1,1-Dichloroethene	108
Acetone	103
2-Propanol	100
Carbon Disulfide	97
3-Chloropropene	104
Methylene Chloride	111
Methyl tert-butyl ether	118
trans-1,2-Dichloroethene	109
Hexane	109
1,1-Dichloroethane	107
2-Butanone (Methyl Ethyl Ketone)	114
cis-1,2-Dichloroethene	107
Tetrahydrofuran	105
Chloroform	112
1,1,1-Trichloroethane	116
Cyclohexane	112
Carbon Tetrachloride	113
2,2,4-Trimethylpentane	113
Benzene	110
1,2-Dichloroethane	115
Heptane	114
Trichloroethene	110
1,2-Dichloropropane	102
1,4-Dioxane	102
Bromodichloromethane	111
cis-1,3-Dichloropropene	109
4-Methyl-2-pentanone	109
Toluene	108
trans-1,3-Dichloropropene	111

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1005416A-09A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051922**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/19/10 07:45 PM**	

Compound	%Recovery
1,1,2-Trichloroethane	109
Tetrachloroethene	110
2-Hexanone	113
Dibromochloromethane	114
1,2-Dibromoethane (EDB)	111
Chlorobenzene	101
Ethyl Benzene	110
m,p-Xylene	110
o-Xylene	113
Styrene	115
Bromoform	118
Cumene	114
1,1,2,2-Tetrachloroethane	110
Propylbenzene	114
4-Ethyltoluene	114
1,3,5-Trimethylbenzene	116
1,2,4-Trimethylbenzene	115
1,3-Dichlorobenzene	110
1,4-Dichlorobenzene	111
alpha-Chlorotoluene	112
1,2-Dichlorobenzene	111
1,2,4-Trichlorobenzene	99
Hexachlorobutadiene	104
Naphthalene	82

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	104	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1005416A-10A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051923**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/19/10 08:05 PM**	

Compound	%Recovery
Freon 12	104
Freon 114	98
Chloromethane	100
Vinyl Chloride	118
1,3-Butadiene	114
Bromomethane	98
Chloroethane	78
Freon 11	109
Ethanol	81
Freon 113	91
1,1-Dichloroethene	88
Acetone	89
2-Propanol	86
Carbon Disulfide	87
3-Chloropropene	93
Methylene Chloride	93
Methyl tert-butyl ether	104
trans-1,2-Dichloroethene	98
Hexane	99
1,1-Dichloroethane	94
2-Butanone (Methyl Ethyl Ketone)	102
cis-1,2-Dichloroethene	96
Tetrahydrofuran	99
Chloroform	99
1,1,1-Trichloroethane	104
Cyclohexane	104
Carbon Tetrachloride	105
2,2,4-Trimethylpentane	104
Benzene	102
1,2-Dichloroethane	107
Heptane	107
Trichloroethene	112
1,2-Dichloropropane	101
1,4-Dioxane	103
Bromodichloromethane	106
cis-1,3-Dichloropropene	104
4-Methyl-2-pentanone	102
Toluene	99
trans-1,3-Dichloropropene	105

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1005416A-10A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051923**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/19/10 08:05 PM**	

Compound	%Recovery
1,1,2-Trichloroethane	106
Tetrachloroethene	104
2-Hexanone	106
Dibromochloromethane	107
1,2-Dibromoethane (EDB)	108
Chlorobenzene	97
Ethyl Benzene	108
m,p-Xylene	109
o-Xylene	110
Styrene	111
Bromoform	110
Cumene	109
1,1,2,2-Tetrachloroethane	99
Propylbenzene	109
4-Ethyltoluene	112
1,3,5-Trimethylbenzene	116
1,2,4-Trimethylbenzene	115
1,3-Dichlorobenzene	113
1,4-Dichlorobenzene	116
alpha-Chlorotoluene	109
1,2-Dichlorobenzene	117
1,2,4-Trichlorobenzene	100
Hexachlorobutadiene	105
Naphthalene	73

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	105	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	104	70-130

Air Toxics LTD.

CHAIN-OF-CUSTODY RECORD

Sample Transportation Notice
Relinquishing signature on this document indicates that sample is being shipped in compliance with all applicable local, State, Federal, national, and international laws, regulations and ordinances of any kind. Air Toxics Limited assumes no liability with respect to the collection, handling or shipping of these samples. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Air Toxics Limited against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples. D.O.T. Hotline (800) 467-4922

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Project Manager Marie Milani

Collected by: (Print and Sign) Marie Milani / [illegible]

Company Millennium Consulting, LLC Email mmilani@millenvironment.com

Address 620 Contra Costa Blvd #102 City Pleasant Hill State CA Zip 94523

Phone 925-308-6700 Fax 925-308-6708

Project Info:
P.O. #
Project # 16073.2013
Project Name Richmond Harbor Navigation FEA

Turn Around Time:
☐ Normal
☒ Rush 2 day
specify

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested *	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psi)
01A	Harbor ASG-1	34743	5/17/10	1:50 pm	Modified TO-15 APH Fractions (1A) - MTBE	29	5		
	Harbor ASG-1	34743	5/17/10	1:50 pm	Modified ASTM D-1946 (SA) - He only	29	5		
02A	Harbor ASG-2	31137	5/17/10	2:12 pm	Modified TO-15 APH Fractions (1A)	30	5½		
	Harbor ASG-2	31137	5/17/10	2:12 pm	Modified ASTM D-1946 (1A only)	30	5½		
03A	Harbor ASG-3	30838	5/17/10	11:10 am	Modified TO-15 APH Fractions	29	5		
	Harbor ASG-3	30838	5/17/10	11:10 am	Modified ASTM D-1946 (1A)	29	5		
04A	Harbor ASG-3 (Dup)	1619	5/17/10	11:10 am	Modified TO-15 APH Fraction	29	5		
	Harbor ASG-3 (Dup)	1619	5/17/10	11:10 am	Modified ASTM D-1946 (1A) - He only	29	5		
05A	Harbor ASG-4	7610D	5/17/10	9:22 am	Modified TO-15 APH Fraction	30	6		
	Harbor ASG-4	7610D	5/17/10	9:22 am	Modified ASTM D-1946 (1A)	30	6		

Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time
[signature] 5/18/10 9:25	Monica Gregen ATL 5/18/10 928
Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time
Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time

Notes:
* See quote # Q1005157 09 R3 for specific analytes

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	Drop off	—	NA	Good	Yes No None	1005416

Air Toxics LTD.

CHAIN-OF-CUSTODY RECORD

Sample Transportation Notice
Relinquishing signature on this document indicates that sample is being shipped in compliance with all applicable local, State, Federal, national, and international laws, regulations and ordinances of any kind. Air Toxics Limited assumes no liability with respect to the collection, handling or shipping of these samples. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Air Toxics Limited against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples. D.O.T. Hotline (800) 467-4922

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Project Manager Mark Milani

Collected by: (Print and Sign) Mark Milani

Company Millennium Consulting Assoc. Email mmilani@mccenvironmental.com

Address 620 Contra Costa Blvd #102 City Pleasant Hill State CA Zip 94523

Phone 925-808-6700 Fax 925-808-6707

Project Info:
P.O. #
Project # 1609J.20 U Piedmont
Project Name HAVENS RJ PFA

Turn Around Time:
☐ Normal
☒ Rush 2 day specify

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested *	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psi)
06	HAVENS AS6-S	95661	5/17/10	11:35	Modified TO-15 APH Fraction	25	4		
	HAVENS AS6-S	95661	5/17/10	11:35	Modified ASTM D 1946 (HC)	25	4		
07A	HAVENS AS6-6	34255	5/17/10	12:13 pm	Modified TO-15 APH Fraction	30	6		
	HAVENS AS6-6	34255	5/17/10	12:13 pm	Modified ASTM D 1946 (HC)	30	6		

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Mark Milani	5/18/10 9:25 am	Monica Gleeson AIR	5/18/10 0925
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time

Notes:
* See Quote 210051570J RJ for specific Analysis

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	Drop Off		NA	Good	Yes No None	1005416

Form 1293 rev.11

Air Toxics LTD.
Laboratory Services Since 1989

5/20/2010
Mr. Mark Milani
Millennium Consulting Associates (MECA)
620 Contra Costa Blvd.
Suite 102
Pleasant Hill CA 94523

Project Name: Piedmont Havins ES PEA
Project #: 16033.2013
Workorder #: 1005416B

Dear Mr. Mark Milani

The following report includes the data for the above referenced project for sample(s) received on 5/18/2010 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 APH are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kyle Vagadori at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kyle Vagadori
Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1005416B

Work Order Summary

CLIENT:	Mr. Mark Milani Millennium Consulting Associates (MECA) 620 Contra Costa Blvd. Suite 102 Pleasant Hill, CA 94523	**BILL TO:**	Mr. Mark Milani Millennium Consulting Associates (MECA) 620 Contra Costa Blvd. Suite 102
PHONE:	925-808-6700	**P.O. #**	
FAX:	925-808-6708	**PROJECT #**	16033.2013 Piedmont Havins ES PEA
DATE RECEIVED:	05/18/2010	**CONTACT:**	Kyle Vagadori
DATE COMPLETED:	05/20/2010		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	Havins ASG-1	Modified TO-15 APH	6.2 "Hg	5 psi
01B	Havins ASG-1	Modified TO-15 APH	6.2 "Hg	5 psi
02A	Havins ASG-2	Modified TO-15 APH	5.0 "Hg	5 psi
02B	Havins ASG-2	Modified TO-15 APH	5.0 "Hg	5 psi
03A	Havins ASG-3	Modified TO-15 APH	6.6 "Hg	5 psi
03B	Havins ASG-3	Modified TO-15 APH	6.6 "Hg	5 psi
04A	Havins ASG-3 (Dup)	Modified TO-15 APH	6.4 "Hg	5 psi
04AA	Havins ASG-3 (Dup) Lab Duplicate	Modified TO-15 APH	6.4 "Hg	5 psi
04B	Havins ASG-3 (Dup)	Modified TO-15 APH	6.4 "Hg	5 psi
04BB	Havins ASG-3 (Dup) Lab Duplicate	Modified TO-15 APH	6.4 "Hg	5 psi
05A	Havins ASG-4	Modified TO-15 APH	4.2 "Hg	5 psi
05B	Havins ASG-4	Modified TO-15 APH	4.2 "Hg	5 psi
06A	Havins ASG-5	Modified TO-15 APH	5.8 "Hg	5 psi
06B	Havins ASG-5	Modified TO-15 APH	5.8 "Hg	5 psi
07A	Havins ASG-6	Modified TO-15 APH	4.6 "Hg	5 psi
07B	Havins ASG-6	Modified TO-15 APH	4.6 "Hg	5 psi
08A	Lab Blank	Modified TO-15 APH	NA	NA

Continued on next page

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1005416B

Work Order Summary

CLIENT:	Mr. Mark Milani Millennium Consulting Associates (MECA) 620 Contra Costa Blvd. Suite 102 Pleasant Hill, CA 94523	**BILL TO:**	Mr. Mark Milani Millennium Consulting Associates (MECA) 620 Contra Costa Blvd. Suite 102
PHONE:	925-808-6700	**P.O. #**	
FAX:	925-808-6708	**PROJECT #**	16033.2013 Piedmont Havins ES PEA
DATE RECEIVED:	05/18/2010	**CONTACT:**	Kyle Vagadori
DATE COMPLETED:	05/20/2010		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
08B	Lab Blank	Modified TO-15 APH	NA	NA
09A	CCV	Modified TO-15 APH	NA	NA
09B	CCV	Modified TO-15 APH	NA	NA

CERTIFIED BY: Linda D. Frumarx DATE: 05/20/10

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763,
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/10
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
ATL APH Fractions
Millennium Consulting Associates (MECA)
Workorder# 1005416B

Seven 6 Liter Summa Canister (100% Certified) samples were received on May 18, 2010. The laboratory performed analysis via Air Toxics APH (Air- Phase Petroleum Hydrocarbon) methods for the Determination of APH Fractions using GC/MS in the full scan mode. Chromatographic peaks were identified via mass spectrum as either aliphatic or aromatic petroleum hydrocarbons and included in the appropriate range as defined by the method. APH is not a NELAP approved method and as such quality control criteria are estimated.

Aliphatic data is calculated from the Total Ion chromatogram which has been reprocessed in a duplicate file differentiated from the original by the addition of an alphanumeric extension. The Aromatic calculation also uses the information contained in the associated Extracted Ion file.

Hydrocarbon ranges provided under ATL SOP #103 using representative response factors, all data provided as estimated only.

Receiving Notes

The Chain of Custody (COC) information for sample Havens ASG-6 did not match the entry on the sample tag with regard to sample identification. The information on the COC was used to process and report the sample.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: Havins ASG-1

Lab ID#: 1005416B-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	17	34 NJ	55	110 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	17	91 NJ	69	370 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	17	40 NJ	98	230 NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	17	23 NJ	120	160 NJ

Client Sample ID: Havins ASG-1

Lab ID#: 1005416B-01B

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	17	86 NJ	83	420 NJ

Client Sample ID: Havins ASG-2

Lab ID#: 1005416B-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	16	110 NJ	52	360 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	16	230 NJ	66	950 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	16	58 NJ	94	340 NJ

Client Sample ID: Havins ASG-2

Lab ID#: 1005416B-02B

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	16	64 NJ	79	310 NJ

Client Sample ID: Havins ASG-3

Lab ID#: 1005416B-03A

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: Havins ASG-3

Lab ID#: 1005416B-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	17	600 NJ	56	1900 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	17	440 NJ	70	1800 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	17	150 NJ	100	870 NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	17	55 NJ	120	390 NJ

Client Sample ID: Havins ASG-3

Lab ID#: 1005416B-03B

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	17	110 NJ	84	540 NJ

Client Sample ID: Havins ASG-3 (Dup)

Lab ID#: 1005416B-04A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	17	480 NJ	55	1500 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	17	450 NJ	70	1800 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	17	160 NJ	99	940 NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	17	57 NJ	120	400 NJ

Client Sample ID: Havins ASG-3 (Dup) Lab Duplicate

Lab ID#: 1005416B-04AA

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	17	540 NJ	55	1700 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	17	460 NJ	70	1900 NJ

Summary of Detected Compounds
MODIFIED METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: Havins ASG-3 (Dup) Lab Duplicate

Lab ID#: 1005416B-04AA

>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	17	170 NJ	99	990 NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	17	64 NJ	120	450 NJ

Client Sample ID: Havins ASG-3 (Dup)

Lab ID#: 1005416B-04B

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	17	120 NJ	84	580 NJ

Client Sample ID: Havins ASG-3 (Dup) Lab Duplicate

Lab ID#: 1005416B-04BB

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	17	120 NJ	84	580 NJ

Client Sample ID: Havins ASG-4

Lab ID#: 1005416B-05A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	16	110 NJ	50	370 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	16	56 NJ	64	230 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	16	18 NJ	91	110 NJ

Client Sample ID: Havins ASG-4

Lab ID#: 1005416B-05B

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	16	17 NJ	77	84 NJ

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: Havins ASG-5

Lab ID#: 1005416B-06A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	17	420 NJ	54	1300 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	17	590 NJ	68	2400 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	17	140 NJ	97	840 NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	17	66 NJ	120	460 NJ

Client Sample ID: Havins ASG-5

Lab ID#: 1005416B-06B

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	17	88 NJ	82	430 NJ

Client Sample ID: Havins ASG-6

Lab ID#: 1005416B-07A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	16	400 NJ	51	1300 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	16	360 NJ	65	1500 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	16	180 NJ	92	1000 NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	16	88 NJ	110	610 NJ

Client Sample ID: Havins ASG-6

Lab ID#: 1005416B-07B

No Detections Were Found.

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-1

Lab ID#: 1005416B-01A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051926a**	**Date of Collection: 5/17/10 1:50:00 PM**	
Dil. Factor:	**1.69**	**Date of Analysis: 5/19/10 09:42 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	17	34 NJ	55	110 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	17	91 NJ	69	370 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	17	40 NJ	98	230 NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	17	23 NJ	120	160 NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-1

Lab ID#: 1005416B-01B

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051926c**	**Date of Collection: 5/17/10 1:50:00 PM**	
Dil. Factor:	**1.69**	**Date of Analysis: 5/19/10 09:42 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	17	86 NJ	83	420 NJ
>C10-C12 Aromatic Hydrocarbons (ref. to 1,2,4,5-TMB)	17	Not Detected NJ	93	Not Detected NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-2

Lab ID#: 1005416B-02A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051927a**	**Date of Collection:**	**5/17/10 2:12:00 PM**
Dil. Factor:	**1.61**	**Date of Analysis:**	**5/19/10 10:02 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	16	110 NJ	52	360 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	16	230 NJ	66	950 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	16	58 NJ	94	340 NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	16	Not Detected NJ	110	Not Detected NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-2

Lab ID#: 1005416B-02B

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051927c**	**Date of Collection:**	**5/17/10 2:12:00 PM**
Dil. Factor:	**1.61**	**Date of Analysis:**	**5/19/10 10:02 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	16	64 NJ	79	310 NJ
>C10-C12 Aromatic Hydrocarbons (ref. to 1,2,4,5-TMB)	16	Not Detected NJ	88	Not Detected NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-3

Lab ID#: 1005416B-03A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051928a**	**Date of Collection:**	**5/17/10 11:10:00 AM**
Dil. Factor:	**1.72**	**Date of Analysis:**	**5/19/10 10:22 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	17	600 NJ	56	1900 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	17	440 NJ	70	1800 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	17	150 NJ	100	870 NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	17	55 NJ	120	390 NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-3

Lab ID#: 1005416B-03B

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051928c**	**Date of Collection:**	**5/17/10 11:10:00 AM**
Dil. Factor:	**1.72**	**Date of Analysis:**	**5/19/10 10:22 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	17	110 NJ	84	540 NJ
>C10-C12 Aromatic Hydrocarbons (ref. to 1,2,4,5-TMB)	17	Not Detected NJ	94	Not Detected NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-3 (Dup)

Lab ID#: 1005416B-04A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051929a**	**Date of Collection: 5/17/10 11:10:00 AM**	
Dil. Factor:	**1.70**	**Date of Analysis: 5/19/10 10:50 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	17	480 NJ	55	1500 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	17	450 NJ	70	1800 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	17	160 NJ	99	940 NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	17	57 NJ	120	400 NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-3 (Dup) Lab Duplicate

Lab ID#: 1005416B-04AA

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051930a**	**Date of Collection:**	**5/17/10 11:10:00 AM**
Dil. Factor:	**1.70**	**Date of Analysis:**	**5/19/10 11:22 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	17	540 NJ	55	1700 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	17	460 NJ	70	1900 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	17	170 NJ	99	990 NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	17	64 NJ	120	450 NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-3 (Dup)

Lab ID#: 1005416B-04B

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051929c**	**Date of Collection:**	**5/17/10 11:10:00 AM**
Dil. Factor:	**1.70**	**Date of Analysis:**	**5/19/10 10:50 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	17	120 NJ	84	580 NJ
>C10-C12 Aromatic Hydrocarbons (ref. to 1,2,4,5-TMB)	17	Not Detected NJ	93	Not Detected NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-3 (Dup) Lab Duplicate

Lab ID#: 1005416B-04BB

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051930c**	**Date of Collection:**	**5/17/10 11:10:00 AM**
Dil. Factor:	**1.70**	**Date of Analysis:**	**5/19/10 11:22 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	17	120 NJ	84	580 NJ
>C10-C12 Aromatic Hydrocarbons (ref. to 1,2,4,5-TMB)	17	Not Detected NJ	93	Not Detected NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-4

Lab ID#: 1005416B-05A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051931a**	**Date of Collection: 5/17/10 9:22:00 AM**	
Dil. Factor:	**1.56**	**Date of Analysis: 5/20/10 01:41 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	16	110 NJ	50	370 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	16	56 NJ	64	230 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	16	18 NJ	91	110 NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	16	Not Detected NJ	110	Not Detected NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-4

Lab ID#: 1005416B-05B

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051931c**	**Date of Collection:**	**5/17/10 9:22:00 AM**
Dil. Factor:	**1.56**	**Date of Analysis:**	**5/20/10 01:41 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	16	17 NJ	77	84 NJ
>C10-C12 Aromatic Hydrocarbons (ref. to 1,2,4,5-TMB)	16	Not Detected NJ	86	Not Detected NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-5

Lab ID#: 1005416B-06A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051935a**	**Date of Collection: 5/17/10 11:25:00 AM**	
Dil. Factor:	**1.66**	**Date of Analysis: 5/20/10 04:42 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	17	420 NJ	54	1300 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	17	590 NJ	68	2400 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	17	140 NJ	97	840 NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	17	66 NJ	120	460 NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-5

Lab ID#: 1005416B-06B

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051935c**	**Date of Collection:**	**5/17/10 11:25:00 AM**
Dil. Factor:	**1.66**	**Date of Analysis:**	**5/20/10 04:42 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	17	88 NJ	82	430 NJ
>C10-C12 Aromatic Hydrocarbons (ref. to 1,2,4,5-TMB)	17	Not Detected NJ	91	Not Detected NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-6

Lab ID#: 1005416B-07A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051933a**	**Date of Collection:**	**5/17/10 12:18:00 PM**
Dil. Factor:	**1.58**	**Date of Analysis:**	**5/20/10 02:29 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	16	400 NJ	51	1300 NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	16	360 NJ	65	1500 NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	16	180 NJ	92	1000 NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	16	88 NJ	110	610 NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-6

Lab ID#: 1005416B-07B

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051933c**	**Date of Collection: 5/17/10 12:18:00 PM**	
Dil. Factor:	**1.58**	**Date of Analysis: 5/20/10 02:29 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	16	Not Detected NJ	78	Not Detected NJ
>C10-C12 Aromatic Hydrocarbons (ref. to 1,2,4,5-TMB)	16	Not Detected NJ	87	Not Detected NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1005416B-08A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051925a**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/19/10 09:05 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	10	Not Detected NJ	32	Not Detected NJ
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	10	Not Detected NJ	41	Not Detected NJ
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	10	Not Detected NJ	58	Not Detected NJ
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	10	Not Detected NJ	70	Not Detected NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1005416B-08B

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051925c**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/19/10 09:05 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	10	Not Detected NJ	49	Not Detected NJ
>C10-C12 Aromatic Hydrocarbons (ref. to 1,2,4,5-TMB)	10	Not Detected NJ	55	Not Detected NJ

NJ =The identification is based on presumptive evidence; estimated value.

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1005416B-09A

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051914d**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/19/10 03:25 PM**	

Compound	%Recovery
C5-C6 Aliphatic Hydrocarbons (ref. to Pentane + Hexane)	91
>C6-C8 Aliphatic Hydrocarbons (ref. to Heptane)	96
>C8-C10 Aliphatic Hydrocarbons (ref. to Decane)	97
>C10-C12 Aliphatic Hydrocarbons (ref. to Dodecane)	94

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1005416B-09B

MODIFIED METHOD TO-15 GC/MS FULL SCAN

File Name:	**d051914e**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/19/10 03:25 PM**	

Compound	%Recovery
>C8-C10 Aromatic Hydrocarbons (ref. to 1,2,3-TMB)	97
>C10-C12 Aromatic Hydrocarbons (ref. to 1,2,4,5-TMB)	102

Container Type: NA - Not Applicable

Air Toxics LTD.

CHAIN-OF-CUSTODY RECORD

Sample Transportation Notice
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180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Project Manager Mark Milani

Collected by: (Print and Sign) Mark Milani / [signature]

Company McLennan Consulting, Attn: Email mmilani@mclenenviro.com

Address 620 Contr. Costa Blvd #101 City Pleasant Hill State CA Zip 94523

Phone 925-308-6700 Fax 925-308-6708

Project Info:
P.O. #
Project # 16073.2013
Project Name Piedmont Havens Elem PEA

Turn Around Time:
☐ Normal
☒ Rush 2 day
specify

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested *	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psi)
01A	Havens AS6-1	34743	5/17/10	1:50 pm	Modified TO-15 APH Fractions (EP) - MTBE	29	5		
	Havens AS6-1	34743	5/17/10	1:50 pm	Modified ASTM D-1946 (EH) - He only	29	5		
02A	Havens AS6-2	31137	5/17/10	2:12 pm	Modified TO-15 APH Fractions (EP)	30	5½		
	Havens AS6-2	31137	5/17/10	2:12 pm	Modified ASTM D-1946 (EH only)	30	5½		
03A	Havens AS6-3	30838	5/17/10	11:10 am	Modified TO-15 APH Fractions	29	5		
	Havens AS6-3	30838	5/17/10	11:10 am	Modified ASTM D-1946 (EH)	29	5		
04A	Havens AS6-3 (Dup)	1619	5/17/10	11:10 am	Modified TO-15 APH Fraction	29	5		
	Havens AS6-3 (Dup)	1619	5/17/10	11:10 am	Modified ASTM D-1946 (EH) - He only	29	5		
05A	Havens AS6-4	76100	5/17/10	9:22 am	Modified TO-15 APH Fractions	30	6		
	Havens AS6-4	76100	5/17/10	9:22 am	Modified ASTM D-1946 (EH)	30	6		

Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time
[signature] 5/18/10 9:25	Monica Groppen ATL 5/18/10 928
Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time
Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time

Notes:
* See quote # Q1005157 09 R3 for specific analytes

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	Drop off	—	NA	Good	Yes No None	1005416

Form 1293 rev.11

Air Toxics LTD.

CHAIN-OF-CUSTODY RECORD

Sample Transportation Notice
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180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Project Manager Mark Milani

Collected by: (Print and Sign) Mark Milani

Company Millennium Consulting Assoc. Email mmilani@mcaenviro.com

Address 620 Contra Costa Blvd #102 City Pleasant Hill State CA Zip 94523

Phone 925-808-6700 Fax 925-808-6707

Project Info:
P.O. #
Project # 16033.2010 Piedmont
Project Name HAVENS ES PEA

Turn Around Time:
☐ Normal
☒ Rush
2 day
specify

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested *	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psig)
06A	HAVENS AS6-S	95661	5/17/10	11:35	Modified TO-15 APH Program	25	4		
	HAVENS AS6-S	95661	5/17/10	11:35	Modified ASTM D 1946 (HL)	25	4		
07A	HAVENS AS6-6	34255	5/17/10	12:18 pm	Modified TO-15 APH Program	30	6		
	HAVENS AS6-6	34255	5/17/10	12:18 pm	Modified ASTM D 1946 (HL)	30	6		

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Mark Milani	5/18/10 9:25 am	Monica Gregson AIL	5/18/10 9:27
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time

Notes:
* Use Quote 2100515709 RJ for specific Analytes

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	Drop Off		NA	Good	Yes No (None)	100516

Air Toxics LTD.
Laboratory Services Since 1989

5/19/2010
Mr. Mark Milani
Millennium Consulting Associates (MECA)
620 Contra Costa Blvd.
Suite 102
Pleasant Hill CA 94523

Project Name: Piedmont Havins ES PEA
Project #: 16033.2013
Workorder #: 1005416C

Dear Mr. Mark Milani

The following report includes the data for the above referenced project for sample(s) received on 5/18/2010 at Air Toxics Ltd.

The data and associated QC analyzed by Modified ASTM D-1946 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kyle Vagadori at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kyle Vagadori
Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1005416C

Work Order Summary

CLIENT:	Mr. Mark Milani Millennium Consulting Associates (MECA) 620 Contra Costa Blvd. Suite 102 Pleasant Hill, CA 94523	**BILL TO:**	Mr. Mark Milani Millennium Consulting Associates (MECA) 620 Contra Costa Blvd. Suite 102
PHONE:	925-808-6700	**P.O. #**	
FAX:	925-808-6708	**PROJECT #**	16033.2013 Piedmont Havins ES PEA
DATE RECEIVED:	05/18/2010	**CONTACT:**	Kyle Vagadori
DATE COMPLETED:	05/19/2010		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	Havins ASG-1	Modified ASTM D-1946	6.2 "Hg	5 psi
02A	Havins ASG-2	Modified ASTM D-1946	5.0 "Hg	5 psi
02AA	Havins ASG-2 Lab Duplicate	Modified ASTM D-1946	5.0 "Hg	5 psi
03A	Havins ASG-3	Modified ASTM D-1946	6.6 "Hg	5 psi
04A	Havins ASG-3 (Dup)	Modified ASTM D-1946	6.4 "Hg	5 psi
05A	Havins ASG-4	Modified ASTM D-1946	4.2 "Hg	5 psi
06A	Havins ASG-5	Modified ASTM D-1946	5.8 "Hg	5 psi
07A	Havins ASG-6	Modified ASTM D-1946	4.6 "Hg	5 psi
08A	Lab Blank	Modified ASTM D-1946	NA	NA
09A	LCS	Modified ASTM D-1946	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 05/19/10

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763,
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/10
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified ASTM D-1946
Millennium Consulting Associates (MECA)
Workorder# 1005416C

Seven 6 Liter Summa Canister (100% Certified) samples were received on May 18, 2010. The laboratory performed analysis via Modified ASTM Method D-1946 for Helium in air using GC/TCD. The method involves direct injection of 1.0 mL of sample.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	*ASTM D-1946*	*ATL Modifications*
Calibration	A single point calibration is performed using a reference standard closely matching the composition of the unknown.	A 3-point calibration curve is performed. Quantitation is based on a daily calibration standard which may or may not resemble the composition of the associated samples.
Reference Standard	The composition of any reference standard must be known to within 0.01 mol % for any component.	The standards used by ATL are blended to a >/= 95% accuracy.
Sample Injection Volume	Components whose concentrations are in excess of 5 % should not be analyzed by using sample volumes greater than 0.5 mL.	The sample container is connected directly to a fixed volume sample loop of 1.0 mL on the GC. Linear range is defined by the calibration curve. Bags are loaded by vacuum.
Normalization	Normalize the mole percent values by multiplying each value by 100 and dividing by the sum of the original values. The sum of the original values should not differ from 100% by more than 1.0%.	Results are not normalized. The sum of the reported values can differ from 100% by as much as 15%, either due to analytical variability or an unusual sample matrix.
Precision	Precision requirements established at each concentration level.	Duplicates should agree within 25% RPD for detections > 5 X's the RL.

Receiving Notes

The Chain of Custody (COC) information for sample Havens ASG-6 did not match the entry on the sample tag with regard to sample identification. The information on the COC was used to process and report the sample.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:
B - Compound present in laboratory blank greater than reporting limit.
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.
File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

Client Sample ID: Havins ASG-1

Lab ID#: 1005416C-01A

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.084	0.11

Client Sample ID: Havins ASG-2

Lab ID#: 1005416C-02A

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.080	1.7

Client Sample ID: Havins ASG-2 Lab Duplicate

Lab ID#: 1005416C-02AA

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.080	1.7

Client Sample ID: Havins ASG-3

Lab ID#: 1005416C-03A

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.086	1.5

Client Sample ID: Havins ASG-3 (Dup)

Lab ID#: 1005416C-04A

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.085	1.4

Client Sample ID: Havins ASG-4

Lab ID#: 1005416C-05A

No Detections Were Found.

Client Sample ID: Havins ASG-5

Lab ID#: 1005416C-06A

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

Client Sample ID: Havins ASG-5

Lab ID#: 1005416C-06A

No Detections Were Found.

Client Sample ID: Havins ASG-6

Lab ID#: 1005416C-07A

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.079	0.12

Air Toxics LTD.
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Client Sample ID: Havins ASG-1

Lab ID#: 1005416C-01A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**9051832**	**Date of Collection:**	**5/17/10 1:50:00 PM**
Dil. Factor:	**1.69**	**Date of Analysis:**	**5/18/10 09:18 PM**

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.084	0.11

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-2

Lab ID#: 1005416C-02A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**9051833**	**Date of Collection:**	**5/17/10 2:12:00 PM**
Dil. Factor:	**1.61**	**Date of Analysis:**	**5/18/10 09:28 PM**

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.080	1.7

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-2 Lab Duplicate

Lab ID#: 1005416C-02AA

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**9051834**	**Date of Collection:**	**5/17/10 2:12:00 PM**
Dil. Factor:	**1.61**	**Date of Analysis:**	**5/18/10 09:35 PM**

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.080	1.7

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-3

Lab ID#: 1005416C-03A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**9051835**	**Date of Collection:**	**5/17/10 11:10:00 AM**
Dil. Factor:	**1.72**	**Date of Analysis:**	**5/18/10 09:42 PM**

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.086	1.5

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-3 (Dup)

Lab ID#: 1005416C-04A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**9051836**	**Date of Collection:**	**5/17/10 11:10:00 AM**
Dil. Factor:	**1.70**	**Date of Analysis:**	**5/18/10 09:49 PM**

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.085	1.4

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-4

Lab ID#: 1005416C-05A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**9051837**	**Date of Collection: 5/17/10 9:22:00 AM**	
Dil. Factor:	**1.56**	**Date of Analysis: 5/18/10 09:59 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.078	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-5

Lab ID#: 1005416C-06A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**9051838**	**Date of Collection:**	**5/17/10 11:25:00 AM**
Dil. Factor:	**1.66**	**Date of Analysis:**	**5/18/10 10:05 PM**

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.083	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Havins ASG-6

Lab ID#: 1005416C-07A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**9051839**	**Date of Collection:**	**5/17/10 12:18:00 PM**
Dil. Factor:	**1.58**	**Date of Analysis:**	**5/18/10 10:16 PM**

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.079	0.12

Container Type: 6 Liter Summa Canister (100% Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1005416C-08A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**9051828**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/18/10 08:14 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.050	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1005416C-09A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**9051840**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 5/18/10 10:37 PM**	

Compound	%Recovery
Helium	98

Container Type: NA - Not Applicable

Air Toxics LTD.

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FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Project Manager Marie Milani

Collected by: (Print and Sign) Marie Milani / [signature]

Company Millennium Consulting Assoc Email mmilani@millenviro.com

Address 620 Contr. Costa Blvd #162 City Pleasant Hill State CA Zip 94523

Phone 925-308-6748 Fax 925-308-6748

Project Info:
P.O. #
Project # 16073.2013
Project Name Piedmont Having Elem

Turn Around Time:
☐ Normal
☒ Rush 2 day (specify)

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested *	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psig)
01A	Havens ASG-1	34743	5/17/10	1:50 pm	Modified TO-15 A/M Fractions (SIM) - MTBE	29	5		
	Havens ASG-1	34743	5/17/10	1:50 pm	Modified ASTM D-1946 (SIM) - He only	29	5		
02A	Havens ASG-2	31137	5/17/10	2:12 pm	Modified TO-15 A/M Fractions (SIM)	30	5½		
	Havens ASG-2	31137	5/17/10	2:12 pm	Modified ASTM D-1946 (He only)	30	5½		
03A	Havens ASG-3	30838	5/17/10	11:10 am	Modified TO-15 A/M Fractions	29	5		
	Havens ASG-3	30838	5/17/10	11:10 am	Modified ASTM D-1946 (He	29	5		
04A	Havens ASG-3 (Dup)	1619	5/17/10	11:10 am	Modified TO-15 A/M Fraction	29	5		
	Havens ASG-3 (Dup)	1619	5/17/10	11:10 am	Modified ASTM D-1946 (SIM) - He only	29	5		
05A	Havens ASG-4	16100	5/17/10	9:22 am	Modified TO-15 A/M Fractions	30	6		
	Havens ASG-4	16100	5/17/10	9:22 am	Modified ASTM D-1946 (SIM)	30	6		

Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time
[signature] 5/18/10 9:25	Monica Gregson ATL 5/18/10 928
Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time
Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time

Notes:
* See Quote # Q1005157 09 R3 for specific analytes

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	Drop off	—	NA	Good	Yes No (None)	1005416

Form 1293 rev.11

Air Toxics LTD.

CHAIN-OF-CUSTODY RECORD

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(916) 985-1000 FAX (916) 985-1020

Project Manager Mark Milani

Collected by: (Print and Sign) Mark Milani

Company Millennium Consulting Assoc. Email mmilani@mcaenviro.com

Address 620 Contra Costa Blvd #102 City Pleasant Hill State CA Zip 94523

Phone 925-308-6700 Fax 925-308-6707

Project Info:
P.O. #
Project # 1603J.20 U
pinamar
Project Name HAVENS EJ PEA

Turn Around Time:
☐ Normal
☒ Rush
2 day
specify

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested *	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psi)
06A	HAVENS AS6-S	95661	5/17/10	11:35	Modified TO-15 SIM Fraction	25	4		
	HAVENS AS6-S	95661	5/17/10	11:35	Modified ASTM D 1946 (HE)	25	4		
07A	HAVENS AS6-6	34255	5/17/10	12:13 pm	Modified TO-15 SIM Fraction	30	6		
	HAVENS AS6-6	34255	5/17/10	12:13 pm	Modified ASTM D 1946 (HE)	30	6		

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Mark Milani	5/18/10 9:25 am	Monica Gregson ATL	5/18/10 0927
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time

Notes:
* for Quote 210051570 RJ
for specific Analytes

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	Drop Off		NA	Good	Yes No (None)	1005416

Form 1293 rev.11

APPENDIX B

J&E Soil Vapor Intrusion Model Summary Spreadsheets

SG-[illegible]REEN
PA Version 2.0; 04/

Reset to Defaults

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
TPH01	3.70E+03			TPHg-Aliphatic (C5-8)

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152.4	24	SC		

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.63	0.385	0.197	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PR TIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
1.00E-01	1.00E-05	8.00E-01	25	7,000	369.00	508.00	0.0E+00	7.0E-01	81.00

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^v (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
137	0.188	0.299	1.78E-09	0.837	1.49E-09	4,000	3.70E+03	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	8,304	7.63E-01	3.13E+01	1.80E-04	2.58E-03	137

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	3.70E+03	1.25	8.33E+01	2.58E-03	5.00E+03	1.07E+28	4.54E-04	1.68E+00

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	7.0E-01

END

RESUL IEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	2.3E-03

MESSAGE SUMMARY BELOW:

END

VLOOK' 'LES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.745	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02108	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.1E-04	1.1E-03	2.91E+02	?	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.1E+01	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	5.3E-06	3.0E-01	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	**1.1E-05**	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	**2.9E-05**	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	**5.0E+00**	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	**9.7E-05**	0.0E+00	3.18E+02	?	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	**5.0E-03**	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	**1.8E-06**	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	?	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	**7.8E-05**	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	8.8E-05	**3.0E-02**	4.41E+01		?
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	**3.7E-05**	7.0E-02	1.64E+02	?	X
75296	2-Chloropropane	9.14E+00	6.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	495.00	6,286	0.0E+00	1.0E-01	7.85E+01		?
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	**1.6E-06**	7.0E-01	9.90E+01		X
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	**7.0E-02**	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	**1.2E-03**	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.0E-05	4.0E-03	1.13E+02	?	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	802.00	8,322	**1.6E-05**	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	2.0E-06	**6.0E-01**	1.31E+02	?	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	**5.8E-05**	**1.4E-02**	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.59E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	3.5E-03	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.2E-03	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	**3.4E-05**	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	1.4E-02	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		

							VLOOK'	LES									
95578	2-[illegible]rophenol	3.68E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02		3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01		6.14E-03	25	442.30	649.17	9,369	0.0E+00	7.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02		4.08E-04	25	430.00	652.00	9,171	2.0E-03	2.1E-02	1.47E+02	X	X
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03		1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02		8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01		1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01		1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04		1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04		2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01		7.86E-03	25	409.34	617.20	8,501	2.5E-06	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01		2.74E-03	25	418.31	636.00	8,737	0.0E+00	9.0E-01	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02		4.14E-04	25	452.00	685.00	8,773	4.9E-05	1.0E-03	1.27E+02	?	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04		2.37E-05	25	452.00	695.00	11,858	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01		1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01		1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01		7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		?
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02		2.39E-03	25	447.21	684.75	9,271	1.1E-05	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dib	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02		7.41E-04	25	404.60	583.00	8,310	7.1E-05	8.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00		7.34E-02	25	268.60	425.00	5,370	1.7E-04	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03		1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02		9.77E-04	25	356.65	561.00	7,643	2.1E-05	4.0E-01	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03		1.03E-04	25	350.30	519.00	7,786	2.9E-04	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02		5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03		1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01		7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		?
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01		5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00		1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?
108883	Toluene	1.62E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01		6.62E-03	25	383.78	591.79	7,930	0.0E+00	3.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01		3.69E-03	25	404.87	632.40	8,410	0.0E+00	1.0E+00	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01		1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E-01	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01		5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01		1.66E+00	25	341.70	508.00	6,895	0.0E+00	7.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04		1.80E-05	25	451.15	659.79	10,803	7.1E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04		1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02		1.32E-03	25	582.55	825.00	14,447	5.1E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.86E+01	5.81E-02		1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04		1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02		7.81E-04	25	416.14	678.20	5,900	2.7E-05	7.0E-02	2.08E+02	?	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02		2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01		1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01		1.84E-02	25	394.40	620.20	8,288	5.9E-06	3.5E-02	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04		1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04		1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01		1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03		1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01		4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01		9.36E-03	25	320.85	516.5	6717	0.0E+00	6.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03		1.11E-04	25	715.9	969.27	17000	1.1E-04	0.0E+00	2.52E+02	?	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03		9.44E-05	25	714.15	979	16455	1.1E-05	0.0E+00	2.28E+02	?	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03		1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04		1.06E-05	25	596.55	839.36	15000	7.7E-04	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01		3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01		1.77E-02	25	381.15	587.38	7900	1.6E-05	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02		2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02		6.23E-04	25	328.3	497.1	6677.66	2.6E-07	3.0E+00	8.82E+01		
CH4	Methane		2.47E-01	2.43E-05	2.20E+01	2.70E+01		6.58E-01	25	111.75	298	2208			1.60E+01		
TPH01	TPHg-Aliphatic (C5-8)	3.98E+03	1.00E-01	1.00E-05	5.40E+00	5.00E+01		8.00E-01	25	369	508	7000		7.0E-01	8.10E+01		
TPH02	TPHg-Aliphatic (C9-18)	2.51E+05	1.00E-01	1.00E-05	3.40E-02	1.20E+02		1.90E+00	25	473	588.9	7000		3.0E-01	1.30E+02		
TPH03	TPHg-Aromatics (C9-16)	2.51E+03	1.00E-01	1.00E-05	2.50E+01	1.40E-01		1.20E-02	25	473	637	9321		5.0E-02	1.20E+02		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01		1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02		

SG[illegible]REEN
PA Version 2.0; 04/

Reset to Defaults

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
TPH02	1.61E+03			TPHg-Aliphatic (C9-18)

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152.4	24	SC		

MORE

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.63	0.385	0.197	5

MORE

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PR TIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
1.00E-01	1.00E-05	1.90E+00	25	7,000	473.00	568.90	0.0E+00	3.0E-01	130.00

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^v (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
137	0.188	0.299	1.78E-09	0.837	1.49E-09	4,000	1.61E+03	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm-m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	10,729	1.79E+00	7.33E+01	1.80E-04	2.58E-03	137

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	1.61E+03	1.25	8.33E+01	2.58E-03	5.00E+03	1.07E+28	4.54E-04	7.30E-01

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	3.0E-01

END

RESUL iEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	2.3E-03

MESSAGE SUMMARY BELOW:

END

VLOOK LES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.75	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.1E-04	1.1E-03	2.91E+02	?	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.51E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	**3.1E+01**	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	**5.3E-06**	**3.0E-01**	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	**1.1E-05**	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	552.16	7,342	**2.9E-05**	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	**5.0E+00**	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	**9.7E-05**	0.0E+00	3.18E+02	?	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	**5.0E-03**	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	**1.8E-06**	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	?	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	**7.8E-05**	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	8.8E-05	**3.0E-02**	4.41E+01		?
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	**3.7E-05**	7.0E-02	1.64E+02	?	X
75295	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	1.6E-06	**7.0E-01**	9.90E+01		X
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	**7.0E-02**	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	**1.2E-03**	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.0E-05	4.0E-03	1.13E+02	?	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	**1.6E-05**	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	2.0E-06	**6.0E-01**	1.31E+02	?	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	**5.8E-05**	1.4E-02	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	**3.5E-03**	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	**3.2E-03**	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	**3.4E-05**	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	1.4E-02	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		

							VLOOK	LES								
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02		3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01		6.14E-03	25	442.30	649.17	9,359	0.0E+00	7.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02		4.08E-04	25	430.00	652.00	9,171	2.0E-03	2.1E-02	1.47E+02	X	X
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03		1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02		8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01		1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01		1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04		1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04		2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01		7.86E-03	25	409.34	617.20	8,501	2.5E-06	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01		2.74E-03	25	418.31	636.00	8,737	0.0E+00	9.0E-01	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02		4.14E-04	25	452.00	685.00	8,773	4.9E-05	1.0E-03	1.27E+02	?	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04		2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01		1.07E-02	25	432.20	680.00	9,123	0.0E+00	1.4E-01	1.20E+02		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.36E-01		1.31E-02	25	456.46	680.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01		7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		?
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02		2.39E-03	25	447.21	684.75	9,271	1.1E-05	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dib	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02		7.41E-04	25	404.60	583.00	8,310	7.1E-05	8.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00		7.34E-02	25	268.60	425.00	5,370	1.7E-04	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03		1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02		9.77E-04	25	356.65	561.00	7,643	2.1E-05	4.0E-01	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03		1.03E-04	25	350.30	519.00	7,786	2.9E-04	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02		5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03		1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01		7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		?
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01		5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00		1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01		6.62E-03	25	383.78	591.79	7,930	0.0E+00	3.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01		3.69E-03	25	404.87	632.40	8,410	0.0E+00	1.0E+00	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01		1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E-01	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01		5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01		1.66E+00	25	341.70	508.00	6,895	0.0E+00	7.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04		1.80E-05	25	451.15	659.79	10,803	7.1E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04		1.12E-05	25	574.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02		1.32E-03	25	582.55	825.00	14,447	5.1E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02		1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04		1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02		7.81E-04	25	416.14	678.20	5,900	2.7E-05	7.0E-02	2.08E+02	?	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02		2.46E-04	25	383.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01		1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01		1.84E-02	25	394.40	620.20	8,288	5.9E-06	3.5E-02	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04		1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04		1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01		1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03		1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01		4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01		9.36E-03	25	320.85	516.5	6717	0.0E+00	6.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03		1.11E-04	25	715.9	969.27	17000	1.1E-04	0.0E+00	2.52E+02	?	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03		9.44E-05	25	714.15	979	16455	1.1E-05	0.0E+00	2.28E+02	?	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03		1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04		1.06E-05	25	596.55	839.36	15000	7.7E-04	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01		3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01		1.77E-02	25	381.15	587.38	7900	1.6E-05	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02		2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02		6.23E-04	25	328.3	497.1	6677.66	2.6E-07	3.0E+00	8.82E+01		
CH4	Methane		2.47E-01	2.43E-05	2.20E+01	2.70E+01		6.58E-01	25	111.75	298	2208			1.60E+01		
TPH01	TPHg-Aliphatic (C5-8)	3.98E+03	1.00E-01	1.00E-05	5.40E+00	5.00E+01		8.00E-01	25	369	508	7000		7.0E-01	8.10E+01		
TPH02	TPHg-Aliphatic (C9-18)	2.51E+05	1.00E-01	1.00E-05	3.40E-02	1.20E+02		1.90E+00	25	473	568.9	7000		3.0E-01	1.30E+02		
TPH03	TPHg-Aromatics (C9-16)	2.51E+03	1.00E-01	1.00E-05	2.50E+01	1.40E-01		1.20E-02	25	473	637	9321		5.0E-02	1.20E+02		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01		1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02		

SG REEN
PA Version 2.0; 04/

Reset to Defaults

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
TPH03	5.80E+02			TPHg-Aromatics (C9-16)

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152.4	24	SC		

MORE

Lookup Soil Parameters

ENTER Vandose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.63	0.385	0.197	5

MORE

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PR(TIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
1.00E-01	1.00E-05	1.20E-02	25	9,321	473.00	637.00	0.0E+00	5.0E-02	120.00

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
137	0.188	0.299	1.78E-09	0.837	1.49E-09	4,000	5.80E+02	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm-m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	12,566	1.12E-02	4.58E-01	1.80E-04	2.58E-03	137

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	5.80E+02	1.25	8.33E+01	2.58E-03	5.00E+03	1.05E+28	4.54E-04	2.63E-01

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	5.0E-02

END

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	5.0E-03

MESSAGE SUMMARY BELOW:

END

VLOOK LES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.48	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02		
57749	Chlordane	1.20E+05	1.16E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.1E-04	1.1E-03	2.91E+02	?	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	**3.1E+01**	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	5.3E-06	**3.0E-01**	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	456.00	695.00	9,510	**1.1E-05**	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	**2.9E-05**	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	5.0E+00	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	**9.7E-05**	0.0E+00	3.18E+02	?	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	**5.0E-03**	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.8E-06	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	?	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	**7.8E-05**	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	8.8E-05	**3.0E-02**	4.41E+01		?
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	**3.7E-05**	7.0E-02	1.64E+02	?	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,695	**1.6E-06**	**7.0E-01**	9.90E+01		X
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	**7.0E-02**	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.2E-03	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.0E-05	4.0E-03	1.13E+02	?	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	**1.6E-05**	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	2.0E-06	**6.0E-01**	1.31E+02	?	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	**5.8E-05**	1.4E-02	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	3.5E-03	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.2E-03	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	3.4E-05	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	1.4E-02	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		

VLOOK LES

95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02		3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01		6.14E-03	25	442.30	649.17	9,369	0.0E+00	7.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02		4.08E-04	25	430.00	652.00	9,171	2.0E-03	2.1E-02	1.47E+02	X	X
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03		1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02		8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.85E-02	8.02E-06	2.95E+01	4.87E-01		1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01		1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	6.73E-06	6.13E+03	4.38E-04		1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.50E-02	8.60E-06	2.09E+03	9.62E-04		2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01		7.86E-03	25	409.34	617.20	8,501	2.5E-06	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01		2.74E-03	25	418.31	636.00	8,737	0.0E+00	9.0E-01	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02		4.14E-04	25	452.00	685.00	8,773	4.9E-05	1.0E-03	1.27E+02	?	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04		2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01		1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01		1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01		7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		?
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02		2.39E-03	25	447.21	684.75	9,271	1.1E-05	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dib	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02		7.41E-04	25	404.60	583.00	8,310	7.1E-05	8.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00		7.34E-02	25	268.60	425.00	5,370	1.7E-04	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03		1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02		9.77E-04	25	356.65	561.00	7,643	2.1E-05	4.0E-01	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03		1.03E-04	25	350.30	519.00	7,786	2.9E-04	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02		5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03		1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01		7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		?
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01		5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00		1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01		6.62E-03	25	383.78	591.79	7,930	0.0E+00	3.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01		3.69E-03	25	404.87	632.40	8,410	0.0E+00	1.0E+00	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01		1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E-01	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01		5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01		1.66E+00	25	341.70	508.00	6,895	0.0E+00	7.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04		1.80E-05	25	451.15	659.79	10,803	7.1E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04		1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02		1.32E-03	25	582.55	825.00	14,447	5.1E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02		1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04		1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02		7.81E-04	25	416.14	678.20	5,900	2.7E-05	7.0E-02	2.08E+02	?	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02		2.46E-04	25	383.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01		1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01		1.84E-02	25	394.40	620.20	8,288	5.9E-06	3.5E-02	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04		1.10E-05	25	687.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04		1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01		1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03		1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01		4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01		9.36E-03	25	320.85	516.5	6717	0.0E+00	6.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03		1.11E-04	25	715.9	969.27	17000	1.1E-04	0.0E+00	2.52E+02	?	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03		9.44E-05	25	714.15	979	16455	1.1E-05	0.0E+00	2.28E+02	?	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03		1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04		1.06E-05	25	596.55	839.36	15000	7.7E-04	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01		3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01		1.77E-02	25	381.15	587.38	7900	1.6E-05	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02		2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02		6.23E-04	25	328.3	497.1	6677.66	2.6E-07	3.0E+00	8.82E+01		
CH4	Methane		2.47E-01	2.43E-05	2.20E+01	2.70E+01		6.58E-01	25	111.75	298	2208			1.60E+01		
TPH01	TPHg-Aliphatic (C5-8)	3.98E+03	1.00E-01	1.00E-05	5.40E+00	5.00E+01		8.00E-01	25	369	508	7000		7.0E-01	8.10E+01		
TPH02	TPHg-Aliphatic (C9-18)	2.51E+05	1.00E-01	1.00E-05	3.40E-02	1.20E+02		1.90E+00	25	473	568.9	7000		3.0E-01	1.30E+02		
TPH03	TPHg-Aromatics (C9-16)	2.51E+03	1.00E-01	1.00E-05	2.50E+01	1.40E-01		1.20E-02	25	473	637	9321		5.0E-02	1.20E+02		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01		1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02		

SG-SCREEN
PA Version 2.0; 04/

Reset to Defaults

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
71432	4.90E+01			Benzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152.4	24	SC		

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.5	0.43	0.15	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PR CTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
8.80E-02	9.80E-06	5.54E-03	25	7,342	353.24	562.16	2.9E-05	3.0E-02	78.11

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
137.4	0.280	0.105	1.78E-09	0.946	1.69E-09	4,000	4.90E+01	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	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)
1.00E+06	5.00E-03	15	7,977	5.29E-03	2.17E-01	1.80E-04	6.86E-03	137.4

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	4.90E+01	1.25	8.33E+01	6.86E-03	5.00E+03	3.50E+10	9.22E-04	4.52E-02

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.9E-05	3.0E-02

END

RESUL IEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
5.4E-07	1.4E-03

MESSAGE SUMMARY BELOW:

END

VLOO' LES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.90	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.52	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0048	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00508	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD) Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	4.2E-05	4.0E-02	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	3.4E-04	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.1E-04	1.1E-03	2.91E+02	?	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.65E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.1E+01	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	8,988	5.3E-06	3.0E-01	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.58E-01	3.88E-03	25	458.00	695.00	9,510	1.1E-05	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	2.9E-05	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	5.0E+00	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	638.44	860.38	15,000	9.7E-05	0.0E+00	3.18E+02	?	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.8E-06	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.60E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	?	
75014	Vinyl chloride (chloroethene)	1.85E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	7.8E-05	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.05E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.7E-06	9.0E-03	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	1.0E-06	4.0E-01	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	8.8E-05	3.0E-02	4.41E+01		?
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	3.7E-05	7.0E-02	1.64E+02	?	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	1.6E-06	7.0E-01	9.90E+01		X
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	7.0E-02	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.02E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+05	1.12E-02	5.68E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.2E-03	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.0E-05	4.0E-03	1.13E+02	?	
78933	Methylethylketone (2-butanone)	2.30E+00	8.06E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	2.0E-06	6.0E-01	1.31E+02	?	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	1.4E-02	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	488.15	738.00	10,206	2.2E-05	3.5E-03	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.67E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.2E-03	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	3.4E-05	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	1.4E-02	1.42E+02		X
92524	Biphenyl	4.36E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	788.00	10,880	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	7.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	2.0E-03	2.1E-02	1.47E+02	X	X
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.39E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,588	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	2.5E-06	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	9,737	0.0E+00	9.0E-01	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	9,773	4.9E-05	1.0E-03	1.27E+02	?	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X

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104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		?
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	1.1E-05	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,319	7.1E-05	8.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.48E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	1.7E-04	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,843	2.1E-05	4.0E-01	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	2.9E-04	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	346.85	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2-	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.84E-03	1.39E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		?
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?
108883	Toluene	1.62E+02	8.70E-02	8.50E-06	5.25E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	3.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	1.0E+00	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.80	542.00	7,263	0.0E+00	1.4E-01	9.26E+01		X
110009	Furan	1.88E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	7.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.38E-04	1.80E-05	25	451.15	659.79	10,803	7.1E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	574.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	925.00	14,447	5.1E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	566.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.7E-05	7.0E-02	2.08E+02	?	X
126987	Methacrylonitrile	3.56E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.80	564.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropn	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	3.5E-02	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	550	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.84E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	6.03E+04	5.84E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.85	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	6.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	989.27	17000	1.1E-04	0.0E+00	2.52E+02	?	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	1.1E-05	0.0E+00	2.28E+02	?	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.65	839.36	15000	7.7E-04	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.96E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	664	9230.16	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.36	7900	1.6E-05	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.18E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.66E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	2.6E-07	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02		

SG-SCREEN
PA Version 2.0; 04/

Reset to Defaults

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
100414	5.20E+01			Ethylbenzene

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152.4	24	SC		

MORE

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.5	0.43	0.15	5

MORE

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PR TIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.50E-02	7.80E-06	7.86E-03	25	8,501	409.34	617.20	2.5E-06	1.0E+00	106.17

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
137.4	0.280	0.105	1.78E-09	0.946	1.69E-09	4,000	5.20E+01	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm\text{-}m^3/mol$)	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)
1.00E+06	5.00E-03	15	9,994	7.43E-03	3.05E-01	1.80E-04	5.85E-03	137.4

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	5.20E+01	1.25	8.33E+01	5.85E-03	5.00E+03	2.36E+12	8.32E-04	4.32E-02

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.5E-06	1.0E+00

END

RESUL EET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.4E-08	4.1E-05

MESSAGE SUMMARY BELOW:

END

VLOOK ES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_f (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.075	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.52	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0038	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0058	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.160	Silt Loam
SL	1.60	0.02667	1.448	0.3099	0.397	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	**7.0E-04**	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	**3.1E-04**	**1.1E-03**	2.91E+02	?	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,398	**0.0E+00**	**7.0E-01**	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	**1.8E-04**	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.67E-05	25	329.20	508.10	6,955	**0.0E+00**	**3.1E+01**	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	**5.3E-06**	**3.0E-01**	1.19E+02		
67721	Hexachloroethane	1.76E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	**1.1E-05**	**3.5E-03**	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	**2.9E-05**	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,135	**0.0E+00**	**5.0E+00**	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	**0.0E+00**	1.8E-02	3.45E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	**9.7E-05**	**0.0E+00**	3.18E+02	?	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	**0.0E+00**	**5.0E-03**	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	**1.8E-06**	**9.0E-02**	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,878	**0.0E+00**	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	9.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	**0.0E+00**	**3.5E-02**	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	**8.3E-07**	**1.0E+01**	6.45E+01	?	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	**7.8E-05**	**1.0E-01**	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.68E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	**0.0E+00**	**6.0E-02**	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	**0.0E+00**	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	**8.8E-05**	**3.0E-02**	4.41E+01		?
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	**1.1E-06**	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.05E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	**3.7E-05**	7.0E-02	1.64E+02	?	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	**0.0E+00**	1.0E-01	7.95E+01		?
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	**1.6E-06**	**7.0E-01**	9.90E+01		X
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.26E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	**0.0E+00**	**7.0E-02**	9.69E+01		
75456	Chlorodifluoromethane	4.78E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	**0.0E+00**	**5.0E+01**	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.88E-02	25	296.70	471.00	5,999	**0.0E+00**	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	8.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	**0.0E+00**	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	**0.0E+00**	**3.0E+01**	1.87E+02		
76448	Heptachlor	1.41E+05	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	**1.3E-03**	**1.8E-03**	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	**0.0E+00**	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	**0.0E+00**	**1.1E+00**	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	**1.0E-05**	4.0E-03	1.13E+02	?	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	**0.0E+00**	**5.0E+00**	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	**1.6E-05**	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.38	544.20	7,505	**2.0E-06**	**6.0E-01**	1.31E+02	?	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	**0.0E+00**	**3.5E+00**	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,995	**5.8E-05**	**1.4E-02**	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	**2.7E-03**	**2.0E-02**	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	**0.0E+00**	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	**0.0E+00**	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	**0.0E+00**	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,208	**2.2E-05**	**3.5E-03**	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	**0.0E+00**	**3.2E-03**	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	**3.4E-05**	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	**0.0E+00**	**1.4E-02**	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,880	**0.0E+00**	**1.8E-01**	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	**0.0E+00**	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	**0.0E+00**	2.0E-01	1.47E+02		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	**0.0E+00**	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,389	**0.0E+00**	7.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	**2.0E-03**	**2.1E-02**	1.47E+02	X	X
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	**0.0E+00**	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	**0.0E+00**	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	**0.0E+00**	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	**0.0E+00**	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	**0.0E+00**	3.5E-01	1.20E+02		X
98953	Nitrobenzene	5.45E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,556	**0.0E+00**	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.88E-03	25	409.34	617.20	8,501	**2.5E-06**	1.0E+00	1.06E+02		
100425	Styrene	7.78E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	**0.0E+00**	**9.0E-01**	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	**4.9E-05**	**1.0E-03**	1.27E+02	?	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	**0.0E+00**	**3.5E-01**	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	**0.0E+00**	**1.4E-01**	1.20E+02		X

							VLOOK	SS								
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.39E-01	1.51E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		?
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	1.1E-05	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dibr	2.60E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	7.1E-05	8.0E-04	1.68E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.80	425.00	5,370	1.7E-04	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.1E-05	4.0E-01	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	2.9E-04	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.85	515.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.05E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.90E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		?
108678	1,3,5-Trimethylbenzene	1.35E+03	8.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.62E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	3.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	1.0E+00	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E-01	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	7.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.75	10,803	7.1E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	5.1E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.7E-05	7.0E-02	2.08E+02	?	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	3.5E-02	1.55E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	8.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.28	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	6.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	1.1E-04	0.0E+00	2.52E+02	?	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.67E-03	9.44E-05	25	714.15	979	16455	1.1E-05	0.0E+00	2.28E+02	?	
309002	Aldrin	2.45E+05	1.32E-02	4.66E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.08E-05	25	598.55	839.36	15000	7.7E-04	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.66E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	1.6E-05	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9799.282525	7.4E-06	1.1E-01	1.66E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	2.9E-07	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02		

SG[illegible]REEN
PA Version 2.0; 04/

Reset to Defaults

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108883	1.80E+02			Toluene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152.4	24	SC		

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.5	0.43	0.15	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PR .TIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
8.70E-02	8.60E-06	6.62E-03	25	7,930	383.78	591.79	0.0E+00	3.0E-01	92.14

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^v (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
137.4	0.280	0.105	1.78E-09	0.946	1.69E-09	4,000	1.80E+02	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm-m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	9,001	6.29E-03	2.58E-01	1.80E-04	6.79E-03	137.4

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	1.80E+02	1.25	8.33E+01	6.79E-03	5.00E+03	4.63E+10	9.15E-04	1.65E-01

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	3.0E-01

END

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	5.3E-04

MESSAGE SUMMARY BELOW:

END

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Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.188	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.36	0.03475	1.746	0.4279	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.76	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.083	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0045	1.35	0.187	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.218	Silty Clay
SICL	0.48	0.00839	1.521	0.3425	0.482	0.090	0.0059	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.662	0.3987	0.439	0.065	0.011	1.49	0.160	Silt Loam
SL	1.90	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H ($atm-m^3/mol$)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	598.55	839.36	15,000	**3.1E-04**	1.1E-03	2.91E+02	?	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.60E+04	1.35E+00	3.29E-02	25	307.50	466.74	5,338	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	**3.1E+01**	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	8,988	**5.3E-06**	**3.0E-01**	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	**1.1E-05**	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	**2.9E-05**	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	**5.0E+00**	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	850.36	15,000	**9.7E-05**	0.0E+00	3.18E+02	?	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	**5.0E-03**	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	**1.8E-06**	**9.0E-02**	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,978	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	9.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	**9.3E-07**	1.0E+01	6.45E+01	?	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	**7.8E-05**	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.95E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	**8.8E-05**	**3.0E-02**	4.41E+01		?
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	**1.1E-05**	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.86	7,800	**3.7E-05**	7.0E-02	1.64E+02	?	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	**1.6E-05**	**7.0E-01**	9.90E+01		X
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	**7.0E-02**	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,838	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,899	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	8.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	5,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,493	0.0E+00	3.0E+01	1.67E+02		
76448	Heptachlor	1.41E+05	1.12E-02	5.59E-06	1.80E-01	6.05E+01	1.48E+00	25	503.69	846.31	13,000	**1.2E-03**	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,935	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	**1.0E-05**	4.0E-03	1.13E+02	?	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	**1.6E-05**	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	**2.0E-06**	**6.0E-01**	1.31E+02	?	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	8.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,998	**5.8E-05**	1.4E-02	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	3.5E-03	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.2E-03	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	**3.4E-05**	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	1.4E-02	1.42E+02		X
92524	Biphenyl	4.36E+03	4.04E-02	8.16E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	7.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	2.0E-03	2.1E-02	1.47E+02	X	X
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.66E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	8.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	**2.5E-06**	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	**9.0E-01**	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	9,773	**4.9E-05**	1.0E-03	1.27E+02	?	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,656	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.63E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X

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104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01		1.31E-02	25	466.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01		7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.08E+02		?
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.92E-02		2.39E-03	25	447.21	684.75	9,271	1.1E-05	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02		7.41E-04	25	404.60	583.00	8,310	7.1E-05	8.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00		7.34E-02	25	266.50	425.00	5,370	1.7E-04	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03		1.22E-04	25	325.80	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02		9.77E-04	25	356.85	561.00	7,643	2.1E-05	4.0E-01	9.90E+01		
107131	Acrylonitrile	5.80E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03		1.03E-04	25	350.30	519.00	7,786	2.9E-04	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02		5.10E-04	25	345.85	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03		1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01		7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		?
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	6.67E-06	2.00E+00	2.41E-01		5.87E-03	25	437.88	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00		1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01		6.62E-03	25	383.78	591.79	7,930	0.0E+00	3.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01		3.68E-03	25	404.87	632.40	8,410	0.0E+00	1.0E+00	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01		1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E-01	9.26E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01		5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01		1.66E+00	25	341.70	508.00	6,895	0.0E+00	7.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04		1.80E-05	25	451.15	669.79	10,803	7.1E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04		1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.60E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02		1.32E-03	25	582.55	826.00	14,447	5.1E-04	2.9E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.76E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02		1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.62E+00	9.58E-02	1.07E-05	3.69E+04	7.99E-04		1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02		7.81E-04	25	416.14	678.20	5,900	2.7E-05	7.0E-02	2.09E+02	?	X
126987	Methacrylonitrile	3.56E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02		2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01		1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01		1.84E-02	25	394.40	620.20	8,288	5.9E-06	3.5E-02	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04		1.10E-05	25	667.96	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04		1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.84E+00	5.68E-01		1.39E-02	25	446.6	679	68730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03		1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01		4.07E-03	25	333.85	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01		9.38E-03	25	320.85	516.5	5717	0.0E+00	6.0E-02	6.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03		1.11E-04	25	715.9	969.27	17000	1.1E-04	0.0E+00	2.52E+02	?	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03		9.44E-05	25	714.15	979	16456	1.1E-05	0.0E+00	2.28E+02	?	
309002	Aldrin	2.45E+06	1.32E-02	4.85E-06	1.70E-02	6.95E-03		1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04		1.06E-05	25	586.55	839.36	15000	7.7E-04	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01		3.09E-03	25	446	684	9230.16	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	8.26E-02	1.00E-05	2.80E+03	7.24E-01		1.77E-02	25	361.15	567.38	7900	1.6E-05	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02		2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.58E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.59E-02		6.23E-04	25	328.3	497.1	6877.66	2.6E-07	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01		1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02		

SG-[illegible]REEN
PA Version 2.0; 04/

Reset to Defaults

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108383	1.80E+02			m-Xylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152.4	24	SC		

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.5	0.43	0.15	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PR TIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.00E-02	7.80E-06	7.32E-03	25	8,523	412.27	617.05	0.0E+00	1.0E-01	106.17

END

INTERMEDIATE C/ ATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^v (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
137.4	0.280	0.105	1.78E-09	0.946	1.69E-09	4,000	1.80E+02	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	10,090	6.91E-03	2.84E-01	1.80E-04	5.46E-03	137.4

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	1.80E+02	1.25	8.33E+01	5.46E-03	5.00E+03	1.80E+13	7.94E-04	1.43E-01

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

END

RESUL EET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	1.4E-03

MESSAGE SUMMARY BELOW:

END

VLOOI _ES

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.81	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.748	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.376	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00656	1.679	0.4044	0.489	0.050	0.0048	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.45	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.78	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02657	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table — CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.80	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.97E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	**7.0E-04**	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	**3.1E-04**	**1.1E-03**	2.91E+02	?	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	**0.0E+00**	**7.0E-01**	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	**1.8E-04**	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	**0.0E+00**	**3.1E+01**	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	**5.3E-06**	**3.0E-01**	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	**1.1E-05**	**3.5E-03**	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	**2.9E-05**	**3.0E-02**	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	**0.0E+00**	**5.0E+00**	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	**0.0E+00**	**1.8E-02**	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	880.38	15,000	**9.7E-05**	**0.0E+00**	3.18E+02	?	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.66E-01	5.22E-03	25	276.71	467.00	5,714	**0.0E+00**	**5.0E-03**	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.60E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	**1.8E-06**	**9.0E-02**	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	**0.0E+00**	**3.0E-03**	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	**0.0E+00**	**3.5E-02**	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.88E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	**8.3E-07**	**1.0E+01**	6.45E+01	?	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	**7.8E-05**	**1.0E-01**	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.65E-05	1.00E+06	1.42E-03	3.45E-05	25	354.50	545.50	7,110	**0.0E+00**	**6.0E-02**	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	**0.0E+00**	**7.0E-01**	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	**8.8E-05**	**3.0E-02**	4.41E+01		?
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	**1.1E-06**	**7.0E-02**	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	383.15	585.85	7,800	**3.7E-05**	**7.0E-02**	1.64E+02	?	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	**0.0E+00**	**1.0E-01**	7.85E+01		?
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	**1.6E-06**	**7.0E-01**	9.90E+01		X
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	**0.0E+00**	**7.0E-02**	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	**0.0E+00**	**5.0E+01**	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	**0.0E+00**	**7.0E-01**	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	**0.0E+00**	**2.0E-01**	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	**0.0E+00**	**3.0E+01**	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	503.69	846.31	13,000	**1.2E-03**	**1.8E-03**	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	**0.0E+00**	**2.0E-04**	2.73E+02		
78831	Isobutanol	2.59E+00	8.80E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	**0.0E+00**	**1.1E+00**	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	**1.0E-05**	**4.0E-03**	1.13E+02	?	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.28E-03	5.58E-05	25	352.50	536.78	7,481	**0.0E+00**	**5.0E+00**	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	**1.6E-05**	**1.4E-02**	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,905	**2.0E-06**	**6.0E-01**	1.31E+02	?	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	508.70	7,280	**0.0E+00**	**3.5E+00**	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.98E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,998	**5.8E-05**	**1.4E-02**	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	**2.7E-03**	**2.0E-02**	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.80E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	**0.0E+00**	**7.0E-01**	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	**0.0E+00**	**2.1E-01**	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	**0.0E+00**	**1.4E-01**	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	**2.2E-05**	**3.5E-03**	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	**0.0E+00**	**3.2E-03**	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	**3.4E-05**	**3.0E-03**	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	**0.0E+00**	**1.4E-02**	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	**0.0E+00**	**1.8E-01**	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	**0.0E+00**	**1.0E-01**	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	**0.0E+00**	**2.0E-01**	1.47E+02		
95578	2-Chlorophenol	3.88E+02	6.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	**0.0E+00**	**1.8E-02**	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.05E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	**0.0E+00**	**7.0E-03**	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.80E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	**2.0E-03**	**2.1E-02**	1.47E+02	X	X
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	**0.0E+00**	**1.1E-01**	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.87E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	**0.0E+00**	**3.2E-01**	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.85E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	**0.0E+00**	**1.4E-01**	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	**0.0E+00**	**4.0E-01**	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	**0.0E+00**	**3.5E-01**	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,555	**0.0E+00**	**2.0E-03**	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.85E-03	25	409.34	617.20	8,501	**2.5E-06**	**1.0E+00**	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	**0.0E+00**	**9.0E-01**	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	**4.9E-05**	**1.0E-03**	1.27E+02	?	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	8.73E-04	2.37E-05	25	452.00	695.00	11,658	**0.0E+00**	**3.5E-01**	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	**0.0E+00**	**1.4E-01**	1.20E+02		X

							VLOOI	LES								
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.39E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.05E+02		?
106467	1,4-Dichlorobenzene	8.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	1.1E-05	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	7.1E-05	8.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.48E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	1.7E-04	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	9.52E+03	4.00E-02	9.77E-04	25	355.65	561.00	7,643	2.1E-05	4.0E-01	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	2.9E-04	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2-	9.08E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		?
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	3.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	1.0E+00	1.13E+02		
109993	1-Chlorobutane	1.72E+01	8.28E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,268	0.0E+00	1.4E-01	9.28E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	7.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	669.79	10,803	7.1E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	5.1E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.7E-05	7.0E-02	2.08E+02	?	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,500	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropre	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.81E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.65E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	3.5E-02	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.16E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.68E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.84E-03	1.38E-04	25	350.28	523.3	7833.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.55	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	6.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	1.1E-04	0.0E+00	2.52E+02	?	
218019	Chrysene	3.98E+05	2.48E-02	5.21E-06	6.30E-03	3.97E-03	9.44E-05	25	714.15	979	16455	1.1E-05	0.0E+00	2.28E+02	?	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	5.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	598.55	839.36	15000	7.7E-04	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.88E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	1.6E-05	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.88E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	2.6E-07	3.0E+00	8.62E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02		

SG-[illegible]REEN
PA Version 2.0; 04/

Reset to Defaults

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
95476	6.70E+01			o-Xylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152.4	24	SC		

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.5	0.43	0.15	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PR TIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
8.70E-02	1.00E-05	5.18E-03	25	8,661	417.60	630.30	0.0E+00	1.0E-01	106.17

END

INTERMEDIATE C. .ATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
137.4	0.280	0.105	1.78E-09	0.946	1.69E-09	4,000	6.70E+01	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm-m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	10,245	4.88E-03	2.00E-01	1.80E-04	6.79E-03	137.4

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	6.70E+01	1.25	8.33E+01	6.79E-03	5.00E+03	4.63E+10	9.15E-04	6.13E-02

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

END

RESUL IEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	5.9E-04

MESSAGE SUMMARY BELOW:

END

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01495	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2939	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.76	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CalEPA Toxicity Criteria in bold (last updated 2/4/08 DTSC/HERD)

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.98E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	**7.0E-04**	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	**3.1E-04**	**1.1E-03**	2.91E+02	?	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	**0.0E+00**	**7.0E-01**	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.19E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	**1.8E-04**	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	**0.0E+00**	**3.1E+01**	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	**5.3E-06**	**3.0E-01**	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	**1.1E-05**	**3.5E-03**	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	**2.9E-05**	**3.0E-02**	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	**0.0E+00**	**5.0E+00**	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	**0.0E+00**	**1.8E-02**	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	638.44	860.38	15,000	**9.7E-05**	**0.0E+00**	3.18E+02	?	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	**0.0E+00**	**5.0E-03**	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	**1.8E-06**	**9.0E-02**	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	298.00	456.70	5,676	**0.0E+00**	**3.0E-03**	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,666	**0.0E+00**	**3.5E-02**	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	**8.3E-07**	**1.0E+01**	6.45E+01	?	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	**7.8E-05**	**1.0E-01**	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.65E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	**0.0E+00**	**6.0E-02**	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.98E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	**0.0E+00**	**7.0E-01**	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	5,104	**8.8E-05**	**3.0E-02**	4.41E+01		?
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	**1.1E-06**	**7.0E-02**	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.05E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	**3.7E-05**	**7.0E-02**	1.64E+02	?	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	**0.0E+00**	**1.0E-01**	7.85E+01		?
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	**1.6E-06**	**7.0E-01**	9.90E+01		X
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	**0.0E+00**	**7.0E-02**	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,936	**0.0E+00**	**5.0E+01**	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,899	**0.0E+00**	**7.0E-01**	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.82E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	**0.0E+00**	**2.0E-01**	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	**0.0E+00**	**3.0E+01**	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	**1.2E-03**	**1.8E-03**	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	**0.0E+00**	**2.0E-04**	2.79E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	**0.0E+00**	**1.1E+00**	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	9.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	**1.0E-05**	**4.0E-03**	1.13E+02	?	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	**0.0E+00**	**5.0E+00**	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	388.15	602.00	8,322	**1.6E-05**	**1.4E-02**	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	**2.0E-06**	**6.0E-01**	1.31E+02	?	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	**0.0E+00**	**3.5E+00**	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,995	**5.8E-05**	**1.4E-02**	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	**2.7E-03**	**2.0E-02**	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.50E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	**0.0E+00**	**7.0E-01**	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	**0.0E+00**	**2.1E-01**	1.54E+02		X
86737	Fluorene	1.38E+04	3.83E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	**0.0E+00**	**1.4E-01**	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	488.15	738.00	10,208	**2.2E-05**	**3.5E-03**	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	**0.0E+00**	**3.2E-03**	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	**3.4E-05**	**3.0E-03**	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	**0.0E+00**	**1.4E-02**	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	**0.0E+00**	**1.8E-01**	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	**0.0E+00**	**1.0E-01**	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	**0.0E+00**	**2.0E-01**	1.47E+02		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	**0.0E+00**	**1.8E-02**	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	**0.0E+00**	**7.0E-03**	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	**2.0E-03**	**2.1E-02**	1.47E+02	X	X
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	**0.0E+00**	**1.1E-01**	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.57E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	**0.0E+00**	**3.2E-01**	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.66E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,960	**0.0E+00**	**1.4E-01**	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	**0.0E+00**	**4.0E-01**	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	**0.0E+00**	**3.5E-01**	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.50E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,586	**0.0E+00**	**2.0E-03**	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	**2.5E-06**	**1.0E+00**	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	**0.0E+00**	**9.0E-01**	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	**4.9E-05**	**1.0E-03**	1.27E+02	?	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,858	**0.0E+00**	**3.5E-01**	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	**0.0E+00**	**1.4E-01**	1.20E+02		X

VLOOK ES

104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.09E+02		?
106467	1,4-Dichlorobenzene	8.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	664.75	9,271	1.1E-05	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dibr	2.60E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	7.1E-05	6.0E-04	1.69E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.80	425.00	5,370	1.7E-04	2.0E-03	5.41E+01		
107028	Acrolein	2.78E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	505.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	551.00	7,643	2.1E-05	4.0E-01	9.90E+01		
107131	Acrylonitrile	5.80E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	2.9E-04	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.84E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		?
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	3.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	1.0E+00	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E-01	9.26E+01		X
110009	Furan	1.88E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.61E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	505.00	6,895	0.0E+00	7.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	7.1E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	5.1E-04	2.8E-03	2.65E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.62E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.7E-05	7.0E-02	2.08E+02	?	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	8.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.65E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	3.5E-02	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.54E-03	1.36E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.38E-03	25	320.85	516.5	6717	0.0E+00	6.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	1.1E-04	0.0E+00	2.52E+02	?	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	1.1E-05	0.0E+00	2.28E+02	?	
309002	Aldrin	2.45E+06	1.32E-02	4.88E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	7.7E-04	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.96E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.28E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	1.8E-05	2.0E-02	1.11E+02		
630208	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9788.282525	7.4E-06	1.1E-01	1.69E+02		X
1634044	MTBE	7.28E+00	1.02E-01	1.05E-05	5.10E+04	2.55E-02	6.23E-04	25	328.3	497.1	6677.68	2.6E-07	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02		

SG-SCREEN
PA Version 2.0; 04/

Reset to Defaults

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
106423	1.80E+02			p-Xylene

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152.4	24	SC		

MORE

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.5	0.43	0.15	5

MORE

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PR(TIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
7.69E-02	8.44E-06	7.64E-03	25	8,525	411.52	616.20	0.0E+00	1.0E-01	106.17

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
137.4	0.280	0.105	1.78E-09	0.946	1.69E-09	4,000	1.80E+02	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm-m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	10,083	7.22E-03	2.96E-01	1.80E-04	6.00E-03	137.4

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	1.80E+02	1.25	8.33E+01	6.00E-03	5.00E+03	1.17E+12	8.45E-04	1.52E-01

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

END

RESUL IEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	1.5E-03

MESSAGE SUMMARY BELOW:

END

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α, (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01468	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.65	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.083	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00659	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.50	0.02667	1.449	0.3099	0.397	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	595.55	839.36	15,000	**3.1E-04**	**1.1E-03**	2.91E+02	?	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	**0.0E+00**	**7.0E-01**	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.58E-03	3.87E-05	25	329.20	508.10	6,955	**0.0E+00**	**3.1E+01**	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,986	**5.3E-06**	**3.0E-01**	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	**1.1E-05**	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	**2.9E-05**	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	**0.0E+00**	**5.0E+00**	1.33E+02		
72435	Methoxychlor	9.77E+04	1.58E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	**0.0E+00**	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	**9.7E-05**	**0.0E+00**	3.18E+02	?	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	**0.0E+00**	**5.0E-03**	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	**1.8E-06**	**9.0E-02**	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	**0.0E+00**	**3.0E-03**	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	**0.0E+00**	**3.5E-02**	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	**8.3E-07**	**1.0E+01**	6.45E+01	?	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	**7.8E-05**	**1.0E-01**	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	**0.0E+00**	**6.0E-02**	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	**0.0E+00**	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	**8.8E-05**	**3.0E-02**	4.41E+01		?
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	**1.1E-06**	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	**3.7E-05**	7.0E-02	1.64E+02	?	X
75298	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	486.00	6,286	**0.0E+00**	1.0E-01	7.85E+01		?
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,885	**1.6E-06**	**7.0E-01**	9.90E+01		X
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	**0.0E+00**	**7.0E-02**	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.26E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	**0.0E+00**	**5.0E+01**	8.55E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	**0.0E+00**	**7.0E-01**	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	8.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	**0.0E+00**	**2.0E-01**	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	**0.0E+00**	**3.0E+01**	1.87E+02		
76448	Heptachlor	1.41E+05	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	**1.2E-03**	**1.8E-03**	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	748.00	10,931	**0.0E+00**	**2.0E-04**	2.73E+02		
78831	Isobutanol	2.58E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	**0.0E+00**	**1.1E+00**	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	**1.0E-05**	**4.0E-03**	1.13E+02	?	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	**0.0E+00**	**5.0E+00**	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	**1.6E-05**	**1.4E-02**	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	**2.0E-06**	**6.0E-01**	1.31E+02	?	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	**0.0E+00**	**3.5E+00**	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,986	**5.8E-05**	1.4E-02	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	**2.7E-03**	**2.0E-02**	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	**0.0E+00**	**7.0E-01**	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	**0.0E+00**	**2.1E-01**	1.54E+02		X
86737	Fluorene	1.38E+04	3.83E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	**0.0E+00**	**1.4E-01**	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	488.15	738.00	10,206	**2.2E-05**	**3.5E-03**	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.67E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	**0.0E+00**	**3.2E-03**	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.96E-02	4.82E-04	25	491.14	748.40	10,373	**3.4E-05**	**3.0E-03**	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	**0.0E+00**	**1.4E-02**	1.42E+02		X
92524	Biphenyl	4.36E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,880	**0.0E+00**	**1.8E-01**	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	**0.0E+00**	**1.0E-01**	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	**0.0E+00**	**2.0E-01**	1.47E+02		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	**0.0E+00**	**1.8E-02**	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	**0.0E+00**	**7.0E-03**	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	**2.0E-03**	**2.1E-02**	1.47E+02	X	X
96333	Methyl acrylate	4.53E+00	9.75E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	**0.0E+00**	**1.1E-01**	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	**0.0E+00**	**3.2E-01**	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	**0.0E+00**	**1.4E-01**	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	**0.0E+00**	**4.0E-01**	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	**0.0E+00**	**3.5E-01**	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	**0.0E+00**	**2.0E-03**	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	**2.5E-06**	**1.0E+00**	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	**0.0E+00**	**9.0E-01**	1.04E+02		
100447	Benzylchloride	5.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	9,773	**4.9E-05**	**1.0E-03**	1.27E+02	?	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,656	**0.0E+00**	**3.5E-01**	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	**0.0E+00**	**1.4E-01**	1.20E+02		X

104518	n-Butylbenzene	1.11E+03	5.70E-02	6.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.08E+02		?
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	1.1E-05	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	7.1E-05	8.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.06E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	1.7E-04	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.1E-05	4.0E-01	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	2.9E-04	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2-	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.08E+02		?
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	657.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.35E-02	9.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	3.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	1.0E+00	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E-01	9.28E+01		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,695	0.0E+00	7.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	7.1E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.80E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	826.00	14,447	5.1E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.80E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,600	2.7E-05	7.0E-02	2.08E+02	?	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	9.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	3.5E-02	1.69E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.85	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.65E+01	7.39E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.38E-03	25	320.85	516.5	6717	0.0E+00	8.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+05	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	1.1E-04	0.0E+00	2.52E+02	?	
218019	Chrysene	3.98E+05	2.48E-02	5.21E-06	6.30E-03	3.67E-03	9.44E-05	25	714.15	979	16455	1.1E-05	0.0E+00	2.28E+02	?	
309002	Aldrin	2.45E+05	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.35	15000	7.7E-04	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.88E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.28E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	1.6E-05	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-05	1.1E-01	1.68E+02		X
1634044	MTBE	7.28E+00	1.02E-01	1.05E-05	5.10E+04	2.58E-02	6.23E-04	25	328.3	497.1	6577.65	2.6E-07	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02		

DATA EN[illegible]SHEET

SG-SCREEN
PA Version 2.0; 04/

Reset to Defaults

DTSC

Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
110543	2.60E+02			Hexane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152.4	24	SC		

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.5	0.43	0.15	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PR TIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
2.00E-01	7.77E-06	1.66E+00	25	6,895	341.70	508.00	0.0E+00	7.0E-01	86.18

END

INTERMEDIATE C/ ATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
137.4	0.280	0.105	1.78E-09	0.946	1.69E-09	4,000	2.60E+02	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} ($atm-m^3/mol$)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	7,549	1.59E+00	6.53E+01	1.80E-04	1.56E-02	137.4

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	2.60E+02	1.25	8.33E+01	1.56E-02	5.00E+03	4.36E+04	1.42E-03	3.69E-01

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	7.0E-01

END

RESUL IEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	5.1E-04

MESSAGE SUMMARY BELOW:

END

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_r (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2939	0.442	0.079	0.016	1.48	0.169	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01822	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.150	Silt Loam
SL	1.60	0.02697	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_b (°K)	Critical temperature, T_c (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD) Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	7.0E-04	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	**3.1E-04**	1.1E-03	2.91E+02	?	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.26E-02	25	307.60	466.74	6,938	0.0E+00	7.0E-01	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	1.8E-04	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	**3.1E+01**	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.65E-03	25	334.32	536.40	6,988	**5.3E-06**	**3.0E-01**	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.60E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	**1.1E-05**	3.5E-03	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.78E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	**2.9E-05**	3.0E-02	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	5.0E+00	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.48E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.36	15,000	**9.7E-05**	0.0E+00	3.18E+02	?	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	**5.0E-03**	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	1.50E-05	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	**1.8E-06**	9.0E-02	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	459.70	6,878	0.0E+00	3.0E-03	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	?	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.68E-02	25	259.25	432.00	5,250	**7.8E-05**	1.0E-01	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.50	545.50	7,110	0.0E+00	6.0E-02	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.95E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	**6.8E-05**	3.0E-02	4.41E+01		?
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	**3.7E-05**	7.0E-02	1.64E+02	?	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	309.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	**1.6E-06**	7.0E-01	9.90E+01		X
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	7.0E-02	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	5.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.2E-03	1.8E-03	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02		
78831	Isobutanol	2.59E+00	8.69E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.0E-05	4.0E-03	1.13E+02	?	
78933	Methylethylketone (2-butanone)	2.30E+00	8.09E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	**1.6E-05**	1.4E-02	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.38	544.20	7,505	2.0E-06	**6.0E-01**	1.31E+02	?	
79209	Methyl acetate	3.25E+00	1.04E-01	1.00E-05	2.00E+05	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	**5.8E-05**	1.4E-02	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.64	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	3.5E-03	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.2E-03	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	**3.4E-05**	3.0E-03	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	1.4E-02	1.42E+02		X
92524	Biphenyl	4.36E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,881	0.0E+00	1.0E-01	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	5.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	7.0E-03	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.06E-04	25	430.00	652.00	9,171	2.0E-03	2.1E-02	1.47E+02	X	X
96333	Methyl acrylate	4.53E+00	9.78E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	9.73E-06	6.13E+03	4.36E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	2.5E-06	1.0E+00	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	**9.0E-01**	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	**4.9E-05**	1.0E-03	1.27E+02	?	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X

VLOOI ES

104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		?
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	1.1E-05	8.6E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	7.1E-05	6.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.80	425.00	5,370	1.7E-04	2.0E-03	5.41E+01		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	508.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.1E-05	4.0E-01	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,788	2.9E-04	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,900	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		?
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.85E+01	7.36E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?
108883	Toluene	1.82E+02	8.70E-02	8.80E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	3.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	1.0E+00	1.13E+02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,283	0.0E+00	1.4E-01	9.26E+01		X
110009	Furan	1.85E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,995	0.0E+00	7.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.38E-04	1.80E-05	25	451.15	659.79	10,803	7.1E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	574.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	5.1E-04	2.8E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	466.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.62E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.7E-05	7.0E-02	2.08E+02	?	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	353.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,268	5.9E-06	3.5E-02	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.25E-05	25	560	824	66400	0.0E+00	1.4E-02	1.58E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.85	544	7182	0.0E+00	3.5E-02	9.89E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	6.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	989.27	17000	1.1E-04	0.0E+00	2.52E+02	?	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	18455	1.1E-05	0.0E+00	2.28E+02	?	
309002	Aldrin	2.45E+06	1.32E-02	4.88E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.65E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	598.55	839.36	15000	7.7E-04	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	361.15	587.38	7900	1.6E-05	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.80E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9766.282525	7.4E-06	1.1E-01	1.58E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6577.68	2.6E-07	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02		

SG-[illegible]REEN
PA Version 2.0; 04/

Reset to Defaults

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
95636	8.40E+01			1,2,4-Trimethylbenzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152.4	24	SC		

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.5	0.43	0.15	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PR :TIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
6.06E-02	7.92E-06	6.14E-03	25	9,369	442.30	649.17	0.0E+00	7.0E-03	120.20

END

INTERMEDIATE C. _ATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
137.4	0.280	0.105	1.78E-09	0.946	1.69E-09	4,000	8.40E+01	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	11,516	5.76E-03	2.36E-01	1.80E-04	4.73E-03	137.4

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	8.40E+01	1.25	8.33E+01	4.73E-03	5.00E+03	2.05E+15	7.19E-04	6.04E-02

Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
NA	7.0E-03

END

RESUL :HEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	8.3E-03

MESSAGE SUMMARY BELOW:

END

VLOC LES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_r (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2939	0.442	0.079	0.016	1.49	0.188	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.146	Loam
LS	4.38	0.03475	1.748	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.364	0.063	0.029	1.63	0.148	Sandy Clay Loam
SI	1.82	0.00656	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.218	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0055	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.69	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	**7.0E-04**	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	**3.1E-04**	**1.1E-03**	2.91E+02	?	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	**0.0E+00**	**7.0E-01**	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	**1.8E-04**	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	**0.0E+00**	**3.1E+01**	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	**5.3E-06**	**3.0E-01**	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	**1.1E-05**	**3.5E-03**	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	**2.9E-05**	**3.0E-02**	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	**0.0E+00**	**5.0E+00**	1.33E+02		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	**0.0E+00**	**1.8E-02**	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.69E-04	2.09E-05	25	636.44	860.38	15,000	**9.7E-05**	**0.0E+00**	3.16E+02	?	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	**0.0E+00**	**5.0E-03**	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	**1.8E-06**	**9.0E-02**	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	**0.0E+00**	**3.0E-03**	2.70E+01		
74953	Methylene bromide	1.25E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	**0.0E+00**	**3.5E-02**	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	**8.3E-07**	**1.0E+01**	6.45E+01	?	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	**7.8E-05**	**1.0E-01**	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.65E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	**0.0E+00**	**6.0E-02**	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	**0.0E+00**	**7.0E-01**	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.46E-05	3.04E+05	2.27E-02	5.54E-04	25	283.80	469.00	6,104	**6.8E-05**	**3.0E-02**	4.41E+01		?
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	**1.1E-06**	**7.0E-02**	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	**3.7E-05**	**7.0E-02**	1.64E+02	?	X
75286	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	**0.0E+00**	**1.0E-01**	7.85E+01		?
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	**1.6E-06**	**7.0E-01**	9.90E+01		X
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	**0.0E+00**	**7.0E-02**	9.69E+01		
75458	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	**0.0E+00**	**5.0E+01**	8.65E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	**0.0E+00**	**7.0E-01**	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	**0.0E+00**	**2.0E-01**	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	**0.0E+00**	**3.0E+01**	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	**1.2E-03**	**1.8E-03**	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	**0.0E+00**	**2.0E-04**	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,938	**0.0E+00**	**1.1E+00**	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	**1.0E-05**	**4.0E-03**	1.13E+02	?	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.56E-05	25	352.50	536.78	7,481	**0.0E+00**	**5.0E+00**	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	9.73E-02	9.11E-04	25	386.15	602.00	8,322	**1.6E-05**	**1.4E-02**	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.35	544.20	7,505	**2.0E-06**	**6.0E-01**	1.31E+02	?	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,250	**0.0E+00**	**3.5E+00**	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,895	**5.8E-05**	**1.4E-02**	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	**2.7E-03**	**2.0E-02**	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	**0.0E+00**	**7.0E-01**	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	**0.0E+00**	**2.1E-01**	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	**0.0E+00**	**1.4E-01**	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	488.15	736.00	10,206	**2.2E-05**	**3.5E-03**	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	**0.0E+00**	**3.2E-03**	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	**3.4E-05**	**3.0E-03**	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	**0.0E+00**	**1.4E-02**	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	**0.0E+00**	**1.8E-01**	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	**0.0E+00**	**1.0E-01**	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	**0.0E+00**	**2.0E-01**	1.47E+02		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	**0.0E+00**	**1.8E-02**	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,389	**0.0E+00**	**7.0E-03**	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.57E-02	4.08E-04	25	430.00	652.00	9,171	**2.0E-03**	**2.1E-02**	1.47E+02	X	X
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.88E-03	1.97E-04	25	353.70	535.00	7,749	**0.0E+00**	**1.1E-01**	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	**0.0E+00**	**3.2E-01**	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	**0.0E+00**	**1.4E-01**	1.34E+02		X
98828	Cumene	4.89E+02	5.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	**0.0E+00**	**4.0E-01**	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	**0.0E+00**	**3.5E-01**	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	**0.0E+00**	**2.0E-03**	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	**2.5E-06**	**1.0E+00**	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	**0.0E+00**	**9.0E-01**	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	**4.9E-05**	**1.0E-03**	1.27E+02	?	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	**0.0E+00**	**3.5E-01**	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	**0.0E+00**	**1.4E-01**	1.20E+02		X

							VLOC	LES									
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02			X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.09E+02			?
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	1.1E-05	6.0E-01	1.47E+02			
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	7.1E-05	8.0E-04	1.88E+02			
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	1.7E-04	2.0E-03	5.41E+01			
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.98E-03	1.22E-04	25	325.60	508.00	6,731	0.0E+00	2.0E-05	5.61E+01			
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.1E-05	4.0E-01	9.90E+01			
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	2.9E-04	2.0E-03	5.31E+01			
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01			
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02			
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.05E+02			?
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	657.25	9,321	0.0E+00	6.0E-03	1.20E+02			
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01			?
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	3.0E-01	9.21E+01			
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	1.0E+00	1.13E+02			
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E-01	9.26E+01			X
110009	Furan	1.85E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01			X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	7.0E-01	8.62E+01			
111444	Bis(2-chloroethyl)ether	1.55E+01	8.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	7.1E-04	0.0E+00	1.43E+02			
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02			X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	5.1E-04	2.8E-03	2.85E+02			X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02			
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X		
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.7E-05	7.0E-02	2.08E+02	?	X	
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01			
126998	2-Chloro-1,3-butadiene (chloropri	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	6,075	0.0E+00	7.0E-03	8.85E+01			
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-05	3.5E-02	1.66E+02			
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	857.95	936	14370	0.0E+00	1.1E-01	2.02E+02			X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02			X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.58E-01	1.36E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02			X
141786	Ethylacetate	8.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01			X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01			X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	5717	0.0E+00	6.0E-02	9.69E+01			X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	959.27	17000	1.1E-04	0.0E+00	2.52E+02	?		
218019	Chrysene	3.96E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	18455	1.1E-05	0.0E+00	2.28E+02	?		
309002	Aldrin	2.45E+06	1.32E-02	4.85E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	939.37	15000	4.9E-03	1.1E-04	3.65E+02			X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	939.36	15000	7.7E-04	0.0E+00	2.91E+02			
541731	1,3-Dichlorobenzene	1.96E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02			X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	1.6E-05	2.0E-02	1.11E+02			
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02			X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	2.8E-07	3.0E+00	8.82E+01			
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02			

SC[illegible]REEN
PA Version 2.0; 04/

Reset to Defaults

DTSC

Vapor Intrusion Guidance
Interim Final 12/04
(last modified 2/4/09)

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108678	2.90E+01			1,3,5-Trimethylbenzene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152.4	24	SC		

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.5	0.43	0.15	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

CHEMICAL PR[illegible]RTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
6.02E-02	8.67E-06	5.87E-03	25	9,321	437.89	637.25	0.0E+00	6.0E-03	120.20

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Soil gas conc. ($\mu g/m^3$)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
137.4	0.280	0.105	1.78E-09	0.946	1.69E-09	4,000	2.90E+01	3.39E+04

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Diffusion path length, L_d (cm)
1.00E+06	5.00E-03	15	11,495	5.50E-03	2.25E-01	1.80E-04	4.70E-03	137.4

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)
15	2.90E+01	1.25	8.33E+01	4.70E-03	5.00E+03	2.59E+15	7.15E-04	2.07E-02

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

END

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	3.3E-03

MESSAGE SUMMARY BELOW:

END

VLOC 3LES

Soil Properties Lookup Table									
SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2939	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.58	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	25.76	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.62	0.00658	1.679	0.4044	0.489	0.050	0.0045	1.35	0.167	Silt
SIC	0.40	0.01822	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.50	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CalEPA Toxicity Criteria in bold (last updated 2/4/09 DTSC/HERD)

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, ΔH_{vb} (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	**7.0E-04**	4.10E+02		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	**3.1E-04**	**1.1E-03**	2.91E+02	?	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	**0.0E+00**	**7.0E-01**	7.41E+01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	**1.8E-04**	3.81E+02		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	5,955	**0.0E+00**	**3.1E+01**	5.81E+01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	**5.3E-06**	**3.0E-01**	1.19E+02		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	**1.1E-05**	**3.5E-03**	2.37E+02		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	**2.9E-05**	**3.0E-02**	7.81E+01		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	**0.0E+00**	**5.0E+00**	1.33E+02		
72435	Methoxychlor	9.77E+04	1.55E-02	4.46E-06	1.00E-01	5.46E-04	1.56E-05	25	651.02	848.49	16,000	**0.0E+00**	**1.8E-02**	3.46E+02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	16,000	**9.7E-05**	**0.0E+00**	3.18E+02	?	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	**0.0E+00**	**5.0E-03**	9.49E+01		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	8.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	**1.8E-06**	**9.0E-02**	5.05E+01		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	298.00	456.70	6,676	**0.0E+00**	**3.0E-03**	2.70E+01		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	**0.0E+00**	**3.5E-02**	1.74E+02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	**8.3E-07**	**1.0E+01**	6.45E+01	?	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	**7.8E-05**	**1.0E-01**	6.25E+01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.56E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	**0.0E+00**	**6.0E-02**	4.11E+01		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	**0.0E+00**	**7.0E-01**	7.61E+01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	**6.8E-05**	**3.0E-02**	4.41E+01		?
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	**1.1E-06**	**7.0E-02**	2.53E+02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.05E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	**3.7E-05**	**7.0E-02**	1.64E+02	?	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,288	**0.0E+00**	**1.0E-01**	7.85E+01		?
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	**1.6E-06**	**7.0E-01**	9.90E+01		X
75354	1,1-Dichloroethylene	5.59E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	**0.0E+00**	**7.0E-02**	9.69E+01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	**0.0E+00**	**5.0E+01**	8.55E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	**0.0E+00**	**7.0E-01**	1.37E+02		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	**0.0E+00**	**2.0E-01**	1.21E+02		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	**0.0E+00**	**3.0E+01**	1.87E+02		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	**1.2E-03**	**1.8E-03**	3.73E+02		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	**0.0E+00**	**2.0E-04**	2.73E+02		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,935	**0.0E+00**	**1.1E+00**	7.41E+01		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	**1.0E-05**	**4.0E-03**	1.13E+02	?	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	**0.0E+00**	**5.0E+00**	7.21E+01		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	**1.6E-05**	**1.4E-02**	1.33E+02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	**2.0E-06**	**6.0E-01**	1.31E+02	?	
79209	Methyl acetate	3.25E+00	1.04E-01	1.00E-05	2.00E+05	4.84E-03	1.18E-04	25	329.80	506.70	7,280	**0.0E+00**	**3.5E+00**	7.41E+01		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.98E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,998	**5.8E-05**	**1.4E-02**	1.68E+02		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	**2.7E-03**	**2.0E-02**	8.91E+01		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	**0.0E+00**	**7.0E-01**	1.00E+02		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	**0.0E+00**	**2.1E-01**	1.54E+02		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.80E-03	6.34E-05	25	570.44	870.00	12,658	**0.0E+00**	**1.4E-01**	1.66E+02		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	488.15	738.00	10,206	**2.2E-05**	**3.5E-03**	2.61E+02		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	**0.0E+00**	**3.2E-03**	1.37E+02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.96E-02	4.82E-04	25	491.14	748.40	10,373	**3.4E-05**	**3.0E-03**	1.28E+02		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	**0.0E+00**	**1.4E-02**	1.42E+02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	**0.0E+00**	**1.8E-01**	1.54E+02		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	**0.0E+00**	**1.0E-01**	1.06E+02		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	**0.0E+00**	**2.0E-01**	1.47E+02		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	**0.0E+00**	**1.8E-02**	1.29E+02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	**0.0E+00**	**7.0E-03**	1.20E+02		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.06E-04	25	430.00	652.00	9,171	**2.0E-03**	**2.1E-02**	1.47E+02	X	X
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.66E-03	1.87E-04	25	353.70	536.00	7,749	**0.0E+00**	**1.1E-01**	8.61E+01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	**0.0E+00**	**3.2E-01**	1.14E+02		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	**0.0E+00**	**1.4E-01**	1.34E+02		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	**0.0E+00**	**4.0E-01**	1.20E+02		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.36E-04	1.07E-05	25	475.00	709.50	11,732	**0.0E+00**	**3.5E-01**	1.20E+02		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	**0.0E+00**	**2.0E-03**	1.23E+02		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.88E-03	25	409.34	617.20	8,501	**2.5E-06**	**1.0E+00**	1.06E+02		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	**0.0E+00**	**9.0E-01**	1.04E+02		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	**4.9E-05**	**1.0E-03**	1.27E+02	?	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	**0.0E+00**	**3.5E-01**	1.06E+02		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	**0.0E+00**	**1.4E-01**	1.20E+02		X

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104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.05E+02		?
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.62E-02	2.39E-03	25	447.21	684.75	9,271	1.1E-05	8.0E-01	1.47E+02		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	593.00	8,310	7.1E-05	9.0E-04	1.88E+02		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.80	425.00	5,370	1.7E-04	2.0E-03	5.41E+01		
107028	Acrolein	2.78E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.1E-05	4.0E-01	9.90E+01		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	2.9E-04	2.0E-03	5.31E+01		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01	8.61E+01		
108101	Methylisobutylketone (4-methyl-2-	9.08E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		?
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	6.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02		
108872	Methylcyclohexane	7.65E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	3.0E-01	9.21E+01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	1.0E+00	1.13E+02		
109893	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.68E-02	25	351.60	542.00	7,263	0.0E+00	1.4E-01	9.26E+01		X
110009	Furan	1.65E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.38E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	7.0E-01	8.62E+01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.38E-04	1.80E-05	25	451.15	659.79	10,803	7.1E-04	0.0E+00	1.43E+02		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X
118741	Hexachlorobenzene	5.60E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	5.1E-04	2.6E-03	2.85E+02		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.61E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03	1.81E+02		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X	
124481	Chlorodibromomethane	6.31E+01	1.98E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.7E-05	7.0E-02	2.08E+02	?	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01		
126998	2-Chloro-1,3-butadiene (chloropr	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,268	5.9E-06	3.5E-02	1.66E+02		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	68400	0.0E+00	1.4E-02	1.68E+02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	445.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7693.68	0.0E+00	3.2E+00	8.81E+01		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	6.0E-02	9.69E+01		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	1.1E-04	0.0E+00	2.52E+02	?	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	1.1E-05	0.0E+00	2.28E+02	?	
309002	Aldrin	2.45E+05	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04	3.85E+02		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.38	15000	7.7E-04	0.0E+00	2.91E+02		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.85E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	1.6E-05	2.0E-02	1.11E+02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9788.282525	7.4E-05	1.1E-01	1.68E+02		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.29E-04	25	328.3	497.1	6677.66	2.6E-07	3.0E+00	8.82E+01		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02		

APPENDIX C

Vapor Barrier and Concrete Additive Data

To whom it may concern:

This letter is in regards to the performance of Stego Wrap Vapor Barrier as it compares to thicker HDPE (High Density Polyethylene). Please be aware that the comparison of these two products is very difficult because the common tests performed on both products differ. Stego Wrap Polyolefin uses metallocene resins as a catalyst which creates a product much stronger than traditional HDPE, commonly referred to as an *ultra high molecular weight polyethylene (UHMWPE).* Metallocene resins create polyethylene molecules which are several orders of magnitude longer than familiar HDPE. For example, while HDPE molecules generally have between 700 and 1,800 monomers each, UHMWPE molecules tend to have 100,000 to 250,000 monomers each.

Polyolefin plastics (UHMPE) have revolutionized the plastic industry because of their increased puncture resistance, tensile strength, and low permeance in comparison to traditional polyethylene. In addition to this, Stego has done well when exposed to chemicals such as Petroleum in ASTM E 154 testing. Stego can even be used as a methane barrier, please see the attached data sheet regarding methane.

When more corrosive gases are present in the soil, it is not uncommon to use a double layer of Stego 15-mil. The first will act as a protection course against the chemicals, while the second will provide the full permeance protection required to protect the building envelope.

Please note that I have included the data sheets of both Stego Wrap Vapor Barrier and HDPE Geomembranes. Again, be aware that because the sheets rely on differing test methods direct comparison is fairly difficult.

Sincerely,

Paul Miller

Paul Miller CSI CCPR
Northern CA Regional Manager,
Stego Industries
paulmiller@stegoindustries.com

25 Nov 2003	HDPE Minimum Material Properties					
Style	ASTM	HDPE 40 Smooth	HDPE 60 Smooth	HDPE 80 Smooth	HDPE 60 Textured	HDPE 80 Textured
Nominal Thickness	D5199	40 mil 1.0 mm	60 mil 1.5 mm	80 mil 2.0 mm	57 mil 1.42 mm	76 mil 1.90 mm
Density (Untextured)	D792	0.94	0.94	0.94	0.94	0.94
Tensile Strength Modified Type IV Die	D638 Stress at Yield	84 ppi 14.7 kN/m	126 ppi 22.0 kN/m	168 ppi 29.0 kN/m	126 ppi 22.0 kN/m	168 ppi 29.0 kN/m
	Stress @ Break	152 ppi 26.6 kN/m	225 ppi 40.0 kN/m	304 ppi 53.0 kN/m	90 ppi 15.8 kN/m	120 ppi 21.0 kN/m
	Strain @ Yield 33 mm Guage	12%	12%	12%	12%	12%
	Strain @ Break 50 mm Guage	700%	700%	700%	100%	100%
Tear Resistance	D1004	28 lbs 125 N	42 lbs 187 N	56 lbs 249 N	42 lbs 187 N	56 lbs 249 N
Dimensional Stability	D1204 Max Cng.	± 2%	± 2%	± 2%	± 2%	± 2%
Notched Constant Load ESCR	D5397	200 Hours	200 Hours	200 Hours	200 Hours	200 Hours
Puncture Resistance	D4833	72 lbs 320 N	108 lbs 480 N	144 lbs 640 N	90 lbs 400 N	120 lbs 534 N
Carbon Black Content	D1603	2.0 - 3.0%	2.0 - 3.0%	2.0 - 3.0%	2.0 - 3.0%	2.0 - 3.0%
Carbon Black Dispersion	D5596	CAT 1 or 2	CAT 1 or 2	CAT 1 or 2	CAT 1 or 2	CAT 1 or 2

STEGO® WRAP VAPOR BARRIER SPECIFICATIONS

PROPERTIES	TEST METHOD	ASTM E 1745 Class A Requirements	TEST RESULT	EXPLANATION
Permeance	ASTM F 1249	0.3 perms	0.0084 perms * 0.0035 WVTR	Very impermeable to water vapor
Puncture Resistance	ASTM D 1709	2200 grams	Method B 2326 grams	Resistant to puncturing from construction abuse
Tensile Strength	ASTM D 882	45.0 lbf./in.	79.6 lbf./in.	Will not tear easily
Permeance After Conditioning	ASTM E 154 section 8		0.0091 perms	Permeance after wetting, drying, and soaking
	ASTM E 154 section 11		0.0092 perms	Permeance after heat conditioning
	ASTM E 154 section 12		0.0089 perms	Permeance after low temperature conditioning
	ASTM E 154 section 13		0.0092 perms	Permeance after soil organism exposure
Methane Transmission Rate	ASTM D 1434		**149.6 GTR 2.12×10^{-6} perms	Greatly impedes the transmission of methane gas
Life Expectancy	ASTM E 154		Indefinite	Will not deteriorate/decompose below concrete slabs when buried
Thickness			15 mils	Stronger, tougher and less permeable than much thicker membranes
Roll Dimensions			14 ft. X 140 ft.	1,960 ft^2/roll - allows for a minimum of seams
Roll Weight			140 lbs.	Easy to unroll and install

Stego Wrap Vapor Barrier Brownfield Testing – Simulated Dry Cleaning Site

Setup:

To simulate a dry-cleaning brownfield site, Barbara Belmont, Senior Chemist at American Research and Testing (ART), prepared contaminated water to contain 3600 ppb perchloroethylene (PCE), 12500 PPB trichloroethylene (TCE), 16200 PPB CIS-1,2-dichloroethylene (C-DCE), AND 1700 PPB trans-1,2-dichlorothylene (T-DCE). Two liters of this mixture were placed in a 49 cm x 23.5 cm wide by 27 cm tall chamber. ASTM 20-30 sand was added to the vessel until it was 5 cm above the original water line. At this level, the sand was damp with no free standing water. Stego Wrap Vapor Barrier was placed on top of the damp sand, and the entire surface of the vapor barrier was weighted down with sand-filled plastic bags to ensure full contact of the Stego Wrap with the damp sand. The test vessel was covered and sealed. After 30 days of exposure under ambient laboratory conditions (21-25 °C), the samples were removed for evaluation.

In English now- We took an actual soils report from an old dry cleaning site and recreated the conditions, sort of. In the actual scenario the water table was 20 feet below the vapor barrier. In our setup we created a contaminated water table just 2 *inches* below Stego Wrap Vapor Barrier. After a 30 day exposure we examined the material via mass and volume changes as well as tested it for water vapor Permeance.

Results:

Mass and Volume:

Barbara Belmont conducted mass and volume measurements before and after exposure. The following comes directly from her report: *"Almost all of the test coupons exhibited slight changes in mass and volume, no matter what their exposure conditions were. Statistical analysis by t-test showed that the changes for the pollutant-exposed coupons were not significantly different from the changes for the control-exposed coupons."* In other words, Stego Wrap Vapor Barrier's mass and volume were not significantly affected by the exposure.

Permeance:

ART sent exposed samples to Mocon Inc., the industry leader in permeation equipment and testing, for post-exposure permeance testing. The results were fantastic. The permeance of Stego Wrap Vapor Barrier stayed below the industry's "Barrier" benchmark of 0.01 grain/(ft^2*hr*inHg).

At **0.0092 grain/(ft^2*hr*inHg)**, Stego Wrap Vapor Barrier's Permeance rose no more than it does for the ASTM E 1745 prescribed conditioning tests (ASTM E 154 Sections 8,11,12, and 13).

We hope this information helps in your evaluation of using Stego Wrap in your next brownfield project.

For a full packet containing all the laboratory reports and results of these tests, please contact Joe Marks, Director of Engineering at Stego Industries. joemarks@stegoindustries.com.

STEGO® WRAP VAPOR BARRIER INDEPENDENT TEST RESULTS

COLOR: YELLOW
THICKNESS: 15-MILS
TYPE: VAPOR BARRIER
ASTM E 1745: CLASS A
COMPOSITION: MULTI-LAYER EXTRUDED POLYOLEFIN MEMBRANE

PRODUCTION RUN TEST RESULTS PERFORMED/WITNESSED BY INDEPENDENT LABORATORIES:

DESCRIPTION	ASTM DESIGNATION	RESULT	UNITS
Puncture	D1709	2326.5	grams
Tensile (Machine Direction)	D882	85.58	lbf/in
Tensile (Transverse Direction)	D882	79.62	lbf/in
Permeance (Baseline)	F1249	0.0084	grain/ft^2*hr*inHg
Permeance (After Wetting, Drying, Soaking)	E154 Section 8, F1249	0.0091	grain/ft^2*hr*inHg
Permeance (After Heat Cond.)	E154 Section 11, F1249	0.0092	grain/ft^2*hr*inHg
Permeance (After Low Temperature Cond.)	E154 Section 12, F1249	0.0089	grain/ft^2*hr*inHg
Permeance (After Soil Organism Exposure)	E154 Section 13, F1249	0.0092	grain/ft^2*hr*inHg
Methane Permeability	D 1434	7.54E-15	mol/m^2*s*Pa
Radon Diffusion Coefficient	N/A	1.30E-13	m^2/s
Coefficient of Kinetic Friction (Stego on Stego)	D 1894	0.27	-------
Coefficient of Static Friction (Stego on Stego)	D 1894	0.30	-------

PRODUCT INFORMATION SHEET
VC5™

PRODUCT NAME
VC5™

MANUFACTURE:

SINAK *Corporation*

1949 W. Walnut Avenue, San Diego, CA 92101
Phone: (800) 523-3147 • Fax: (619) 295-0227
Web: www.sinak.com • E-mail:information@sinak.com

PRODUCT DESCRIPTION

SINAK VC5™ was formulated to guarantee a moisture emission level of 5.0 lbs or less, all in one application, without the need for a separate moisture control system.

Concrete cured with **VC5™** is protected against floor failure due to moisture and/or alkalinity emanating from the concrete.

VC5™ assures **water-cured quality concrete** every time. The curing process itself is created by the reaction with the soluble calcium compounds within the concrete to form additional insoluble calcium silicate which cannot be removed chemically or physically. The reaction has a densitying effect and significantly slows water loss during the curing process and dramatically reduces moisture emission. The net effect is similar to concrete with a significantly lower water-cement ratio.

VC5™ is effective in eliminating cure-related cracking and is especially effective in hot, windy conditions. The appearance and surface profile is unaffected. There is no coating or film on the surface requiring removal prior to the application of surface treatments or flooring installation.

Usage: **VC5™** is ideal for concrete that is scheduled for all types of floor coverings and surface treatments. Concrete treated with **VC5™** is significantly more durable and lower in surface permeability than concrete cured with other methods.

Specifications requiring 3.0 lbs or less

For areas requiring 3.0 lbs, one (1) coat of **V-Poxy™** will be applied.

Composition and Materials: **VC5™** is a water-based liquid with a proprietary formula in solution. It requires NO mixing, diluting or agitation. Color: Water clear: Toxicity: Non-toxic; VOC: contains NO volatile organic compounds.

TESTING:

ASTM C-39 (Compressive Strength): Better than 7-day water cure.*

ASTM C-309 Section 6 (Water Retention): Passed (0.42 kg/m^2).*

ASTM C-1202 (Chloride Ion Penetration): (Coulombs) 39.5% better than 7-day water cure.*

BS-1881 Part 5 (Initial Surface Absorption): Better than 7-day water cure.*

**Independent laboratory reports are available upon request.*

INSTALLATION

VC5™ application should begin as soon as the surface is firm enough to tolerate foot traffic without damaging the surface. If droplets bead or form on the surface, **STOP**. Wait until there is uniform absorption of **VC5™**.

Installation should be continuous. If rain should occur at any time during this process; see 'Interrupted Applications' at the end of this section.

1. Protect objects and non-concrete areas from spillage or overspray. This is especially important with painted surfaces, glass, metals, ceramics and wood, which may be stained if **VC5™** is left to air-dry on the surface. Protect or remove eyeglasses, watches, jewelry and other personal effects. Do not remove any protective measures until last step of application has been completed.

2. Apply **VC5™** in two (2) *LIGHT*, even coats, barely wetting the surface with an airless or tank type low pressure sprayer. Apply the second coat perpendicular to the first coat to create a cross-hatched pattern. **DO NOT** apply **VC5™** in heavy coats or allow puddles to form.

3. Immediately after the first coat is dry, apply a second coat. (**NOTE:** "Dry" means having returned to original color.) Drying time will vary from 10 to 30 minutes depending on temperature and environment.

4. Clean all equipment by rinsing with water.

NOTE: For areas requiring moisture emission levels of 3.0 lbs, apply one coat of **V-Poxy™** by squeegee and back roll at a rate of 250 square feet per gallon. Prior to installation the surface should be free of oil, dirt, paint, grease and all other bond-inhibiting contaminations. **V-Poxy™** will leave a non-permeable surface. Floor installation should be done with adhesives and methods for non-permeable surfaces. See **V-Poxy™** Product Information Sheet for details.

INTERRUPTED APPLICATIONS

If the application should be interrupted by rain, mark the place of interruption and continue application as soon as weather permits, returning to the place of interruption, following all the installation procedures as if there were no break in the procedure.

Cool Weather Applications

In cool weather, but not lower than 50° F, application and drying will take longer. Allow ample time between coats for complete penetration. **DO NOT** apply below 50° F, or if the temperature is expected to drop below 32° F within 24 hours.

Coverage rates: Two-coat coverage rate typically ranges between 650-800 square feet per gallon for smooth-toweled concrete. Rates may vary due to substrate and environmental conditions. For additional information contact SINAK Corporation.

STORAGE AND HANDLING

VC5™ has an indefinite shelf-life when stored in a cool dry area out of direct sunlight. Must be kept in tightly secured containers to prevent evaporation and contamination. Product that has frozen will not function as intended and should be discarded.

AVAILABILITY

VC5™ is available in 5-gallon plastic pails, 55-gallon steel drums and 275-gallon biodegradable totes.

GUARANTEE

SINAK Corporation guarantees that **VC5™** will limit moisture emission level to 5.0 lbs or less (3.0 lbs or less with **V-Poxy™**).

The concrete must be placed in accordance with normally accepted standards and guidelines by American Concrete Institute (ACI) 302. Water/cement ratio must be no greater than 0.50. Vapor emission testing is to be conducted in accordance with ASTM F-1869 within one-week of the flooring installation. Cost of all testing shall be borne by owner.

TECHNICAL ASSISTANCE

Technical assistance is available from the manufacturer, from trained field representatives and approved applicators.

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY *(As Used on Label and List)* **SINAK VC5™**	***Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.***

Section I

Manufacturer's Name **SINAK Corporation**	Emergency Telephone Number **(619) 295-0076**
Address *(Number, Street, City, State, and ZIP Code)* **1949 W. Walnut Avenue San Diego, CA 92101**	Telephone Number for Information **(619) 295-0076**
	Date Prepared **January 1, 2007**
	Signature of Preparer (optional)

Section II — Hazardous Ingredients / Identity Information

Hazardous Components (Specific Chemical Identity;Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
None				

Section III — Physical / Chemical Characteristics

Boiling Point (At sea level)	**212°F / 100°C**	Specific Gravity (H_2O =1)	**1.1**
Vapor Pressure (mm Hg.)	**N/A**	Melting Point	**N/A**
Vapor Density (AIR = 1)	**Less than 1**	Evaporation Rate (Butyl Acetate = 1)	**Less than 1**
Solubility in Water **Complete**			
Appearance and Odor **Water clear; odorless**			

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used) **None**	Flammable Limits **N/A**	LEL **N/A**	UEL **N/A**
Extinguishing Media **None required**			
Special Fire Fighting Procedures **N/A**			
Unusual Fire and Explosion Hazards **N/A**			

Section — V Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable	X	

Incompatibility *(Materials to Avoid)* **N/A**

Hazardous Decomposition or Byproducts **None**

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? **Mild Irritant** Skin? **Mild Irritant** Ingestion? **Mild Irritant**

Health Hazards *(Acute and Chronic)*

None

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
Non-carcinogenic	**N/A**	**N/A**	**N/A**

Signs and Symptoms of Exposure

May irritate eyes

Medical Conditions
Generally Aggravated by Exposure **N/A**

Emergency and First Aid Procedures

ɔs: If sprayed or spilled into eyes, flush with liberal amounts of water for at least 15 minutes. If discomfort persists, call physician.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled

May be slippery when wet - use caution during cleanup. For spills up to 100 gallons: Squeegee, broom, or flush material to nearest floor drain; or mop up and depose of in landfill in compliance with local statutes. Over 100 gallons: Absorb with fuller's earth or similar material, and dispose of in landfill in compliance with local statutes.

Waste Disposal Method

Spillage or product discard: See above. Empty Containers: Flush 3 times with water, and reuse or recycle container.

Precautions to Be Taken in Handling and Storing

DO NOT store in aluminum containers. Hydrogen gas is produced which could burst container. Must be protected from freezing (discard frozen material). Store out of direct sunlight and/or excess heat.

Other Precautions

N/A

Section VIII — Control Measures

Respiratory Protection *(Specify Type)* **None required. Particle mask or filter advised for overhead or upwind spraying.**

Ventilation	Local Exhaust	**Not required**	Special	**N/A**
	Mechanical *(General)*	**Not required**	Other	**N/A**

Protective Gloves	**Not required**	Eye Protection	**For overhead or upwind spraying, OSHA approved plastic goggles.**

Other Protective Clothing or Equipment **N/A**

ɤ/Hygienic Practices **Clean equipment promptly with soap and water.**

* U.S.G.P.O.: 1986-491-529/45775

Sinak Corporation
1949 W. Walnut Avenue
San Diego, CA 92101

December 12, 2006
Contract No.:148086.10

Attention: Mr. Robert Higgins

Project: SINAK Testing

Subject: **WATER RETENTION BY CONCRETE CURING MATERIALS**

Specification: **ASTM C156-03**

Lab Report No. 4

Water Retention by Concrete Curing Materials.

3 samples of mortar were mix and molded into 4x6x1 inch specimens. Curing compound was applied on the surface of the specimens after an initial curing period. Specimens were kept in a constant temperature and evaporation rate cabinet for 72 hours. The rate loss of mass was calculated and expressed in kilograms per square meter (Kg/m2).

Constant temperature Curing Cabinet Calibration

A 6727P Belvers cabinet was used for this test. Temperature was set at 100° F.
Evaporation rate was monitored for 7 hours with the following results:

Shelf No.	Evaporation rate (g / hr)
1	2.01
2	2.04
3	2.05

Mortar Mix Proportions

Mortar for specimen was proportioned in accordance with section 8 of ASTM C156 standard.
The following table presents the mix proportions and other relevant information.

Water Cement Ratio	0.40
Cement Source	Cemex
Aggregate Source	Hanson Miramar
Flow Table Result (ASTM C87)	32.5
Cement (grams)	600
Water (grams)	240
Aggregate (grams)	1129

Water Retention Test

Product: **Sinak HLQ-125**
Manufacturer: Sinak Corporation, 1949 W. Walnut Avenue, San Diego California
Product Type: Lithium Silicate Based Compound
Specific Gravity: 1.1
Non-Volatile Matter: 3.2%
Date Sampled: November 7, 2006
Specimen Size: 4x6x1 inches
Specimen Area: 21.68 sq. in. (corrected for edge sealing)

Specimen	Date and time cast	Initial Weight, after sealer, g	1 Coat applied, 11/22/06 @ 9:00 am	2 Coat applied, 11/22/06 @ 9:50 am	Total product applied, g	Final Weight, g, *11/25/06*	Moisture Loss, g	**Moisture Loss, in Kg / m2 in 72 hours**
1	11/21/06 @ 1:55 pm	1088.4 g	4.9 g	2.8 g	7.7g	1082.5g	6.1g	**0.44**
2	11/21/06 @ 1:55 pm	1104.8 g	5.4 g	2.7 g	8.1 g	1099.3g	5.8g	**0.41**
3	11/21/06 @ 1:55 pm	1096.5 g	4.4g	2.5 g	6.9 g	1090.4g	6.3g	**0.45**
Average					7.6 g		6.1g	**0.43**

Remarks:

- Curing material was applied per manufacturer recommendations.
- *Per manufacturers recommendations, curing compound application was performed 15 hours after edge sealing. Variation from section 11.2 of the ASTM standard intends to replicate the application method and timing normally practiced.*
- *Non-volatile matter was tested by others and results were provided by manufacturer.*

- Tests results of Sinak HLQ-125 conform to the performance criteria in Section 6. Water Retention Properties of the standard specification ASTM C 309 Liquid Membrane – Forming Compounds for Curing Concrete (loss of water to not more than 0.55 kg/m2 in 72 hours).

Respectfully submitted,
Testing Engineers San Diego, Inc.

12/14/06
Carlos E. Acero, RCE 67031
Project Engineer

Designation: C 309 – 06

Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete[1]

This standard is issued under the fixed designation C 309; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification covers liquid membrane-forming compounds suitable for application to concrete surfaces to reduce the loss of water during the early-hardening period. White-pigmented membrane-forming compounds serve the additional purpose of reducing the temperature rise in concrete exposed to radiation from the sun. The membrane-forming compounds covered by this specification are suitable for use as curing media for fresh concrete, and may also be used for further curing of concrete after removal of forms or after initial moist curing.

NOTE 1—This specification addresses only those properties listed in Sections 5 through 8. Membrane-forming compounds with special properties including better water retention, minimum solids content, resistance to ultraviolet radiation, acid and alkali resistance and non-interference with adhesives are described in Specification C 1315.

NOTE 2—Solutions of silicate salts are chemically reactive in concrete rather than membrane-forming; therefore, they do not meet the intent of this specification.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are provided for informational purposes only.

1.3 The following precautionary caveat pertains only to the test methods portion, Section 10, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.4 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes shall not be considered as requirements of the standard.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

C 156 Test Method for Water Retention by Liquid Membrane-Forming Curing Compounds for Concrete

C 1315 Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete

D 56 Test Method for Flash Point by Tag Closed Cup Tester

D 869 Test Method for Evaluating Degree of Settling of Paint

D 883 Terminology Relating to Plastics

D 1309 Test Method for Settling Properties of Traffic Paints During Storage

D 2369 Test Method for Volatile Content of Coatings

D 3960 Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings

E 1347 Test Method for Color and Color-Difference Measurement by Tristimulus (Filter) Colorimetry

3. Classification

3.1 The following types of liquid membrane-forming compounds are included:

3.1.1 *Type 1*—Clear or translucent without dye,

3.1.2 *Type 1-D*—Clear or translucent with fugitive dye, and

3.1.3 *Type 2*—White pigmented.

3.2 The solids dissolved in the vehicle shall be one of the following classes:

3.2.1 *Class A*—No restrictions,

3.2.2 *Class B*—Must be a resin as defined in Terminology D 883.

NOTE 3—Permanent colors other than white, or other special attributes, are beyond the scope of this specification and are subject to negotiation between the purchaser and the supplier.

[1] This specification is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.22 on Curing Materials.

Current edition approved June 1, 2006. Published June 2006. Originally approved in 1953. Last previous edition approved in 2003 as C 309 – 03.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard.**

4. Ordering Information

4.1 The purchaser shall include the following information in the purchase order when applicable:

4.1.1 Type of liquid membrane-forming compound and class of solids to be furnished, and

4.1.2 Rate of application to be used to determine conformance to this specification. If not specified, the liquid membrane-forming material shall be applied at a rate of 5.0 m^2/L (200 ft^2/gal) for testing purposes.

NOTE 4—The application rate used for testing may, or may not, be the same as the rate to be used for field application. Many agencies use the same rate for field application on relatively smooth surfaces as the rate used for testing, while requiring a substantially greater field application rate on deeply textured surfaces.

4.1.3 The intended method of application (for example, spraying, brushing, or by roller). If not specified, the material shall be of a sprayable consistency.

4.1.4 Maximum permissible volatile organic compound (VOC) content if required by applicable regulations.

5. General Requirements

5.1 Liquid membrane-forming compound Types 1 and 1-D shall be clear or translucent. Membrane-forming compounds with a fugitive dye (Type 1-D) shall be readily distinguishable upon the concrete surface for at least 4 h after application but shall become inconspicuous within 7 days after application if exposed to direct sunlight.

NOTE 5—No laboratory test for the fugitive characteristic of the color in dyed (Type 1-D) compounds is provided in this specification. The disappearance of these colors is strongly dependent on the nature of the exposure and the rate of application of the compounds.

5.2 Type 2 liquid membrane-forming compounds shall consist of finely-divided white pigment and vehicle, ready-mixed for immediate use as is. The membrane-forming compound shall present a uniform white appearance when applied uniformly to a new concrete surface at the specified rate of application.

5.3 Liquid membrane-forming compounds shall be of such a consistency that they can be readily applied by spraying, or by brushing or rolling, when specified, to a uniform coating at temperatures above 4 °C (40 °F).

NOTE 6—For uniform application in the field on vertical concrete surfaces, the specified rate of application may be achieved by two coats applied at an interval of approximately 1 h.

5.4 Liquid membrane-forming compounds shall adhere to freshly placed concrete that has stiffened or set sufficiently to resist marring during application, and to damp, hardened concrete, and shall form a continuous film when applied at the specified rate of application.

5.5 Liquid membrane-forming compounds shall not react deleteriously with concrete. Deleterious reactions are detected by scratching the surface of a mortar specimen (used for the water-retention test) with a knife or screwdriver, not less than 72 h after application, and comparing with the surface hardness similarly determined of a similar specimen that has been moist-cured for approximately half as long. Any softening of the liquid membrane-forming compound-treated surface indicated by such a comparison shall be considered sufficient cause for rejection of the compound.

NOTE 7—Testing for deleterious reactions need only be done for curing compounds of a new or unknown composition.

5.6 Liquid membrane-forming compounds shall be storable for at least 6 months without deterioration, except compounds of the water-emulsion type will not be expected to resist freezing. Type 2 liquid membrane-forming compounds shall not settle out excessively or cake in the container, and shall be capable of being mixed to a uniform consistency by moderate stirring or agitation. When tested for long-term settling, as stated in 10.4, the compound shall have a rating of not less than four.

5.7 The volatile portion of liquid membrane-forming compounds shall be of materials that are neither toxic,[3] nor have flash points less than 10 °C (50 °F), when tested in accordance with 10.6, and shall meet applicable air pollution requirements. When required by the purchaser, the manufacturer shall furnish the VOC content of the liquid membrane-forming compound. The VOC content shall be determined according to Practice D 3960 or as required by the applicable specifications. It is the responsibility of the purchaser to specify and apply the product in accordance with applicable Federal, state, and local regulations.

6. Water Retention Properties

6.1 Liquid membrane-forming compounds, when tested in accordance with 10.1, shall restrict the loss of water to not more than 0.55 kg/m^2 in 72 h.

7. Reflectance Properties

7.1 Type 2 liquid membrane-forming compounds, when tested in accordance with 10.2, shall exhibit a daylight reflectance of not less than 60 %.

8. Drying Time Requirement

8.1 Liquid membrane-forming compounds, when tested in accordance with 10.3, shall dry to touch in not more than 4 h.

9. Sampling

9.1 Samples shall be taken either at the plant or warehouse prior to delivery, or at the point of delivery, at the option of the purchaser. If sampling is done prior to shipment, the inspector representing the purchaser shall have free access to the materials being sampled and shall be afforded all reasonable facilities for inspection and sampling.

9.2 Shake or thoroughly stir liquid membrane-forming compounds before taking a sample. Take one sample for each lot, batch, or other unit of production in a shipment. If the liquid membrane-forming compound is in mixing tanks or vats, one third of the sample shall represent the material coming from the

[3] Toxicity is dependent on the type of material, duration of exposure, and concentration. Concentration will depend on conditions under which the membrane-forming compound is used, that is, in an enclosed space, outside without wind, or outside with wind. Relative toxicity of some materials may be determined from the current edition of "Threshold Limit Values of Airborne Contaminants Adopted by ACGIH," available from the American Conference of Governmental Industrial Hygienists, P.O. Box 1937, Cincinnati, OH 45201.

tank at the beginning of the filling operation, one third shall represent the material coming at the middle of the filling operation, and one third shall represent the material coming at the end of the filling operation. If the liquid membrane-forming compound to be sampled is in containers, obtain a sample by taking a portion out of a number of containers equal in number to the next integer larger than the cube root of the total number of containers in the lot.

9.3 Seal all of the filled containers represented by the sample to prevent leakage, substitution, or dilution. The sampling agency shall mark each container represented by the sample with a suitable identification mark for later identification and correlation.

10. Test Methods

10.1 *Water Retention Test*—Using the application rate specified by the purchaser, or 5.0 m^2/L (200 ft^2/gal) if no rate is specified, test for water retention using Test Method C 156.

10.2 *Reflectance Test*—For Type 2 compounds, on completion of the water retention test, determine the daylight reflectance of the specimens in accordance with Test Method E 1347.

NOTE 8—Daylight reflectance is total luminous reflectance factor, CIE tristimulus value Y for CIE 1931 (2°) standard observer and CIE standard illuminant C or D56.

10.3 *Drying Time Test*:

10.3.1 *Scope*—This test method is used to determine the length of time for a liquid membrane-forming curing compound to dry to the touch and develop into a film that will not track off the concrete.

10.3.2 *Significance and Use*—The ability of a liquid membrane-forming curing compound to dry in a suitable length of time ensures the user of the ability to perform other tasks on the concrete, such as sawing joints, and so forth, without lifting the membrane from the concrete by tracking.

10.3.3 *Procedure*—Apply the membrane-forming compound to a fresh mortar specimen at the specified rate of application and expose it to air at 23 ± 2 °C (73.4 ± 3.6 °F), 50 ± 10 % relative humidity, and at an air velocity of approximately 183 m/min (600 ft/min) horizontally across the surface of the test specimen. Test the film with the finger using moderate pressure. Consider the film to be dry when the soft tacky condition no longer exists and the film feels firm.

10.3.4 *Precision and Bias*—The precision for this procedure is still being determined. The value of drying time can be defined only in terms of a test method; therefore, no statement of bias is being made.

10.4 *Long-Term Settling Test*—Use Test Method D 1309 for routine testing. In the case of dispute, use Test Method D 869.

10.5 *Nonvolatile Content Test*—Test in accordance with Test Method D 2369.

10.6 *Flash Point Test*—Test in accordance with Test Method D 56 using the liquid membrane-forming compound as supplied.

10.7 *VOC Content Test*—When required, use the applicable test methods from Practice D 3960 or determine the VOC content by the procedures specified by the purchaser.

11. Packaging and Package Marking

11.1 The liquid membrane-forming compound shall be delivered in the manufacturer's original, clean, sealed containers. Each container shall be legibly marked with the name of the manufacturer, the trade name of the liquid membrane-forming compound, the type of liquid membrane-forming compound and class of solids, the nominal percentage of nonvolatile material, and the manufacturer's batch or lot number (Note 9). The manufacturer will assign batch or lot numbers to the quantity of membrane-forming compound mixed, sampled, and tested as a single lot. The manufacturer shall exercise care in filling the containers so that all are equally representative of the compound produced.

NOTE 9—The listing of the nominal percentage of nonvolatile material by the manufacturer, and the reporting of this information on the identification accompanying the sample, will assist the testing agency in determining whether the compound in the containers was adequately stirred and the sample is reasonably representative of the membrane-forming compound produced. Type 2 membrane-forming compounds are especially prone to separation due to settling of the pigment.

12. Keywords

12.1 concrete curing; liquid membrane-forming compounds for curing concrete

SUMMARY OF CHANGES

Committee C09 has identified the location of selected changes to this specification since the last issue, C 309 – 03, that may impact the use of this specification. (Approved June 1, 2006)

(*1*) Added new Note 1 and renumbered subsequent notes.