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Solutia, Inc.
St. Louis, MO

Sauget Area 1 HHRA Responses to USEPA Comments

ENSR Corporation
March 2001
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(SR-6J)

February 16, 2001

Mr. D. Michael Light
Manager, Remedial Projects
Solutia, Inc.
P.O. Box 66760
St. Louis, Missouri 63166-6760

RE: Comments on Human Health and Ecological Risk Assessments
Sauget Area 1 Site, Sauget and Cahokia, Illinois

Dear Mr. Light:

A review of Solutia's January 9, 2001, submittal of the Human Health Risk Assessment and the Ecological Risk Assessment for the Sauget Area 1 Site has been conducted by the U.S. Environmental Protection Agency (U.S. EPA) as well as the following agencies: U.S. Army Corps of Engineers (and their contractor Weston, Inc.), Illinois EPA, U.S. Fish and Wildlife Service. The Illinois Department of Natural Resources has also provided informal comments at this time. Comments from all reviewing agencies on both documents are attached. Until these comments are fully addressed U.S. EPA cannot approve the risk assessments. Please re-submit the revised assessments on or before March 30, 2001. In an effort to expedite Solutia's revision process and to help assure that Solutia understands the needed revisions outlined in our comments, we plan to meet to discuss the comments on Wednesday February 21, 2001, at 9:00 am at the Sauget Village Hall.

If you have any questions regarding the attached comments before our February 21st meeting, please do not hesitate to contact me at 312/886-4663.

Sincerely,

Michael McAteer
Remedial Project Manager

cc: Thomas Martin, USEPA
Tim Gouger, USACE
Candy Morin, IEPA
Kevin de la Bruere, USFWS
Michael Henry, IDNR

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5

COMMENTS ON HUMAN HEALTH RISK ASSESSMENT AND
ECOLOGICAL RISK ASSESSMENT

SAUGET AREA 1 SITE – SAUGET/CAHOKIA, ILLINOIS

Human Health Risk Assessment:

1. Page 3-9, Section 3.2.3.1: At the end of the fifth paragraph on this page, a statement needs to be added regarding the fact that neither U.S. EPA nor Illinois EPA consider TACO to be an ARAR and that the HHRA's use of TACO here is for screening purposes only.

RESPONSE TO USEPA-1:

The following text will be inserted in Section 3.2.3.1 on Page 3-9 at the end of the second paragraph:

> **INSERT-1: It should be noted that the TACO Tier 1 criteria are being used here strictly as screening values; they are not considered either by USEPA or IEPA to be an "applicable or relevant and appropriate requirement" (ARAR) under the NCP.**

In addition, ARAR will be added to the List of Acronyms.

2. Page 5-5, Section 5.2.2: In the first paragraph of this section the statement is made regarding the Borrow Pit lake that "access is very difficult due to its setting." U.S. EPA does not agree with this statement. There are no barriers to accessing this lake and U.S. EPA has encountered local residents fishing in the area (i.e., Old Prairie Du Pont Creek). Please revise this statement accordingly.

RESPONSE TO USEPA-2:

On Page 5-5, the third sentence of the first paragraph of Section 5.2.2 will be replaced with the following text:

> **INSERT-2: The Borrow Pit Lake is located on private property, and access is uncontrolled. Recreational fishing may occur in Borrow Pit Lake.**

3. **Page 5-14, Section 5.4.3:** The calculation for determining the number of days per year that a worker would not likely be exposed to soils due to weather restrictions seems to be an overestimation. A rainfall event of only .1 inches, or even up to or slightly in excess of .5 inches, would not likely restrict outdoor activities. Also, the average daily maximum temperature for St. Louis never drops below 32 degrees (F.) at any point during the year (the lowest average daily max. is 37 degrees for 12 days during mid-January). Given this, it is unreasonable to assume 27 days per year of weather restrictions relating to "cold" temperatures.

USEPA-3

This comment was discussed at the February 21, 2001 meeting conducted at the Sauget Village Hall between USEPA and its contractors the USACE and Weston/Avatar; IEPA; the USFWS; and Solutia and its contractors ENSR and Menzie-Cura (hereinafter referred to as the 2/21/01 meeting). ENSR clarified that the use of the meteorological factor based on temperature and precipitation did not mean that workers or residents would not be outdoors on such days, only that the soil would not be available for significant contact either because it was wet or frozen. It was agreed that this would be clarified in the text. The following text will be inserted on Page 5-13, Section 5.4.3 before the last sentence of the first paragraph:

> **INSERT-3: This is not to say that workers or residents would not be outdoors on such days, only that the soil would not be available for significant contact either because it is wet or frozen.**

ENSR's meteorologist, Brian Stormwind, spoke with Mike McAteer of the USEPA on 2/28/01. They agreed that the USEPA's information in the comment about the "average daily maximum temperature" is correct, i.e., the lowest average maximum daily temperature in January is approximately 37 degrees. Because it is an average, some days the maximum temperature might be higher and some days it might be lower. They also agreed that the value used in the risk assessment for the "average number of days during the year with a maximum temperature less than 32 degrees" is also correct. Again, because it is an average, some years the number of days might be higher and some years the number of days might be lower. Subsequently, on 3/2/01, Mike McAteer and Lisa Bradley of ENSR spoke and agreed that the meteorological factor used in the risk assessment was appropriate and that no revision to the quantitative risk assessment was necessary. However, it was agreed that the use of the meteorological factor would be discussed in the uncertainty section. The following text will be inserted in Section 6.5.3 on Page 6-13 as a new third

paragraph under "Exposure Assumptions":

> **INSERT-4: A meteorological factor was used in the risk assessment to account for the number of days when direct contact with soil or intrusive activities will not occur for receptors during inclement weather, i.e., when it is raining or snowing, when the ground is wet or frozen, or when snow or ice (32 degrees F) are covering the ground. This is not to say that workers or residents would not be outdoors on such days, only that the soil would not be available for significant contact either because it is wet or frozen. Thus, the exposure frequency was adjusted for these site-specific meteorological conditions. A meteorological factor of 24% was calculated (see Section 5.4.3). The meteorological factor was applied only to the resident and outdoor industrial worker receptors (not to the indoor industrial worker, construction worker, trespassing teen, recreational teen or recreational fisher receptors). A review of the RME and MLE risk and hazard estimates for these receptors indicates that if a meteorological factor was not used in the risk assessment, all risks that are within the target risk range would remain within the target risk range, and all hazards that are below the target of one would remain below the target. Therefore, the conclusions and recommended response actions would not change based on the use of the meteorological factor.**

4. Page 8-13, Section 8.5: It is unclear how Solutia has come to the conclusion that remedial action is needed only at a single location at Site I based on the data. Clearly the HHRA as it now stands shows risks in excess of U.S. EPA's acceptable risk range for Sites, G, H and I. This statement needs to be revised in accordance with the data.

RESPONSE TO USEPA-4:

A remedial action was recommended for Site I based on an exceedance of the target risk range and an exceedance of the toxic-endpoint based target hazard index for the RME outdoor industrial worker receptor due to direct contact exposures to COCs in soil. A remedial action was recommended for Sites H and I based on an exceedance of the target risk range and exceedances of the toxic-endpoint based target hazard indices for the RME outdoor industrial worker due to COCs in soil and the RME construction worker receptor due to exposure to COCs in groundwater. The recommended remedial action for these Sites consisted of institutional controls to prevent excavation into the Sites, and the use of appropriate personal protective equipment (PPE) should excavation be deemed necessary in the future. Note that although the total hazard index for the RME construction worker at Site G exceeded the target of one, the target was not

exceeded on a toxic-endpoint-specific basis (see Table 8-5), therefore, no remedial actions were proposed for this Site.

Since submittal of the HHRA and the 2/21/01 meeting, the EE/CA and RI/FS for Sauget Area 1 has been submitted to USEPA (3/9/01). This document presents remedial options for Sauget Area 1 in greater detail.

In response to other comments received on the HHRA (see USACE-COVER-1 through 4 below), additional evaluation of the construction worker scenario is being conducted. The results will be summarized in a revised Section 8 (presented here as Attachment 7), as discussed in the response to comment WESTON-9.

<u>Ecological Risk Assessment</u>

1. **Page 10:** Under the discussion of the Bald Eagle, it should be noted here, as well as in other areas of the report where discussing the Bald Eagle (i.e., page 29), that personnel from both U.S. EPA and Illinois EPA spotted two bald eagles on-site (in area of Site Q at Sauget Area 2) in late 1999.

2. **Page 16:** In the discussion relating to Biota there is a statement regarding the fact that no fish were present in Dead Creek Segment F. Is this a result of low water levels or no water in the segment at that time? This should be explained in the text.

3. **Page 26:** The statement in the first full paragraph on this page that both the reference areas and the Site study areas are both impaired to the same degree seems to conflict with the statement in the paragraph above it: "The number of organisms in reference location Ref 2-1 is greater than the other stations by an order of magnitude." Are the "other stations" referred to here at the Site or other reference locations?

4. **Page 45 – Summary and Conclusions:** U.S. EPA has a general concern with the conclusions reached by Solutia regarding known damage and potential risks to the environment from contamination in Dead Creek Segment F and the Borrow Pit Lake. The assessment over emphasizes the results that indicate little or no risk to certain areas of the Site. However, of more concern to U.S. EPA and eventually the public, are those study results that clearly indicate known or potential damage to the environment at the Site. This section must be revised to include and elaborate on the following facts:

- numerous contaminants of concern exceed ecological benchmarks at that Site area, well in excess of levels found in the reference areas

- fish body burdens for mercury exceed toxic benchmarks, something not seen in the reference areas, clearly indicating that there is some potential for adverse effects on fish in the Site area
- food chain modeling indicates potential risk to great blue heron eating mercury contaminated fish at the Site
- In Creek Segment F, Probable Effects Concentrations (PEC) or Severe Effects Levels (SEL) were exceeded for six metals: cadmium, copper, lead, mercury, nickel and zinc. Threshold Effects Concentrations (TEL) were exceeded for these metals and for arsenic, iron, manganese, total PCBs, seven pesticides and fluoranthene - again this indicates a real potential for adverse effects on biota.
- In the Borrow Pit Lake, PEC and SEL guidelines were exceeded by manganese and nickel and these metals plus arsenic, cadmium, copper, iron, lead, zinc, DDE, total DDT, gamma-BHC, and heptachlor epoxide exceeded the TEC and LEL values.
- In the Acute Toxicity Test for Hyallela Azteca, the growth of this amphipod was statistically lower in stations 1 and 3 in the Borrow Pit Lake
- In the Chronic Toxicity Test for C. tentans, survival, emergence, and reproduction in stations BP-1 and BP-3 in the Borrow Pit Lake were significantly lower than the laboratory controls.
- Hazard Indices exceeded 1 for the river otter and herons under certain Borrow Pit Lake foraging scenarios

Michael McAteer
US Environmental Protection Agency, Region V
Superfund Program
77 West Jackson Blvd
Chicago, IL 60604

Mr. McAteer,

As requested, the U.S. Army Corps of Engineers and our Contractor, Roy F. Weston Inc, have finished reviewing the Sauget Area 1 – EECA & RI/FS, Volume II, Human Health Risk Assessment and the Ecological Risk Assessment submitted January, 2001. Our comments to these documents are provided in the attachments. Finalization of our review and comment for the EECA and RI/FS Support Sampling Plan, Volume 2, Leachate Treatability Tests will be submitted to you by February 23, 2001.

Though review of the Human Health Risk Assessment demonstrated substantial consistency with the planning documents, we cannot recommend approval given the following:

1. Prior characterization work showed organic and inorganic soil contamination greater than a percent of the soil, or higher than 10,000 mg/kg for waste compounds in many waste areas. However, the wastes and highly contaminated soils were not addressed in the risk assessment, which significantly compromised the adequacy of the assessment.

   See response below.

2. The Waste Boring samples were analyzed for TCLP parameters rather than Total parameters. The TCLP analyses does not further define the extent of soil contamination, though does provide a characteristic classification for off-site disposal.

   See response below.

3. The TCLP analyses cannot be used in the risk assessments, only total analyses can.

   See response below.

4. While the human health risk assessment does include the construction worker scenario with exposure to groundwater, the scenario does not include exposure to contaminated soil or wastes. Also, the leachate analyses should also be evaluated in the construction worker exposure scenario.

RESPONSE TO USACE - COVER 1 through 4:

USEPA and Solutia have agreed that additional construction worker evaluations will be included in the HHRA. A separate evaluation of the construction worker receptor's potential exposure to subsurface soil/waste and leachate in Sites G, H, I and L has been conducted. Subsurface soil/waste data were obtained from the E&E report (Sauget Area 1 Data Tables/Maps, Ecology and Environment, Inc., February 1998, prepared for USEPA Region 5 Office of Superfund, Chicago, IL, ARCS Contract No. 68-W8-0086, Work Assignment No. 47-5N60). The construction worker receptor's potential exposure to leachate in Sites G, H, I and L was conducted using the TCLP data obtained from the SSP (i.e., the TCLP data are being used as a surrogate for leachate data). This evaluation will be presented in a new Appendix T, which is submitted here as Attachment 1. This evaluation is being conducted in addition to the construction worker scenarios already included in the HHRA. The results will also be discussed in Section 6.3.3.1 and the revised Section 8 (see Attachment 7).

The following text will be inserted as a new Section 6.3.3.1 on Page 6-5, at the end of the 6.3.3 text:

INSERT-20: 6.3.3.1 Summary of Additional Construction Worker Evaluation.

Pursuant to comments received from USEPA on the December 29, 2000 Human Health Risk Assessment for Sauget Area 1 (the HHRA), an additional evaluation has been conducted for the construction worker and is presented in Appendix T. This evaluation has been conducted to evaluate potential risks to the construction worker associated with constituents in subsurface soil and in leachate in Sites G, H, I and L, and follows the same methods as the HHRA.

Subsurface samples collected in the Sites as part of the SSP were analyzed for TCLP, not total constituent concentrations. Therefore, historical data collected for other investigations were employed to evaluate construction worker contact with COPCs in the subsurface. These data were obtained from the following: Sauget Area 1 Data

Tables/Maps, Ecology and Environmental, Inc., February 1998, prepared for USEPA Region 5 Office of Superfund, Chicago, IL, ARCS Contract No. 68-W8-0086, Work Assignment No. 47-5N60. The historical data are unvalidated, and detection limits were not available for the majority of results reported as not detected. Therefore, only results reported as detected were used in this evaluation.

TCLP data from subsurface samples collected in the Sites were used to represent leachate concentrations, i.e., concentrations in groundwater within the fill material. This evaluation is separate from, and in addition to, the evaluation of the construction worker receptor's exposure to groundwater in the main text of the HHRA (in which the Site groundwater data were used).

The potential risk for the construction worker for both the RME and MLE scenarios for all Sites is below or within the USEPA risk range of 10^{-4} to 10^{-6}.

The potential HIs for the construction worker (RME) are above the target HI of 1 in each Site. The HI for the construction worker for the MLE scenario is above 1 for all Sites with the exception of Site L.

Without addressing these concerns and the comments provided in the attachments, the Human Health Risk Assessment is incomplete and misleading.

Our review of the Ecological Risk Assessment identifies numerous sections, which lack the specificity to even support the risk assessment. Considerable effort is needed to address the attached comments and develop a defensible document.

If you have any questions or comments, please call me at (402) 293-2514.

Sincerely

Timothy P. Gouger, PE
USACE Rapid Response
Project Manager

USACE COMMENTS

Comments on the
Human Health Risk Assessment
USACE Thomason
Sauget Site, Illinois

February 13, 2001

1. **General Comment** - Please provide a summary of all deviations from the work plan and explanations for these deviations.

   RESPONSE TO USACE (2/01)-1:

   A summary of the deviations from the work plan and explanations for the deviations are presented in the table in Attachment 2. This table will be included as Table 1-1 of Section 1 of the text. The following text will be inserted as a new paragraph 4 on Page 1-1 of Section 1:

   > **INSERT-10: There have been some deviations from the work plan in the conduct of this HHRA. Table 1-1 provides a summary and explanation of the deviations.**

2. **Sections 5 and 6** - The construction worker scenario for waste sites was not properly evaluated since only surface soil data was used. Most of the data obtained during investigation of the waste sites could not be used to evaluate direct contact risk due to subsurface soil. It doesn't make sense to assume that the construction worker might have direct contact with groundwater in an excavation, but not the soil. The risk assessment should not be accepted until this exposure pathway is appropriately assessed.

   RESPONSE TO USACE (2/01)-2:

   Construction worker potential exposure to COPCs in subsurface soil/waste and leachate is being addressed in this response to comments document. Please see response to "USACE-COVER-1 through 4" comment above.

3. **Section 6 - Paragraph 5.3.5.** The HHRA work plan stated that the recreational teenager and residential receptor risks would be evaluated both separately and in total. Is there a table in Section 6 showing these combined risks?

RESPONSE TO USACE (2/01)-3:

Table 5-1 of the HHRA Work Plan provided the proposed Receptor/Area matrix for the HHRA for Sauget Area 1. This table indicated that resident receptor risks for each transect would be added to the recreational teen receptor risks calculated for the adjacent Dead Creek segment. Due to its distance from the residential transects, creek segment F and the Borrow Pit Lake were not included for the proposed cumulative risk evaluation.

On May 31, 2000, subsequent to the preparation of the work plan, and prior to the preparation of the HHRA, the USEPA issued a Unilateral Administrative Order (UAO) to Monsanto Company and Solutia Inc. (Docket No. V-W-99-C-554) pursuant to section 106(a) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 as amended, 42 U.S.C. Section 9606(a). The Order required response activities at Sauget Area 1 Creek Segments B and Site M and Creek Segments C, D and E and the portion of Creek Segment F between Creek Segment E and Route 3, which are located in Sauget and Cahokia, Illinois, including the removal of sediments from these areas. Therefore, environmental data from Site M and Dead Creek segments CS-B, CS-C, CS-D, CS-E, and a portion of CS-F were not included in the risk assessment.

Table 5-1 of the HHRA report presents the receptor/area matrix for Sauget Area 1 based on both the removal action and the identification of COPCs in each environmental medium. As CS-F was not identified for the recreational/residential receptor cumulative risk assessment in the work plan, the cumulative evaluation was not included in the HHRA report. As can be seen in the Section 8 summary tables, the recreational teen risks and hazards would not significantly add to even the highest residential risks and hazards.

4. **Sections 6.1 and 8.4.1**. The same 1991 EPA guidance which is cited to support a target risk level for carcinogens of 10^{-4} also states: "A risk manager may also decide that a baseline risk level less than 10^{-4} is unacceptable due to site specific reasons and that remedial action is warranted." It also states: "Once a decision has been made to take an action, the Agency has expressed a preference for cleanups achieving the more protective end of the range (i.e., 10^{-6}), although waste management strategies achieving reductions in site risks anywhere within the risk range may be deemed acceptable by the EPA risk manager." In order that appropriate risk management decisions can be made, the risk characterization

should identify all scenarios where a 10^{-6} carcinogenic risk is exceeded and selection of COCs should be based on an exceedance of this level. Remedial goal options corresponding to 10^{-4}, 10^{-5}, and 10^{-6} should then be developed.

RESPONSE TO USACE (2/01)-4:

As agreed in the 2/21/01 meeting, Section 8 will present a listing of receptors/areas/pathways and the major risk-driving constituents that have risks:

- **Below the 10^{-6} risk level;**
- **In the 10^{-6} to 10^{-5} risk range;**
- **In the 10^{-5} to 10^{-4} risk range; and**
- **Above the 10^{-4} risk level.**

As noted in later comment responses (WESTON-9), Section 8.4 through the end of Section 8 have been revised to increase clarity, and to address the additional risk evaluations for the construction worker noted above. The revised sections, presented here as Attachment 7, include the above listing.

5. **Section 8**. While it is understood that ordinances are in effect in Sauget and Cahokia prohibiting the use of groundwater as a potable water supply, this document does not evaluate whether the waste areas may be impacting groundwater used for drinking water in other locations or what future impacts the waste areas may have on area groundwater. The potential for residential nonpotable wells to become more contaminated is not evaluated. The summary and conclusions should state this.

RESPONSE TO USACE (2/01)-5:

Since submittal of the HHRA and the 2/21/01 meeting, the EE/CA and RI/FS for Sauget Area 1 has been submitted to USEPA (3/9/01). This document discusses the direction of groundwater flow and provides evidence that the nonpotable use residential wells evaluated in the risk assessment are cross-gradient of the groundwater beneath Sites G, H, and I. As discussed in the 2/21/01 meeting, the following text from the EE/CA and RI/FS report (Sections 3.3.2 and 4.2.6) will be inserted as a new paragraph on page 5-2 after the second paragraph in Section 5.1.1 that discusses the

conceptual site model for the Sites.

INSERT-5: As discussed in the EE/CA and RI/FS report for Sauget Area 1, groundwater flow direction was evaluated by installing nine piezometer clusters within the area. Each cluster contained three small-diameter piezometers screened in the shallow hydrogeologic unit (0-30 feet bgs), the middle hydrogeologic unit (30-70 feet bgs), and the deep hydrogeologic unit (greater than 60 feet bgs). Each of these wells was gauged quarterly to determine the potentiometric surface in each zone. The data for two of the quarters were plotted to show the potentiometric surface contours for groundwater. [These are shown in Figures 4-28 through 4-33 of the EE/CS and RI/FS report.] The results indicate that groundwater flow direction is to the west at an approximate gradient of one foot vertical to 1,000 feet horizontal. These results indicate that the nonpotable use domestic wells sampled in the residential area are in fact cross-gradient of groundwater beneath the Sites where COPCs were identified in groundwater.

6. **Appendix D and Appendix G**. The Region 4 guidance cited regarding background levels states that this is for use with naturally occurring inorganics and radionuclides. Background levels for anything else should not be used to screen contaminants out (soil to groundwater pathway COPC selection).

RESPONSE TO USACE (2/01)-6:

Arsenic was the only constituent that was eliminated as a COI for the quantitative risk assessment based solely on background. In the soil to groundwater screening, the only constituents screened out solely based on background were those that did not have a soil to groundwater screening value. Please see the response to comment USACE(2/01)-7 below.

RESPONSE TO USACE (2/01)-7:

The response to this comment is provided in Attachment 18.

7. **Appendix G**. Regarding soil to groundwater pathway COPC selection, if a TACO screening value is not available, the contaminant should be retained for evaluation, not eliminated.

Comments on the
Human Health Risk Assessment
Sauget Site, St. Louis, Missouri
December, 2000

1. **Section 2.2 Sediment Removal Action**: Omission of Creek Segments B-F and Site M. Even if these areas are going to be subject to a removal action, they should be included in the Risk Assessment to ensure that the removal actions are sufficient and no further remedial actions will be required.

RESPONSE TO USACE (12/00)-1:

As discussed in the 2/21/01 meeting, exit sampling will be conducted post sediment removal, and a risk assessment will be performed on these data to determine what, if any, additional actions should be taken in these sections of Dead Creek and Site M. As agreed, text indicating this will be added to Section 2.2 on Page 2-3 (before the text that discusses the conceptual site model) as follows:

> **INSERT-7: Upon completion of the sediment removal action, exit sampling will be conducted in Dead Creek and Site M. A risk assessment will be performed using these data to determine what, if any, additional actions should be taken in these areas.**

2. **Appendix D: Background Samples**: These appear to be poor choices for background samples, particularly EE-20. As the samples contain the same contaminant as the sites, it is not clear that the locations are outside the influence of the site. Although they do not greatly impact the Risk Assessment, it is not clear that they are appropriate for use in any Removal/Remedial Action Objective decisions.

RESPONSE TO USACE (12/00)-2:

As discussed in the 2/21/01 meeting, arsenic is the only constituent eliminated as a COPC for the quantitative risk assessment based solely on the background comparison, and it was agreed that location EE-20 is not necessarily representative of background concentrations of organics. The following text will be inserted on Page 3-8 at the end of Section 3.2.2 and as the last paragraph of Appendix D:

> **INSERT-8: The background locations for soil and groundwater are those identified by USEPA or its contractors in previous investigations. A review of the background data for the soil samples indicates that organic**

constituent concentrations from location EE-20 may not be representative of background, although the inorganic concentrations are similar to those from the other background locations. Since arsenic is the only constituent eliminated as a COPC based solely on the comparison to background, the use of this sample's results has not affected the outcome of the risk assessment.

3. **Appendix E and F: COPC Selection for Soils and Sediments**: Unless Transect 4 and Site N are going to be treated as a single unit for any remedial/removal considerations, include the Transect data which falls within Site N with the Site N data.

RESPONSE TO USACE (12/00)-3:

As discussed in the 2/21/01 meeting, Transect 4 does go through Site N. Both the transect data and the Site N data were evaluated for worker and residential receptors. It was agreed that evaluating Transect 4 and Site N as one area would not change the risk assessment results or conclusions. Therefore, the following text will be inserted on Page 3-5 as the next to last paragraph in Section 3.1.4.2:

INSERT-9: It should be noted that some of the samples in Transect 4 were taken in Site N. Although both sets of data are evaluated for both residential and worker scenarios, their evaluation has been conducted separately in the HHRA.

4. **Appendix H; COPC Selection for Groundwater**: For the evaluation of the waste pit areas groundwater to construction worker pathway, leachate data is available for both Sites G and I which should be included for the waste areas of those sites.

RESPONSE TO USACE (12/00)-4:

Construction worker potential exposure to COPCs in subsurface soil/waste and leachate is being addressed in this response to comments document. Please see response to "USACE-COVER-1 through 4" comment above.

5. **Appendix J; Evaluation of Ambient Air Monitoring Data**: The screening only presents the volatile organic data. Include the other parameters and provide the air volumes used for each sample.

RESPONSE TO USACE (12/00)-5:

Appendix J has been revised and is included here as Attachment 3. Based on these revisions, Table 3-7 of the report has been revised and is presented here

as Attachment 15. In addition, the following text will be added to Section 3.3.6 on Page 3-16 before the last sentence/paragraph:

> **INSERT 18: As discussed in Appendix J, the detected concentration of cadmium does not exceed its respective PRG adjusted for an 8 hours per day, 250 days per year adult worker scenario, and a $1x10^{-5}$ target risk level.**

WESTON COMMENTS

Comments on the
Human Health Risk Assessment
Solutia, Sauget Site, Illinois
February 13, 2001 Comments

1.0 Introduction

Roy F. Weston Inc (WESTON) was retained by the Army Corps of Engineers (ACOE) and the US Environmental Protection Agency (USEPA) to review and provide comments on the *Human Health Risk Assessment, Sauget Area 1* prepared by ENSR International (December, 2000).

In general, the manner in which the HHRA was conducted was consistent with the procedure proposed in the Work Plan. Additionally, the equations used to calculate chemical exposure to the various receptors followed the paradigm recommended by U.S. EPA, and the exposure factor assumptions used in those equations were obtained, for the most part, from acceptable U.S. EPA guidance. However we have concerns regarding the procedure used to select COPC and the data used to calculate exposure point concentrations (EPC) for soil and sediment. First, we believe that determination of COPC based on comparison with TACO values may be inappropriate (see comment in review of Appendix C).

RESPONSE TO WESTON-1:

As discussed in the 2/21/01 meeting, it was agreed that use of the TACO values for COPC screening was appropriate.

Second, it is our understanding that representative sampling may not have been used to estimate EPC in the various areas of the Sauget site. Inspection of historical soil data from Areas H and I of the Sauget site corroborated this concern. This issue in particular is addressed in the ACOE review comments. Based on these two issues, the results and conclusions of the HHRA may not be representative of true conditions at the site, regardless of the "correctness" of the approach used to characterize risk.

RESPONSE TO WESTON-2:

As discussed in the 2/21/01 meeting and in the response to comments "USACE-COVER-1 through 4," additional data have been used to evaluate the subsurface soil/waste and leachate at the Sites.

Comments are provided below for the Work Plan, the technical sections of the HHRA and the supporting appendices. Note that much of the supporting methodology for the performance of the risk assessment was provided in the attendant appendices. Consequently, some of the more

substantive comments are associated with the review of those appendices.

Comments to the Work Plan

The Work Plan is incorporated into the body of the Sauget HHRA as Appendix A. The purpose of examining the Work Plan was to develop a clear understanding of the process that ENSR proposed to follow in the risk assessment with regard to the following:

- Selection of COPCs
- Application of toxicity benchmarks
- Identification of potential exposure scenarios/receptors
- Structure of the exposure algorithms
- Assumptions regarding parameter values in the exposure algorithms
- Characterization of risk
- Uncertainty analysis

In general, the approach specified in the Work Plan follows U.S. EPA guidance. The conceptual site model accounted for all conceivable pathways and routes of exposure and respective receptors. The proposed handling of data (including "non-detects"), comparison with background, and the calculation of exposure point concentrations followed the EPA paradigm.

WESTON understands that EPA had previously approved the Work Plan; however, during examination of the document, some technical issues were identified in Section 5 (Exposure Assessment) that might not be appropriate or that are erroneous. Those issues are addressed below.

Specific Issues –

Soil Adherence Factor Tables - Small discrepancies were noted for total soil mass on some body parts when surface area and soil loading were multiplied. Those were probably the result of data truncation or rounding. However, please check the calculation and provide an example.

RESPONSE TO WESTON-3:

Tables 5-11 and 5-12 have been revised and are presented here as Attachment 4; the changes do not affect the values used for the soil to skin adherence factor used in the risk calculations. An example calculation is provided in Attachment 4 (this example is provided for

information purposes here and will not be included in the final report).

Section 1 – no substantive comments

Section 2 – no substantive comments

Section 3 –

Specific comment – Section 3.3.6, line 4, change Figure 3-9 to Figure 3-7.

RESPONSE TO WESTON-4:

Reference to the correct figure number (3-7) will be made in the final report.

Section 4 –

All RfDs and CSFs reported in Tables 4-1 through 4-4 were confirmed against values reported in IRIS, HEAST, and the latest EPA Region 3 RBC Table. No discrepancies were found.

Section 5 –

The procedures and assumptions described in Section 5 of the HHRA are consistent with those proposed in the Work Plan. The CSM presents a reasonable array of receptors to site-related chemicals.

The equations used to characterize exposure basically follow the EPA paradigm. Also, most of the exposure factor assumptions used in the exposure characterization (presented in Tables 5-2 through 5-13) are based on EPA guidance, and are reasonably conservative. However, for the adult and child resident scenarios, the total soil mass values for feet and area-weighted soil adherence factors presented in Tables 5-11 and 5-12 are incorrect **(see Response to Weston-3, above)**. Those values were carried through from the Work Plan. Again, we refer the authors to comments in the review of the Work Plan.

Weston agrees with the approach described in Section 5.6.1.1 **[the correct citation is 5.5.1.1]** regarding calculation of EPCs. However, clarification is necessary regarding the calculation of the 95% UCL for lognormally distributed data. Specifically, the authors stated that the H-statistic values were obtained from Gilbert (1987). For many of the summary statistics reported in the Tables in Appendix B, the numbers of samples used to generate the summary statistics were equal to 2, 4, 6, 8, 9, and 43. However, the H-Statistic Tables in Gilbert (1987) only include H-statistic values for n = 3, 5, 7, 10, 12, 15, 21, 31, 51, and 101. H-statistic values for n other than

those presented in the Tables cannot be interpolated linearly. Values are derived using four-point Lagrangian interpolation. The authors need to expand this discussion to explain how H-statistics were interpolated, and include an example to demonstrate the technique.

RESPONSE TO WESTON-5:

The following text will be inserted in Section 5.5.1.1 on Page 5-16 as an addition to the paragraph below the definition of the H-statistic parameters.

> **INSERT 19: Gilbert (1987) provides a subset of all H-statistic values. Where a specific value was not available, the H-statistic was estimated based on linear interpolation using the Table A12 from Gilbert (1987). The H-statistic is a function of the standard deviation of the log-transformed data (Sy) and the number of samples in the statistical data set (n). The table presents values for H based on specific combinations of Sy and n. If the Sy and n for the specific analyte did not correspond to the values represented on the table, then the value of H was estimated based on interpolation. First, the values were interpolated based on the relative Sy, and then based on the relative n. For example, a constituent with Sy of 0.59 and n of 9 results has an interpolated H of 2.55.**

The AAFs presented in Table 5-41 are consistent with those values reported in Appendix O (Absorption Adjustment Factors) and the Tables in Appendix P. However, the authors are referred to comments regarding the use of AAFs in the review of Appendix O. Permeability constants in Table 5-42 are consistent with those reported in the EPA document, *Dermal Exposure Assessment: Principles and Applications* (EPA, 1992b). The surrogate values presented in Table 5-42 appear reasonable. Additionally, the calculated values in Table 5-43 are correct.

The COPC in Tables 5-14 through 5-17 and 5-21 through 5-40 are consistent with those presented in Tables 3-1 through 3-7, and Appendices E through J. Additionally, the EPC values for those COPC are consistent with those in Appendices B and E through J.

Section 6 –

Section 6 (Risk Characterization) of the Sauget HHRA was generally well written and contained all of the elements that one would expect of a qualitative analysis of uncertainty. The discussion regarding the risks to the various receptors was consistent with the numerical summaries presented in Tables 6-1 through 6-28. The risk and hazard values in those Tables were compared with those reported in Appendix P. We found only one discrepancy. On Table 6-2 (Indoor Worker), the HQ associated with inhalation exposure to 4-methyl-2-pentanone intruding to indoor air from groundwater in Site G is listed as NC (Not calculated, no dose-response value

or not a constituent of potential concern in this area/medium). However, it is listed as a COPC in Table 3-5 (EEG-107) and Appendix H, and the corresponding Table in Appendix P reports an HQ of 2.30E-03 for that compound. We found no other discrepancies in the Section 6 Tables.

RESPONSE TO WESTON-6:

Table 6-2 has been revised and is presented here as Attachment 5.

Section 7 –

Section 7 (Short-Term Risk Assessment) of the Sauget HHRA was consistent with the approach described in the Workplan. Additionally, the STCOPC identified in Section 7 are consistent with those reported in Appendices E through J. Weston has one concern regarding the screening of calculated excavation air concentrations against USEPA Region 9 air PRGs to evaluate potential STCOPC for that pathway. As indicated in the review of Appendix L, the authors calculated the excavation air concentration by multiplying the groundwater concentration by a groundwater-to-air attenuation factor. The EPA methodology cited by the authors does not recommend the use of an attenuation factor in the model. Additionally, there is no indication that the authors accounted for temperature-dependence for such parameters as Henry's Law constant values or air and water diffusion coefficients. Thus, the calculated excavation air concentrations used in the HHRA may not be appropriate.

RESPONSE TO WESTON-7:

This comment was discussed in a conference call on Friday 2/23/01; attendees were USEPA contractors Florence Sevold and Bob Fares of Avatar, and Lisa JN Bradley and Mike Mills of ENSR. The specific topic was the model presented in Appendix L of the HHRA. It was agreed that the model was appropriate as used, but that the explanatory text in Appendix L would be revised to discuss the conservatism of the model with respect to input assumptions and temperature dependence, and that additional text would be added to the uncertainty discussion in Section 6. The revised Appendix L is presented here as Attachment 6. The following text will be inserted in Section 6.5.3 on Page 6-13 just before the "Exposure Assumptions" section:

INSERT-17:

<u>Calculated EPCs.</u> Models were used to calculate the concentration of a volatile constituent in air based on its concentration in groundwater. Models were used to predict indoor air concentrations, outdoor air concentrations, and excavation trench air concentrations. Although assumptions are made about constituent behavior in each of these

models, the assumptions used are conservative in that they tend to result in over-predictions rather than under-predictions of air concentrations.

Specific comment – Section 7.2.6, second paragraph, line 2: change "concentrations in to" to "concentrations in air to"

RESPONSE TO WESTON-8:

The referenced change will be made in the final report.

Section 8 –

In general, the information presented in Section 8 (Summary and Conclusions) is consistent with the Workplan and the other Sections of the HHRA. However, Section 8.4.3 (Potential Carcinogenic Risk) does not have the same level of detail as that presented in Section 8.4.2 (Non-Carcinogenic Risk Characterization). Instead, the authors included a short discussion of remediation goals (RG). Aside from a brief comment in Section 6 that RGs are calculated for each COC in Section 8, this was the first time that calculation of RGs was discussed in the HHRA. Although the approach appears to be appropriate for this HHRA, the authors need to expand the discussion to include the source of the approach, an annotated example to facilitate understanding, and situations in which this approach may not be appropriate.

RESPONSE TO WESTON-9:

Text in Section 8 from Section 8.4 (page 8-7) to the end has been revised to provide more clarity and detail, and to incorporate the supplemental construction worker scenario results (Appendix T/Attachment 1). The revised portions of Section 8 are presented here as Attachment 7.

Consider the following example as it applies to the limited discussion in Section 8.4.3. If there were four chemicals in a medium that had a cumulative risk of 5E-04, one of those chemicals had an EPC of 120 mg/kg and a risk of 1.2E-04, and the target risk is 1E-04, how would this approach be used to calculate RGs for the four chemicals? Using the approach described in Section 8.4.3, one would wind up with a negative target risk (-3E-04) and RG (-300). Obviously, one can have neither a negative risk nor a negative RG. Is something missing from the RG calculation description, or is the approach flawed?

RESPONSE TO WESTON-10:

The RG calculation methodology was discussed at the 2/21/01 meeting. As stated in the response above, Section 8 has been revised to clarify the RG calculation

methodology and is presented here as Attachment 7.

Appendices

The following Appendices were reviewed to determine the accuracy with which various parameters used in the exposure equations were calculated:

- B – Summary Statistics
- C – Screening Values
- D – Background Calculations
- E – COPC Selection for Soils and Sediment for Residential Scenarios
- F – COPC Selection for Industrial Scenarios
- G – COPC Selection for the Soil to Groundwater Pathway
- H – COPC Selection for Groundwater
- I – COPC Selection for Surface Water and Fish Tissue
- J – Evaluation of Ambient Air Monitoring Data
- K – Calculation of Indoor Air VOC Concentrations From Groundwater
- L – Calculation of Excavation Air VOC Concentrations From Standing Water
- M – Calculation of Outdoor Air VOC Concentrations From Groundwater
- N – Calculation of Produce Concentrations
- O – Absorption Adjustment Factors (AAFs)
- P – Risk Calculation Spreadsheets
- Q – Assessment of Potential Lead Exposures
- R – Toxic Endpoint Analysis

Comments regarding the various Appendices are presented below.

Appendix B –

The format of the summary statistics is consistent with that proposed in the Work Plan. Additionally, the EPC values were selected consistent with the procedure described in the Work Plan and Section 5.5.1.1 of the HHRA. However, there is some concern regarding calculation of the 95 % UCL for lognormally distributed data in the review of Section 5.

(See RESPONSE TO WESTON-5, above):

Specific comment – Footnotes are missing from the Tables.

RESPONSE TO WESTON-11:

Attachment 8 presents the table of footnotes to be added as the last table in Appendix B.

Appendix C –
In general, values for Appendix C are consistent with the TACO values listed in Appendix B of the Work Plan. However, based on a letter from Paul Takacs (IEPA) to Michael McAteer (U.S. EPA, Region 5), it may be inappropriate to use TACO values as screening levels for COPC because TACO values are health-based instead of risk-based, and also are not intended to be protective of the environment (Personal communication from P. Takacs to M. McAteer regarding the Sauget Area 1 Sites, December 18, 1998). This may present a potential flaw in the HHRA.

RESPONSE TO WESTON-12:

As discussed in the 2/21/01 meeting, it was agreed that use of the TACO values for COPC screening was appropriate.

The values in Table C-5 are consistent with those reported in the Region 9 1998 PRG Table, and values in Table C-6 are consistent with those reported in the Region 3 2000 RBC Table.

Appendix D –
Calculation of background levels of chemicals in the various media was consistent with the methodology described in Section 3.2.2 of the HHRA. No calculation errors were identified.

Appendices E through H –
The identification of COPC in these Appendices follow the procedures presented in Section 3 of the HHRA. The maximum detected concentrations in these Tables are consistent with those values contained in Appendix B of the HHRA. The TACO Class-I and Class-II values in these Tables are consistent with those presented in Appendix C. However, please refer to comments regarding the use of TACO values in our review of Appendix C. Background concentrations presented in these Tables were calculated correctly based on the approach described in Section 3 of the HHRA. No discrepancies were found in the data in these Tables.

Appendix I –
The identification of COPC in these Appendices follow the procedures presented in Section 3 of the HHRA. The maximum detected concentrations in these Tables are consistent with those values contained in Appendix B of the HHRA. The TACO Class-II values in these Tables are consistent with those presented in Appendix C. However, please refer to comments regarding the use of TACO values in our review of Appendix C. Background concentrations for surface water presented in Table I-1 are consistent with those in Appendix D. Calculation of

background concentrations for fish tissue is consistent with the approach described in Section 3. RBC values for fish in Table I-3 are consistent with those reported in Table C-6 and the Region 3 2000 RBC Table. No discrepancies were found in the data in these Tables.

Specific comment – Footnote "g" is missing from Table I-3.

RESPONSE TO WESTON-13:

A revised Table I-3 is presented here as Attachment 9.

Appendix J –

The identification of COPC in these Appendices follow the procedures presented in Section 3 of the HHRA. The ambient air PRG values in Tables J-2 through J-5 are consistent with those reported in the Region 9 1998 PRG Table. The 100 times PRG values in Table J-6 were calculated correctly. No discrepancies were found in the data in these Tables.

Specific comment – PRG footnote in Tables J-2 through J-5 refers the reader to Table x for full references. Authors need to supply a Table number to this footnote.

RESPONSE TO WESTON-14:

A revised Appendix J is presented here as Attachment 3.

Appendix K –

In general, values for Appendix K were generated using the EPA spreadsheet version of the Johnson and Ettinger model. Values for 4-methyl-2-pentanone were calculated using the RBCA Toolkit for Chemical Releases. Most of the required parameter inputs were consistent for all chemicals evaluated with both models. However, we found several discrepancies with regard to the concentrations of chemicals in groundwater. Only the first data sheet in Appendix K listed the initial groundwater concentration as g/L. Whereas all other data sheets in Appendix K listed the concentrations as mg/L, most of the groundwater concentrations appear to be representative of g/L units.

RESPONSE TO WESTON-15(a):

The units used in the calculations in Appendix K were ug/L; a printer error caused the report printouts to read mg/L (if the printer is not set up properly for a given program, a "micro" sign is read as the letter "m"). Attachment 10 provides the revised Appendix K tables.

Most of the groundwater values used for the RME indoor air calculations match those reported in Appendix L. However, for the RME calculations of indoor air VOCs relative to Fill

Area G (EEG-107) and Fill Area I (EE-14), groundwater concentrations of benzene, chlorobenzene, naphthalene, PCE, toluene, TCE, and VC for sample location EEG-107, and chlorobenzene for sample location EE-14 are different than those reported in Appendix L (Table L-2). With regard to those data used to calculate MLE indoor air VOCs, none of the groundwater concentrations used in the Johnson and Ettinger model or the RBCA Toolkit for Chemical Releases matched the values reported in Appendix L (Table L-3).

RESPONSE TO WESTON-15(b):

The response to this comment is provided as Attachment 16.

Appendix L –

Appendix L describes an EPA RCRA model used to predict volatilization of chemicals from standing water. In their description of the model, the authors indicated that the concentration of VOCs in air within the excavation trench was derived by dividing the chemical emission rate (Q) by the product of the water surface area (A), wind speed (U) and a constant of 0.05 (apparently related to the diffusion height above the water surface). Q is actually a complex function, requiring several intermediate calculations related to mass transfer coefficients. Three aspects of Appendix L preclude a complete understanding of the model described by the authors. First, one of the parameters, effective diameter (d_e), is said to be equal to $(4A/B)^{0.5}$. we assume that A is representative of the water surface area, but B was not identified anywhere in the model description. Second, the authors did not include any of the values used in the model for several of the model parameters. For example, the model calls for Henry's Law constant values as well as air and water diffusion coefficients. However, those parameters are temperature-dependent. Therefore, they should be calculated using such methodologies described by Lyman et al (1990) or Baum (1998). Third, when we tried to verify the trench air calculations using the equation described above, we realized that the authors had not used the equation that they had described in Appendix L, but instead, calculated the excavation air concentration by multiplying the groundwater concentration by a groundwater-to-air attenuation factor. The utility of that parameter also had not been discussed in Appendix L. In fact, the groundwater-to-air attenuation factor was not even mentioned in the model description. The authors need to revise Appendix L by describing all of the steps that they undertook to calculate the components of air in a hypothetical excavation trench.

RESPONSE TO WESTON-16:

This comment was discussed in a conference call on Friday 2/23/01; attendees were USEPA contractors Florence Sevold and Bob Fares of Avatar, and Lisa JN Bradley and Mike Mills of ENSR. The specific topic was the model presented in Appendix L of the HHRA. It was agreed that the model was appropriate as used, but that the explanatory text in Appendix L would be revised to discuss the conservatism of the model with respect to input assumptions and temperature

dependence. The revised Appendix L is presented here as Attachment 6. Specifically, the text has been revised to correct the typographical error that caused the symbol for "pi" to be printed as a "B," to indicate that chemical-specific parameters were based on a 25 degree C temperature and why this is a conservative assumption, and to define and explain the use of the attenuation factor. (See also RESPONSE TO WESTON-7)

Appendix M –

The authors indicated that outdoor air VOC concentrations from groundwater were predicted based on the method recommended in ASTM PS-104 and calculations were completed using the RBCA Tool Kit for Chemical Releases software. The authors indicated further that site-specific values for depth to groundwater, width of source zone area, and vadose zone thickness were incorporated in the evaluation. However, Table M-1 reports default values for those parameters that were subsequently used in the RCBA model. The authors also indicated that parameters were summarized in the attached modeling printouts; however they were only listed in Table M-1, a spreadsheet printout that was not generated by RBCA. Consequently, there is no way to ascertain that the parameter values listed in Table M-1 were used in the model runs. The RBCA Site Assessment Summary Tables included in Appendix M only contain one page ("page 5 of 7") for each run. Risk assessments need to be as transparent as possible. In order to achieve that transparency, and to facilitate the review of this document, the authors need to supply the other input data (as they did with the Johnson and Ettinger model in Appendix K).

RESPONSE TO WESTON-17:

The "Values Used in Modeling" in Table M-1 indicate (by "SS") that depth to groundwater and groundwater plume width were input to the models as site-specific parameters. Due to space considerations, the appendix only contained "page 5 of 7" for each model run. As discussed in the 2/21/01 meeting, all 7 output pages as well as input pages will be shown for the first model run; the remaining model runs present only page "5 of 7" of the output. Attachment 11 provides the full model input and output for well EEG-05 for Appendix M.

Appendix N – no substantive comments

Appendix O –

There are some significant concerns regarding the calculation of absorption adjustment factors (AAFs) for the dermal-water scenarios. First, we disagree with the author's argument that AAFs can have numerical values greater than one. An absorption fraction is defined in the EPA Exposure Assessment Guidelines (EPA, 1992a) as a fraction of applied dose that is absorbed after a designated time. It is a cumulative number and can increase with time to a possible maximum of 1. The equation form is:

$$AF = \frac{\text{Units of Mass Absorbed}}{\text{Mass Applied}}$$

Additionally, the EPA Dermal Exposure Guidance (EPA, 1992b) specifically states that the permeability coefficient-based approach is advocated over the absorption fraction approach for determining the dermally absorbed dose in compounds in an aqueous medi[um] [sic]. Also, it appears that the authors used both AAFs and permeability constants to assess dermal exposures to chemicals in groundwater.

RESPONSE TO WESTON-18:

This topic was discussed in a conference call on Friday 2/23/01; attendees were USEPA contractors Florence Sevold and Bob Fares of Avatar, and Lisa JN Bradley of ENSR. It was agreed that the AF defined in the comment is not the same factor as the AAF used in the risk assessment, and it was discussed and agreed why the dermal water AAF values can be greater than one. To clarify this issue in the appendix, the following text will be added to Appendix O, page O-3, just before the "Support for the Use of AAFs in Agency Guidance" section:

INSERT-11:

<u>Dermal-Water AAFs</u>

While most exposure scenarios in a risk assessment calculate an <u>exposure</u> dose, i.e., how much of a constituent is ingested or inhaled, the equation used to determine the dermal exposure to constituents in water calculates an <u>absorbed</u> dose through the use of a dermal permeability constant (see Section 5.3.3 and Table 5-42). Therefore, for the dermal-water pathway, the numerator of the AAF equation (presented above) is always 100%. Where the absorption value used in the denominator of the AAF equation is less than 100% (as is generally the case for many metals), the dermal-water AAF can have a value much greater than one.

In addition, the following text is inserted as a new final section in Section 4 on Page 4-6, to introduce the concept of AAFs:

INSERT-6:

4.6 Absorption Adjustment Factors

Differences exist in absorption between humans in an environmental situation and the animals generally used in the studies to develop the dose-response values. Absorption Adjustment Factors (AAFs) are used in a risk assessment to account for these differences. AAFs are discussed in greater detail in Section 5.5.2 and Appendix O.

Appendix P –

The AAFs and toxicity values presented in the Tables in Appendix P are consistent with those values reported in Appendix O (Absorption Adjustment Factors), Section 4 (Dose-Response Assessment), Tables 4-1 through 4-4 and Section 5 (Exposure Assessment), Table 5-41. However, we refer the authors to the comments regarding the use of AAFs in the review of Appendix O. Permeability constants are consistent with those reported in the EPA document, *Dermal Exposure Assessment: Principles and Applications* (EPA, 1992b), Table 5-42 of the HHRA, and those calculated in Table 5-43 of the HHRA. Values for RfDs and CSFs used in the Tables of Appendix P are consistent with those reported in Tables 4-1 through 4-4 of the HHRA. Lastly, the exposure assumptions used for the various receptors in Appendix P are consistent with those proposed in the Workplan, discussed in Section 5 of the HHRA, and summarized in Tables 5-2 through 5-13.

Appendix Q –

The description of the USEPA IEUBK model for children and the adult lead exposure model are consistent with the descriptions in The EPA Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (EPA, 1994) and Bowers et al. (1994). Figure Q-1 and Tables Q-1 and Q-2 were missing from the Appendix.

RESPONSE TO WESTON-19:

The missing figure and tables are presented here as Attachment 12.

Specific comment – In the discussion of Lead in Drinking Water on page Q-3, the authors stated that a water ingestion rate of 0.005 L/day was substituted for all age groups evaluated. The authors should repeat the rationale that they included on page Q-8 (Water Ingestion Rate) for this assumption.

RESPONSE TO WESTON-20:

The last line of the indicated section will be replaced with the following text:

INSERT-12: To evaluate site-specific exposure to lead in non-potable use groundwater, it was assumed that children may inadvertently ingest 0.005 liters of groundwater per day while using groundwater for outdoor activities, for all age groups evaluated (0-6 years of age). This ingestion rate is equivalent to one-tenth that assumed to occur during a swimming event (USEPA, 1989). A site-specific groundwater concentration of 129 ug/L was used in the model.

Appendix R – no substantive comments

Comments on the
Ecological Risk Assessment
Solutia, Sauget Site, Illinois
January 2001

1.0 Introduction

Roy F. Weston Inc (WESTON) was retained by the Army Corps of Engineers (ACOE) and the US Environmental Protection Agency (USEPA) to review and provide comments on the *Ecological Risk Assessment, Sauget Area 1* prepared by Menzie-Cura and Associates (January 2001). Comments are provided for the technical sections of the ERA and the supporting appendices.

General Comments:

1. All sections lack in either site-specificity and/or sufficient detail to support the risk assessment. (Specifics cited for each section below.)
2. There are several factors in this report that make it difficult to understand and interpret. The organization of the document does not follow convention. For example, much of the information presented in Section 7 – Risk Characterization is usually presented earlier in the text. For instance, the "Purpose and the Rationale" should be given in the Problem Formulation and the "Approach" should be given in the Analysis Phase, either in the Exposure Assessment or in the Effects Assessment. A paragraph at the beginning of the Risk Assessment explaining the set-up of the document would be helpful. The organization within sections, in particular Section 7, is confusing and has redundancies. Footnotes are not explained in a good number of tables; tables in Appendix C lack appropriate numbering; chemical listing order/classification is not always consistent. Sometimes information is provided, but the onus is on the reader to make connections across sections and make logic jumps. The number of decimals shown for a concentration is inconsistent in tables among chemicals and among tables within chemicals. Issues such as these result in a risk assessment that is not transparent.
3. While it is understood that the reference area selection was discussed with EPA representatives, a good explanation of why these locations were selected is not presented in the report. Physical characteristics (such as surface water TSS and pH and sediment TOC and grain size) are not provided for the site or reference areas. Since this information is not provided, it is not possible to determine if the reference areas are actually appropriate. Without knowing if the reference area is appropriate, elimination of chemicals based on reference concentrations cannot be accepted. In addition, supposition of no additional risk from the site cannot be made.
4. The Work Plan was very general, but was approved with the understanding that more site-specific information was to be presented in the Risk Assessment document. This site-

specific information, for the most part, has not been added. (Specific instances cited below.)

5. There was no discussion regarding the meeting of data quality objectives (DQOs). Since raw data is not provided, it is not even possible to check if the proposed detection limits were met. Particularly interested in the case of contaminants with sample quantitation limits are greater than benchmarks.
6. Page 1, Paragraph 2, Sentence 1 indicates that the risk assessment is only to be performed on the lower portion of CS-F and the Borrow Pit Lake. However, there is a terrestrial component to the risk assessment. Wording must change to make it clear that the floodplains of the upper portions of Dead Creek are not being remediated under the removal action, and that a screening-level risk assessment is also being conducted for these terrestrial areas.
7. Issues with the biological collection efforts. How often are CS-F and Borrow Pit Lake dry? If it is only a small percentage of the year, may not have sampled at the appropriate time. In addition, not sure how appropriate the plant species and tissue type (e.g., stems versus seeds), shrimp, and/or clam are for the receptors selected.
8. References for specific information [e.g., life history information of the otter and muskrat (pages 10-11)] are often missing.
9. All three components of a sediment triad were completed; however, they were never integrated into a triad evaluation.
10. Although Table 8-1 is called a "Weight of Evidence Evaluation of Ecological Risk," a weight of evidence is never presented in the risk assessment. What a weight of evidence is supposed to encompass is briefly touched upon in Section 4, but *a priori* selection of weights and determination of what responses are considered low versus high for each endpoint is not included.

Specific Comments:

Section 1 - Introduction

1. A brief introduction of the site, including historic and current activities would be helpful. It should not be necessary for a reviewer to find previous documents to determine if the facility is still operational and what types of contamination would be likely given the site use.

Section 2 – Background

2. This section appears to be an ecological characterization, if so, insufficient information is provided. This section should describe the habitat in more detail. Although the reader is referred to Section 7.2.1 for more information, and species observed or expected to occur on-site are cited, very little, if any additional information on the stream/lake characteristics and shoreline habitats appear. The length of CS-F and the size of Borrow Pit Lake are not

even mentioned in this section.

3. Information provided regarding the reference sites is paltry at best.
4. Which reference areas are comparable to CS-F?
5. Figure 1-1 may be a good map of the overall site, but at least one additional map, zoomed to the areas of concern for this risk assessment would be appropriate. In addition, a habitat map for the study areas (CS-F and Borrow Pit Lake) would be helpful.
6. Figure 2-1 would be more helpful if it showed the selected reference areas relative to the site. As with the site area, additional maps showing the habitat within the reference areas would be helpful.

Section 3 – Problem Formulation

7. Site-specific information is usually not provided. Examples (not all inclusive) follow:
   - Section 3.1.2 – Contaminant Fate and Transport Mechanisms: No discussion of source areas and routes of transport to CS-F and Borrow Pit Lake. Thought Dead Creek was a recharging stream and contaminants could move from groundwater to the stream. Give list of general transport mechanisms, but never discuss where in system these mechanisms are likely. Never put into context with selected COPCs.
   - Section 3.1.3 – Mechanisms of Ecotoxicity and Likely Categories of Potentially Affected Receptors: No basis for the first sentence, "The COPCs may affect the survival and reproductive capacity of benthic biota, fish, invertebrates, vascular plants, and wildlife." Chemical or even chemical class-specific toxicity information is never provided.
8. There is not a good explanation of why the river otter and muskrat were selected as receptors when these species do not appear on Table 7-17.
9. The discussion of terrestrial receptors can be likened to a footnote in section 3.1.3 – Mechanisms of Ecotoxicity and Likely Categories of Potentially Affected Receptors. Please provide more information (e.g., potential receptors) for the terrestrial evaluation.
10. Soil invertebrates are the only terrestrial receptors noted in Section 3.2 – Identification of Receptors. Site-specific terrestrial mammalian, avian, and plants receptors must be called out since the benchmarks used to screen soil concentrations can be based on any of the above, not just soil invertebrates.
11. Page 12: Earthworms are not sessile.
12. Figure 3-1: Aquatic plants can be exposed to chemicals via water uptake. Omnivorous and piscivorous fish should be split into two different groups. Both may be exposed to contaminated sediment through incidental ingestion and the omnivores may be exposed through the ingestion of aquatic plants. Piscivorous birds may also be exposed through incidental or purposeful ingestion of surface water.
13. Figure 3-1 shows the conceptual model for Dead Creek only. None is presented for Borrow Pit Lake or the terrestrial component of the ERA

Section 5 – Exposure Assessment

14. Why is the historic data (e.g., data used in the SLERA) not used in the ERA? Sample numbers and approximate locations were approved assuming that the historic data would be used.
15. 15. The COPC selection process for soil is missing from text and tables Section 5.1.1 – Sampling Locations: Should mention if surface water and sediment samples are co-located. Justification should be provided as to why another plant species was not collected in Borrow Pit Lake. Justification should be provided as to why clams and shrimp were not collected from CS-F.
16. Page 17: The TEQ calculation is not presented correctly. Missing a bracket between the sigma and the open parenthesis.
17. Page 17: Regarding treating "M" flagged values as non-detects. Believe these are more akin to J values; therefore, should be assumed to be a detect.
18. Page 18, Paragraph 1, Last sentence: First, background comparisons can only eliminate inorganic contaminants. Second, insufficient samples were analyzed for some media (e.g., shrimp) for removal from the COPC list based on background comparisons. In either case, qualitative discussions may be made regarding site concentrations compared to background in the uncertainty analysis.
19. Page 18, Paragraph 3: Ethylbenzene should not be excluded unless it is shown that it is not a potential contaminant from site activities, or it is not detected in the upstream segment of Dead Creek.
20. Page 18, Paragraph 4: States that maximum concentrations from biota are compared to maximum concentrations from reference areas. Aside from the issues already noted with the reference area comparison, no reason is given for making the comparisons differently for biota than for surface water and sediment (maximum site to twice average reference).
21. Page 18, last sentence: States that, "total concentrations of DDT and PAHs were calculated as the sum of the concentrations of individual compounds detected...." First, there is no explanation as to why for PAHs, a total exposure point concentration is used for avian receptors but and individual PAH exposure point concentration is used for mammalian receptors. Second, it appears as though total PAHs were calculated only using the selected COPCs. This is not the correct way to determine total PAHs. If you are going to assume that PAHs are additive, then you cannot screen out individual PAHs. If some of the individual PAHs are higher in the reference area, then that should be discussed in the uncertainty analysis.
22. Please provide information regarding how many individuals comprised composite samples for biota.
23. Data reduction text virtually non-existent. How were qualified data and duplicates handled?
24. Table 5-2: Please title such that it is obvious from where (CS-F, Borrow Pit Lake, or both) these data were obtained.
25. Table 5-3 is very difficult to follow. Suggest adding row lines.

26. Table 5-3 is noted as being "Concentrations in ug/kg except metals that are in mg/kg." What units apply to the surface water samples?
27. Figures 5-1 through 5-3. Only need to present the area and samples used in this assessment. Reference areas should be put in "to scale".
28. Please provide figures of biota sample locations.

Section 6 – Ecological Effects Assessment

29. This Section needs to be expanded. Additions should include (but not be limited to): explanation of the sediment triad (including the basis of the benthic community evaluation and sediment toxicity tests) and the types of and basis for toxicity values (e.g., TRVs, benchmarks).

Section 7 – Risk Characterization

30. The text should discuss how comparisons to benchmarks are made (e.g., maximum concentration compared with available guidelines).
31. Page 21, last paragraph: Please provide more information regarding the data sources in this database. Was the sampling biased? e.g., Did it focus on industrial areas or areas suspected to be contaminated? Were the samples taken in only suspected "clean" areas? Or both?
32. Page 22, first full paragraph: Appears to be a typo in the mercury benchmark. It is noted as 25 mg/kg instead of 0.25 mg/kg.
33. Page 22, last paragraph, continued on Page 23: It is not indicated in the report whether the metals analyzed in surface water are total metals or dissolved (filtered) metals. Since the reference area has substantially higher TSS (average of 420 mg/L versus a site maximum of 160 mg/L) it would be entirely inappropriate to compare concentrations between these two areas if the metals are indeed analyzed as total. Please provide additional information as necessary in the text and tables regarding the analyses and remove text comparing concentrations if need be.
34. Suggest attaching the entire sediment toxicity report, instead of just the executive summary in Appendix E. Tables supplied do not support all of the data presented in text (e.g., page 27, paragraph 3, last sentence.) There is no indication that sediment for toxicity test was co-located with benthic invertebrate and sediment chemistry samples. In addition, chemical analysis of sediment used in the toxicity tests does not appear to have been done. The text should indicate why not or present the data.
35. Page 27, *H. azteca* Chronic Toxicity: According to page 4, Prairie DuPont Creek (PDC) reference area and Reference Area 2-2 locations were selected based on their comparability to Borrow Pit Lake. Why was Borrow Pit Lake toxicity data compared only with Reference Area 2-2?
36. Page 28, Section 7.2.1– Measure of Effect 2a: Wildlife species composition and habitat

use. The way the study was designed, the data cannot be used as a measure of effect. It can only be used to establish a simple presence/absence during a very specific season and time period. It cannot, as the text states, "measure (of) the degree to which local and migratory wildlife use the habitat and the extent to which it supports their needs" or "...indicate(s) whether Dead Creek can support wildlife species comparable to unaffected reference areas." The habitat does not seem to be well documented (e.g., no maps, no species list of vegetation, no canopy estimates completed). Nor were there attempts made to quantify species present, approximate biomass, or to calculate the expected carrying capacity of the area. The data presented, while important, can only be used in the ecological characterization of the site, to help select receptors, and to discuss the site versus the reference area in a very qualitative way.

37. Page 28, last full paragraph. Does "very little submerged or emergent vegetation grow(s) in the pond" only during certain seasons and/or when the water levels are very low? Seems as though blanket statement made about year-round site conditions based on one outing in October.
38. Table 7-1 through 7-3, 7-18, 7-22, and 7-23: Benzo(a)pyrene is listed twice, with different benchmark values for each listing. Please correct. Also looks like in Table 7-18, the average value for the detected benzo(a)pyrene is incorrect. Should be 113 instead of 140.
39. Table 7-19: Titling makes it look as though food ingestion is the only thing considered in the assessment. Should re-title such that it is obvious that surface water and sediment ingestion are included. In addition, there are blank spaces, mainly in SVOCs and Dioxin TEQ that should be filled.
40. Tables 7-20 and 7-21: It is not clear what chemicals are included in these tables. Previous tables included all chemicals that were selected as a COPC. These tables leave out some, but not all chemicals that were listed as COPCs but were not detected in surface water. Please add all COPCs to table.

Section 8 – Weight of Evidence Discussion of Ecological Risk

41. Page 41, 1st paragraph: Although it is expected to see impacts to the benthic community due to low water level, this is a confounding factor. One cannot make the conclusion that there are no chemical-related effects if the community analyses were performed during a time when the habitat is degraded to such an extent that effects from poor habitat would mask chemical effects. The water level in the study area is not always low. Would suggest re-sampling benthic communities during a higher water level period assuming that the stream characteristics are such that a benthic community could be supported if there were higher water levels. If this is not the case, than a good explanation must be given.
42. Page 41, 1st paragraph, sentence 3: Toxicity testing were not inconclusive, toxicity was indicated. Potential causality (i.e., whether the toxicity is site-related) is not a consideration in the comparisons made for the toxicity tests. Except for the *H. azteca* 42-day tests (and there are questions as to how this was done), information regarding the site results versus

the reference results is not provided.

43. Table 8-1: Comparisons to benchmarks are listed as both laboratory and literature. Similar lines of evidence should have the same category.

Section 9 – Discussion of Uncertainties and Exposure Assumptions

44. This section should be site-specific and provide much greater detail. Many uncertainties missed. Uncertainty section should also suggest which direction the uncertainty may be influencing risk. Also, there is no obvious distinction made in any of the discussion between inherent variability and uncertainty.
45. Page 44, last paragraph. This paragraph is incorrect. Uncertainty in the food chain assessment is not captured by using both a NOAEL and a LOAEL. The uncertainty in a food chain assessment is not bounded between the two toxicological benchmarks.

Appendix F

46. Page 2: $Conc_{water}$ indicates that the exposure concentration is the average surface water concentration. Tables in Section F show the maximum surface water concentration is also used. Please make text and tables consistent.
47. Page 3, Model Application: Chronic and acute (or maximum) exposures are discussed. One would assume that an acute exposure should be compared with acute toxicity values; however, only chronic toxicity values are used and no explanation is provided. Please provide.
48. Page 5, Paragraph 3: Sources for the mallard's food ingestion rate and % moisture content of diet are not provided; therefore, cannot tell if reasonable.
49. Page 7: The moisture content of fish is not presented; therefore, cannot reproduce the calculated sediment ingestion rate value.
50. Cannot check the foraging area calculations since cannot find where area of the site is presented.
51. In most tables, sediment concentrations for Borrow Pit Lake appear for every chemical, even if not detected. Should zero or blank out (preferable) the non-detected concentrations.

217/782-6762

January 31, 2001

Mr. Michael McAteer
U.S. EPA Region 5
77 West Jackson Boulevard (SR-6J)
Chicago, IL 60604-3590

Reference: 1630200005 St. Clair County
Sauget Area 1 Site
Superfund/Technical
Administrative Order by Consent dated January 21, 1999
Human Health Risk Assessment
Ecological Risk Assessment
Leachate Treatability Test
Data Report

Dear Mr. McAteer:

The referenced documents for the Sauget Area 1 Site EE/CA and RI/FS were received on January 9, 2001. These review comments are due to you on February 2, 2001. You should note that I am the only Illinois EPA reviewer of these documents, therefore no risk assessor or toxicologist participated in their review.

Human Health Risk Assessment

1. Section 1 and Section 3 include numerous references to the IEPA TACO program. Illinois EPA has determined that TACO is not an ARAR because it does not satisfy the requirements of the National Contingency Plan at 40 C.F.R 300.400(g). Also, due to the potential variety of conclusions to be reached under the TACO procedures, it is difficult to determine whether TACO would be more stringent than Federal requirements. It appears that the broader issue is whether or not the use of TACO is consistent with the NCP.

RESPONSE TO IEPA-1:

It was agreed in the 2/21/01 meeting that the use of the TACO Tier 1 criteria for screening purposes is consistent with the NCP. It was also agreed that the TACO Tier 1 criteria do not constitute ARARs. Please see the response to comment

USEPA-1 above.

2. Page 1-4. The IEPA TACO Mixture Rule is cited regarding carcinogens. Is this consistent with the provisions of RAGS?

RESPONSE TO IEPA-2:

It was agreed in the 2/21/01 meeting that the use of the 10^{-6} to 10^{-4} risk range is consistent with RAGS.

3. Page 3-9. IEPA TACO Tier I criteria were used for the identification of COPCs for soil and groundwater. Are these the appropriate criteria or are there State and/or Federal ARARs for soil and groundwater?

RESPONSE TO IEPA-3:

Please see the response to comments IEPA-1 and USEPA-1 above.

4. Page 3-9. It is stated that the HHRA Workplan does not require assessment of a residential drinking water scenario even though the Site groundwater meets the criteria of 35 Ill. Adm. Code 620 for Class I groundwater. So the risk assessment was performed by using the Class II groundwater criteria. It should be noted that in consideration of the NCP's expectations as stated at 40 C.F.R. 300.430 to return usable ground waters to their beneficial uses, it may be appropriate in the Feasibility Study to evaluate Class I criteria and MCLs when groundwater ARARs are determined.

RESPONSE TO IEPA-4:

As discussed in the 2/21/01 meeting, TACO Tier 1 criteria for Class II groundwater were used in the HHRA for screening purposes only. The comparison of Sauget Area 1 groundwater data to TACO Tier 1 criteria for Class II groundwater is presented in Appendix H of the HHRA report. Based on discussions in the 2/21/01 meeting, a comparison of Sauget Area 1 groundwater data to TACO Tier 1 criteria for Class I groundwater has been conducted. This evaluation will be presented in a new Appendix U, which is submitted here as Attachment 13. The results of the screening will be discussed in the uncertainty analysis in Section 6.5. The following text will be inserted as a new Section 6.5.1.1 on page 6-9:

INSERT-13:

6.5.1.1 COPCs for Groundwater Based on TACO Tier I Class I Groundwater

Criteria.

The last table in Appendix U (which presents the comparison of groundwater data to TACO Class I groundwater criteria) identifies Class I COPCs by groundwater sample location. Comparing the results to the Class II results, additional Class I COPCs were identified in most locations for which Class II COPCs occurred. In Site G, between 1 and 3 COPCs were identified in five additional locations. In Site H, one COPC was identified in one additional location. In Site I, two COPCs were identified in one additional location. In Site L, one and two COPCs were identified in two additional sampling locations, respectively. And in residential areas, lead was identified as a COPC in two residential non-potable use wells and one shallow groundwater sample location. Therefore, the Class I screening results were not very different from the Class II screening results.

yes they are.

5. Page 3-9. Private wells exist in the study area along with local ordinances that prohibit the use of groundwater as a potable water supply. Are those ordinances enforceable, and do they effectively eliminate the human exposure to groundwater pathway?

RESPONSE TO IEPA-5

As discussed in the 2/21/01 meeting, there are ordinances in place that prohibit the use of groundwater as drinking water in the Villages of Sauget and Cahokia. The four residential non-potable use wells sampled as part of the SSP are not used as a source of drinking water, nor are they expected to be used as such in the foreseeable future. However, at the request of IEPA, a drinking water risk assessment will be conducted for these four wells. This evaluation will be presented in a new Appendix V, which is submitted here as Attachment 14. The results of the risk assessment will be discussed in the uncertainty analysis in Section 6.5. The following text will be inserted as a new Section 6.5.1.2 on page 6-9:

INSERT-14:

6.5.1.2 Drinking Water Evaluation of Residential Non-Potable Use Wells

Lead was identified as (the only) COPC in two of the non-potable use residential wells (DW-MCDO and DW-WRIG). No COPCs were identified in the other two non-potable use wells. A drinking water evaluation of lead was conducted and is presented in Appendix V. The results indicate that well DW-WRIG could be used as a source of drinking water; however, use of well DW-MCDO as a source of drinking water would not be

appropriate.

In addition, the following text will be added to Section 3.2.3.1 on Page 3-10, as the new first full paragraph on that page:

> **INSERT-15: However, to provide a range of evaluations, groundwater was separately compared to TACO Tier I Class I groundwater criteria; this comparison is presented in Appendix U. In addition, the residential non-potable use wells sampled as part of the SSP were also evaluated for a drinking water use scenario; this evaluation is presented in Appendix V. The results of these evaluations are discussed in Section 6.5.** where is this?

6. Page 3-10. Is it appropriate to use the Class II groundwater criteria in the evaluation of human exposure to surface water? It seems likely that surface water criteria exist or can be calculated based upon standard equations, and those criteria should be used.

RESPONSE TO IEPA-6:

As discussed in the 2/21/01 meeting, there are no criteria to evaluate recreational/swimming use of surface waters. It was discussed why the Class II criteria for groundwater for screening surface water data for COPC identification is conservative. In addition, Lisa Bradley of ENSR spoke with Tom Hornshaw of IEPA about this screening on a conference call. It was agreed that the screening was appropriate, and that additional explanatory text would be added to the HHRA. The following text will be added to Appendix C, page C-3, as the last paragraph in the section titled "The TACO Values Used for Screening Groundwater and Surface Water":

> **INSERT-16: The TACO Tier I criteria for Class II groundwater are also used to select COPCs for surface water for the recreational receptor scenarios that involve wading or swimming, and for groundwater for the construction worker scenario that involves excavation into the water table. There are no other state or federal screening criteria to use for these scenarios. The use of the Class II criteria is conservative based on the following:**
>
> - **The Class II criteria are generally only 5- to 10-fold higher than the Class I (drinking water) criteria.**
> - **The drinking water ingestion rate is assumed by regulatory programs (USEPA, 1989 and IEPA, 1998) to be 2 liters or 2000 mL**

per day.

- **The incidental ingestion of surface or groundwater while swimming is assumed to be 50 ml per event, which is 1/40th of the drinking water ingestion rate (assuming daily swimming).**
- **Incidental ingestion of surface water while wading is assumed to be 10 ml/day, which is 1/200th of the drinking water ingestion rate (assuming daily wading).**
- **Incidental ingestion of surface water during construction activities is assumed to be 5 ml/day, which is 1/400th of the drinking water ingestion rate (assuming daily excavation below the water table)**
- **Therefore, screening criteria 40-fold higher than drinking water standards (and up to 400-fold higher for the construction worker) could have been used and still have been protective of these receptors.**

IEPA ok?

- **As the Class II criteria are generally 5- to 50-fold higher than drinking water criteria, their use as screening criteria for these scenarios is appropriate.**

7. Page 3-13. IEPA's report "A Summary of Selected Background Conditions for Inorganics in Soil" is cited. Without any determination of the appropriateness of referring to that report, note that the arsenic concentrations in background soils were changed on December 21, 2000 by amendments at 35 Ill. Adm. Code 742 Table G. For counties within metropolitan statistical areas the concentration is 13.0 mg/kg and for counties outside metropolitan statistical areas the concentration is 11.3 mg/kg.

RESPONSE TO IEPA-7:

The following text will replace the third paragraph on page 3-13:

INSERT 22:

IEPA has published a report entitled "A Summary of Selected Background Conditions for Inorganics in Soil" (IEPA, 1994). This report is presented here in Appendix D. In this publication, background concentrations are reported for soils within counties in metropolitan areas and soils in counties outside of metropolitan areas. Within metropolitan areas, 114 soil samples were evaluated; arsenic concentrations ranged from 1.1 to 24 mg/kg, with a mean concentration of 7.4 mg/kg and a median concentration of 7.2 mg/kg. Outside of metropolitan areas, 120 soil

samples were evaluated; arsenic concentrations ranged from 0.35 to 22.4 mg/kg, with a mean concentration of 5.9 mg/kg and a median concentration of 5.2 mg/kg. The TACO program identifies the background arsenic concentration in counties within metropolitan statistical areas as 13 mg/kg (IEPA, 1998, Appendix A, Table G, as amended January 6, 2001). Sauget Area 1 is in St. Clair County, which is identified as a metropolitan area county in the TACO program. All detected concentrations of arsenic in soil were within the range of arsenic concentrations detected in metropolitan areas (1.1 to 24 mg/kg) with the exception of the single sample noted above. As provided for in the TACO program, an alternative statistical approach for background was used in the HHRA, as identified in the HHRA Workplan. The site-specific background concentration for arsenic of 19 mg/kg is also within the range of arsenic concentrations detected in background locations presented in the IEPA report.

Ecological Risk Assessment

8. Page 17. Section 5.1.3. When multiple values were available for a compound in the COPC selection process, the Illinois value superseded the national value, which superseded the Great Lakes value. Is this appropriate or should the most conservative value be used?

9. Page 18. Was frequency of detection the only criteria considered for eliminating ethylbenzene and 2,4-dimethylphenol as COPCs?

10. Page 38. Regarding selenium in site soils and the reference to the 1994 Illinois EPA report, the last sentence of that paragraph should be revised as follows: "Therefore, the selenium concentrations detected in site surface soil are likely to be within the range of Illinois background, although selenium was not detected in the three site-specific background samples".

Illinois EPA's August 1994 report "A Summary of Selected Background Conditions for Inorganics in Soil", states that the data can be used to evaluate the plausible validity of any site-specific background data, but are not meant to replace the collection of site-specific background data for sites.

11. Page 46. There are several Federal and State threatened and endangered species which occur in the vicinity of Creek Segment F and Borrow Pit Lake. This report appears to be an incomplete evaluation of them as receptors. Also, both the Federal and State Endangered Species Acts should be evaluated as ARARs in the Feasibility Study.

Also note that a bald eagle was observed on December 7, 2000 along the Mississippi River

adjacent to Site Q at the Sauget Area 2 Site less than one mile from Borrow Pit Lake.

Leachate Treatability Test

12. It may be helpful in the evaluation of the testing results to include the American Bottoms POTW's discharge standards.

13. In addition to the tests which were performed separately, a series of tests may be appropriate to determine which methods when performed in series are best suited to achieve the required discharge standards.

Data Report

No comments.

You should note that these comments do not address issues of natural resource injury, natural resource damage assessment, and natural resource restoration. If you have any questions, please call me at 217/785-9397.

Sincerely,

Candy Morin, Remedial Project Manager
National Priorities List Unit
Federal Site Remediation Section
Bureau of Land

cc: Mike Henry, IDNR
Kevin de la Bruere, USFWS

sgtarea1/datarsk01.01

bcc: Terry Ayers
Chris Perzan
Bureau File

US Fish and Wildlife Comments on
Ecological Risk Assessment for Sauget Area 1
Sauget
St. Clair County, IL

General Comments:

1. The Ecological Risk Assessment (ERA) is supposedly for all of Sauget Area 1, yet it is limited to only Creek Segment F (CS-F)and the associated "Borrow Pit Lake" (BPL). There is no consideration of terrestrial habitats or mention of Sites G,H,I,L,M, or N in the ERA. Therefore, this document does not present a complete assessment of risk associated with the Sauget Area 1 Superfund site.

2. Some feeding guilds are not considered in the ERA. Specifically, there is no mention of vermivores, insectivorous birds and mammals, non-piscivorous raptors, amphibians, and reptiles. These pathways remain uncharacterized and the risks associated with them unknown.

Specific Comments:

Figure 3-1: The Conceptual Site Model does not address soil contamination as a source and link to burrowing mammals, invertebrates, and raptors, and vermivorous wildlife as would be the case in a terrestrial habitat.

Section 3.1.2: The scope of the fate and transport mechanisms needs to be expanded to include areas other than aquatic habitats. For example, consider COPC's leaching from landfills to soil, etc.

Section 3.1.3: Insectivorous birds may be affected by contaminant uptake in benthic macroinvertebrates if they are eaten after a hatch. Therefore, insectivorous birds should be considered as a potentially affected receptor in an aquatic system.

IBID.: In order to properly characterize the site, there needs to be an evaluation of potential terrestrial receptors that may be exposed to contaminants from non-aquatic habitats in additional operable units associated with the site.

Section 3.1.4: In order to properly characterize the site, the scope of this section needs to be expanded to include terrestrial habitats. Additionally, strike the words along creek banks and floodplain in last two bullets.

Section 3.2: See General Comment 2.

IBID.: In the section dealing with Benthic macroinvertebrates, a bullet states that invertebrates provide food for bottom feeding fish species. Add insectivorous birds, and waterfowl.

Section 4.1: This section should be expanded to include insectivorous birds, and terrestrial receptors such as vermivorous wildlife, and non-piscivorous raptors.

Section 5.1.1 Sediments: Sediment samples were taken from a depth of 0 to 2 inches. With a site with such a long history of release, the true contaminant sources may be buried to a level much deeper than this by relatively clean sediments through normal depositional loading. If in the future a large scour event, or dredging were to remove this top layer a large source of contamination may be exposed. In a ERA, the site should be fully characterized, and the depth of contamination should be fully known in order to make a proper risk management decision.

Soil: Soil samples were limited to 0-6 inches. At a site with a long history of release, the true contaminant load may be buried to a level much deeper than this by relatively clean sediments during flood events and other depositional activities. In an ERA, the site should be properly characterized, and as a part of this characterization, the depth of contamination should be fully explored and investigated in order to make a proper risk management decision. Additionally, soil invertebrates, and burrowing mammals normally encounter soils at a deeper than this. Ecological soil samples generally are taken at a depth of two feet.

Figure 5-3: Risk has not been properly characterized at sites G, H, I, or L as no soil samples were taken these sites.

Section 7.1.1: The ecological risks for Dead Creek Segment F have not been completely characterized. A food chain transfer model should be constructed to characterize risks to wildlife that forage on aquatic life produced in Segment F. Although fish or benthic macroinvertebrates were not collected from Segment F, one could use the sediment/water concentrations multiplied by a Bioaccumulation Factor (BAF) to calculate expected fish/invert residues and exposure to wildlife.

Section 7.1.3.2: The ERA states that impairment of the benthic community is most likely due to the poor habitat in the sampled locations. No historical data appears to have been consulted in making this determination. The more sensitive macroinvertebrates may have died off from chemical contamination over the many years that the creek was polluted.

Subject: Re: Sauget

Mike et al,

My apologizes for not getting back to you sooner. Dr. Stoeckel (Denise), our toxicologist who would otherwise be engaged in reviewing the Area 1 ERA has resigned to pursue motherhood as her new career. While we will miss her expertise tremendously ... this is indeed a joyous event and we wish her the very best.

We are still engaged in Sauget issues. Unfortunately, the recent events mean no formal technical comments will be submitted at this time on the ERA for Area 1. (I do have some "observations" based on a cursory review for your consideration, but understand I am not formally trained in risk assessment.). While we scramble to hire a new toxicologist, we will be looking at using one of our contractors to fill this void in the interim.

Observations:

1. This document acknowledges area toxicity to avian species yet seems to say "it' not from Monsanto/Solutia because no samples were taken from the BP Lake in the FWS study of Allorton so it can't be us, and birds eat all over the place so they are not likely to cohabit at very long at the site...so the risk is nil". This is the theme for the entire report ...

Here you have at least 4 known T&E avian species observed at the lake, but summarily dismiss risk because (essentially) contamination is "everywhere, but not ours" and bald eagles "aren't around much so little exposure risk is present". I find this logic/approach flawed and the question of what is the direct risk from the lake is never addressed. With ERA you are using existing data, then trying to model the risk by bounding the uncertainties...

Specifically, with the avian issue, the problem formulation step would appear more appropriate to bound any uncertainty associated with the lake by assuming receptors (in this case piscivorus) obtain 100% of their food from the contaminated area with 100% bioavailability. Rather than making broad brushed assumptions dismissing possible risk.

2. Sediment samples - I may have missed this, but I thought the data was taken from depths of 0-2". If so, I am not sure this is a true metric of potential historic contamination. Specifically, I would think 0-2" would only be telling of recent depositional loadings and not what's truly adsorbed over time onto the creek/lake bottom. We have used our researchers at the ISGS to conduct sediment dating exercises in the past, I am curious if this would be of any utility here...

3. Is there any historic information on the creek for biota ? The report at times implies since nothing is there...there's no risk. Local communities and populations may have been present *in the past until contaminations (e.g. zinc) changed things... in theory. Again, I find this logic* flawed.

4. Assessment Endpoint - As I understand, by definition AE's are an explicit expression of the environmental value that is to be protected. I keep going back to the T&E species known to be at the lake. I am unclear why they were not given higher consideration when identifying assessment/measurement endpoints. Granted they look at the Bald Eagle, but they make it clear that they used direct observation and "no bald 's nest and they only hang out a couple of months at best"...factoring this in..."no risk". Remedial actions , as I understand, do not focus on protecting organisms unless they are designated as protected status species...which we have in this case several at the site and within the local ecosystem.

5. I use a "cheat sheet" when ever I look at ERA's. Specifically, I keep a copy of OSWER Directive 9285.7-28P (Issuance of Final Guidance: ERA and RM Principles for Superfund Sites), dated Oct. 7, 1999 in front of me to make me "dangerous" at best.

Accordingly, one question comes to mind when I read the Directive and compare it to the ERA at Area 1. Specifically, a goal of the ERA is to present a characterization of site risks to the ecosystem that are transparent to the public. As such, how does assessing part of CS F, and borrow pit lake extrapolate to the remainder of Site 1 and the local biota population/community?

6. Finally, I am not familiar with the USEPA preliminary risk work referenced, which is being used to supplant the first two steps of the ERA in this document. I would be helpful to the reader if a brief overview of the past work were given and an explanation as to why it is sufficient for Steps 1 and 2 of the Superfund ERA process.

I appreciate being kept in the loop and would be very interested in seeing what your technical ERA folks have to say....

Regards,

Michael L. Henry, CHMM
Senior Project Manager
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ATTACHMENT 1

APPENDIX T – SUPPLEMENTAL CONSTRUCTION WORKER EVALUATION

APPENDIX T - SUPPLEMENTAL CONSTRUCTION WORKER EVALUATION

CONTENTS

1.0 INTRODUCTION 1

2.0 SITE CHARACTERIZATION 1

3.0 DATA EVALUATION AND HAZARD IDENTIFICATION 1

3.1 Data Evaluation 1

3.1.1 Summary Statistics 2

3.2 Methodology for Selection of Constituents of Potential Concern 2

4.0 DOSE-RESPONSE ASSESSMENT 3

5.0 EXPOSURE ASSESSMENT 4

6.0 RISK CHARACTERIZATION 5

6.1 Potential Carcinogenic Risk Results 6

6.2 Potential Noncarcinogenic Hazard Results 7

6.3 Lead Evaluation 8

6.4 Uncertainty Analysis 8

7.0 CONCLUSIONS 9

8.0 REFERENCES 9

APPENDIX T

SUPPLEMENTAL CONSTRUCTION WORKER EVALUATION

1.0 INTRODUCTION

Pursuant to comments received from USEPA on the December 29, 2000 Human Health Risk Assessment for Sauget Area 1 (the HHRA), an additional evaluation has been conducted for the construction worker. This evaluation has been conducted to evaluate potential risks to the construction worker associated with subsurface soil and leachate in Sites G, H, I and L, and follows the same methods as presented in the December 29, 2000 HHRA report.

2.0 SITE CHARACTERIZATION

A description of the site, and the conceptual site model for the site, are presented in Section 2 of the HHRA.

3.0 DATA EVALUATION AND HAZARD IDENTIFICATION

The purpose of the data evaluation and hazard identification process is two-fold: 1) to evaluate the nature and extent of release of constituents present at the site; and 2) to select a subset of these constituents identified as Constituents of Potential Concern (COPCs) for quantitative evaluation in the risk assessment. This step of the risk assessment involves compiling and summarizing the data for the risk assessment, and selecting COPCs based on a series of screening steps.

3.1 Data Evaluation

Subsurface samples collected in the Sites as part of the SSP were analyzed for TCLP, not total constituent concentrations. Therefore, historical data collected for other investigations were employed to evaluate potential construction worker contact with COPCs in the subsurface. These data were obtained from the following: Sauget Area 1 Data Tables/Maps, Ecology and Environmental, Inc., February 1998, prepared for USEPA Region 5 Office of Superfund, Chicago, IL, ARCS Contract No. 68-W8-0086, Work Assignment No. 47-5N60. The historical data are unvalidated, and detection limits were not available for the majority of results reported as not detected. Therefore, only results reported as detected were used in this evaluation. Any sample for which all results were reported as not detected were eliminated from further evaluation. Samples used in the subsurface soil evaluation are presented in Table T-1.

TCLP data from subsurface samples collected in the Sites as part of the SSP were used to represent leachate concentrations, i.e., concentrations in groundwater within the fill material. This evaluation is separate from, and in addition to, the evaluation of the construction worker receptor's exposure to groundwater in the main text of the HHRA (in which the Site groundwater data were used). Samples used in the groundwater-TCLP evaluation are presented in Table T-2

3.1.1 Summary Statistics

The available subsurface soil and groundwater TCLP data for each Site were summarized for use in the risk assessment.

The steps used to summarize the data for use in identifying COPCs in the screening process presented in this section are discussed in Section 3.1.3 of the HHRA. The additional steps used to summarize the data for identifying exposure point concentrations (EPCs) are presented in Section 5.0 of the HHRA.

Table T-3 presents the summary statistics for subsurface soil, and Table T-4 presents the summary statistics for groundwater-TCLP.

3.2 Methodology for Selection of Constituents of Potential Concern

COPCs are a subset of the complete list of constituents detected in site media that are carried through the quantitative risk assessment process.

The steps used to identify COPCs are presented in Section 3.2 of the HHRA and are summarized below.

- **Frequency of Detection and Essential Nutrient Status.** No constituents were excluded from consideration as a COPC based on the frequency of detection screen. Essential nutrients (i.e., calcium, iron, magnesium, sodium and potassium) were not included as COPCs (HHRA Workplan, and USEPA, 1989a).

- **Comparison to Background.** Background samples were collected in the vicinity of the site to provide information on naturally occurring levels of constituents typical for the local area. The purpose of comparing site conditions to local background is to determine if site concentrations of constituents are representative of background concentrations, which, therefore, should not be included in risk calculations. Background comparisons were conducted for each medium using site-specific background data and background concentrations. No constituents in subsurface soil or groundwater were eliminated from further consideration based solely on background.

- **Toxicity Screen.** A toxicity screen was performed in accordance with USEPA Region 5 guidance (USEPA, 1998b) and IEPA regulations (IEPA, 1998). The sources of the screening criteria and the screening methodology are presented in Sections 3.2.3.1 and 3.2.3.2 of the HHRA. The screening values are presented in Appendix C. Tables T-5 through T-8 present the screening conducted for subsurface soils, and Table T-9 presents the screening conducted for groundwater.

4.0 DOSE-RESPONSE ASSESSMENT

The purpose of the dose-response assessment is to identify the types of adverse health effects a constituent may potentially cause, and to define the relationship between the dose of a constituent and the likelihood or magnitude of an adverse effect (response) (USEPA, 1989a). Adverse effects are classified by USEPA as potentially carcinogenic or noncarcinogenic (i.e., potential effects other than cancer). Dose-response relationships are defined by USEPA for oral exposure and for exposure by inhalation. Oral toxicity values are also used to assess dermal exposures, with appropriate adjustments, because USEPA has not yet developed values for this route of exposure. Combining the results of the toxicity assessment with information on the magnitude of potential human exposure provides an estimate of potential risk. The methodology of the dose-response assessment and sources of the data are provided in Section 4.0 of the HHRA.

Table T-10 lists the COPCs identified in subsurface soil and groundwater for the construction worker scenario and summarizes the toxicity information for COPCs with potential noncarcinogenic effects for the oral route of exposure. For each COPC, the chemical abstracts service number (CAS number), the dose-response value (RfD), and the reference for the toxicity value are presented. In addition, the USEPA confidence level in the value, the uncertainty factor, the modifying factor, the study animal, study method, target organ and critical effect upon which the toxicity value is based are also presented for each COPC, where available. The confidence level is provided for constituents published on IRIS, and is based on the confidence in the study and the extent of toxicity information available for that constituent.

Table T-11 summarizes the toxicity information for COPCs with potential noncarcinogenic effects for the inhalation route of exposure. For each COPC, the CAS number and the toxicity value are presented. Inhalation RfD (in units of mg/kg-day) values are calculated from Reference Concentrations (RfC) (in units of mg/m^3) assuming a 70 kg adult breathes 20 m^3 of air per day. Both values are presented where available. In addition, the reference for the toxicity value, the USEPA confidence level in the value, the uncertainty factor, the modifying factor, the study animal, study method, target organ and critical effect upon which the toxicity value is based are also presented for each constituent. USEPA does not support use of oral toxicity values to evaluate inhalation exposures (USEPA, 1996b).

Table T-12 summarizes the toxicity information for COPCs classified by the USEPA as potential carcinogens for the oral route of exposure. For each constituent, the CAS number, USEPA carcinogenicity class, the oral cancer-slope factor and the reference are provided. In addition, the study animal and route of exposure upon which the cancer slope factor (CSF) is based are presented.

Table T-13 summarizes the toxicity information for COPCs classified by the USEPA as potential carcinogens for the inhalation route of exposure. For each constituent, the CAS number, USEPA carcinogenicity class, the inhalation cancer slope factor and unit risk factor (provided in units of $(ug/m^3)^{-1}$) and the reference are provided. In addition, the study animal and route of exposure upon which the CSF is based are presented. The CSF is calculated from the unit risk assuming a 70 kg adult breathes 20 m^3 of air per day.

5.0 EXPOSURE ASSESSMENT

The purpose of the exposure assessment is to predict the magnitude and frequency of potential human exposure to each of the COPC retained for quantitative evaluation in the HHRA. To estimate the potential risk to human health that may be posed by the presence of COPCs in environmental media in the study area, it is first necessary to estimate the potential exposure dose of each COPC for each receptor. The exposure dose is estimated for each constituent via each exposure route/pathway by which the receptor is assumed to be exposed. Reasonable maximum exposure (RME) scenarios, and most likely exposure (MLE) scenarios based on appropriate USEPA guidance are both evaluated in the quantitative risk assessment. Exposure dose equations combine the estimates of constituent concentration in the environmental medium of interest with assumptions regarding the type and magnitude of each receptor's potential exposure to provide a numerical estimate of the exposure dose. The exposure dose is defined as the amount of COPC taken into the receptor and is expressed in units of milligrams of COPC per kilogram of body weight per day (mg/kg-day). The exposure doses are combined with the toxicity values to estimate potential risks and hazards for each receptor.

Section 5.1 of the HHRA presents the updated Conceptual Site Model (CSM) for the site.

Section 5.2 of the HHRA identifies the potential exposure scenarios and receptors evaluated in the HHRA. In this appendix, an on-site construction/utility worker is evaluated for potential exposure to COPCs in Site subsurface soil via incidental ingestion and dermal contact, and via inhalation of particulates suspended during excavation activity. Construction/utility work is assumed to occur up to depths of 30 feet bgs as noted in the HHRA. Due to the shallow depth of groundwater, the construction/utility worker may contact groundwater during excavation. Therefore, the construction worker is assumed to be exposed to COPCs in groundwater via incidental ingestion and dermal contact, and via inhalation of COPCs volatilized from standing water in an excavation trench. In this evaluation, leachate from the Sites, as represented by the TCLP data, are used to evaluate exposure to groundwater. Because the Sites are areas of known waste disposal, appropriate safeguards would likely be used when excavating in waste areas (gas monitoring, appropriate personal protective

equipment), although the use of such safeguards were not assumed when identifying the exposure factors used in the risk assessment. This assumption is addressed in the remedy discussion in Section 8 of the HHRA, where the use of institutional controls to enforce these safeguards is discussed.

Section 5.3 of the HHRA presents the methods for quantifying potential exposures.

Section 5.4 of the HHRA presents the receptor-specific exposure parameters. Exposure assumptions for the scenarios evaluated here are the same as those used in the HHRA. The exposure assumptions are presented in Table T-14.

Section 5.5 of the HHRA presents the constituent-specific exposure parameters. Constituent-specific parameters are presented for the COPCs for the additional construction worker scenarios in Tables T-15 (Absorption Adjustment Factors) and T-16 (Dermal Permeability Constants). Several dermal permeability constants were calculated, as shown in Table T-17. Additional AAF derivations not included in Appendix O are presented at the end of the text of this appendix.

Table T-18 presents the RME Exposure Point Concentrations (EPCs) for COPCs in subsurface soil, and Table T-19 presents the RME EPCs for COPCs in subsurface soil entrained on dusts (calculation of these are discussed in Section 5.5.1.2 of the HHRA). Table T-20 presents the RME EPCs for COPCs in groundwater, and Table T-21 presents the RME EPCs for volatile COPCs in an excavation trench. These EPCs were calculated in Appendix L of the HHRA. The MLE EPCs for these scenarios are presented in Tables T-22 through T-25. It should be noted that the EPCs for subsurface soils have been calculated based solely on data for detected constituents; therefore, the EPCs are likely biased high. This is due to the fact that the historical data report (see Section T3.1) did not provide the quantitative detection limits for constituents reported as "non-detect."

The exposure dose and risk calculation spreadsheets are presented at the end of this appendix. The risk results are discussed in Section 6.0 of this appendix.

6.0 RISK CHARACTERIZATION

The potential risk to human health associated with potential exposure to COPC in environmental media at the site is evaluated in this step of the risk assessment process. Risk characterization is the process in which the dose-response information (Section 4.0) is integrated with quantitative estimates of human exposure derived in the Exposure Assessment (Section 5.0). The result is a quantitative estimate of the likelihood that humans will experience any adverse health effects given the exposure assumptions made. Two general types of health risk are characterized for each potential exposure pathway considered: potential carcinogenic risk and potential noncarcinogenic risk. Carcinogenic risk is evaluated by averaging exposure over a normal human lifetime, which,

based on USEPA guidance (1989a), is assumed to be 70 years. Noncarcinogenic risk is evaluated by averaging exposure over the total exposure period.

Characterization of the potential impact of potential carcinogenic and noncarcinogenic constituents is approached in very different ways. The difference in approaches arises from the conservative assumption that substances with possible carcinogenic action proceed by a no-threshold mechanism, whereas other toxic actions may have a threshold, a dose below which few individuals would be expected to respond. Thus, under the no-threshold assumption, it is necessary to calculate a risk, but for constituents with a threshold, it is possible to simply characterize an exposure as above or below the threshold. In risk assessment, that threshold is termed a reference dose (RfD). Reference doses as well as cancer slope factors were discussed in Section 4.0. The approach to carcinogenic risk characterization is presented in Section 6.1 of the HHRA, and the approach to noncarcinogenic risk characterization is presented in Section 6.2 of the HHRA. The risk characterization results for the construction worker subsurface soil and groundwater pathways are presented in Section 6.1 of this appendix. Uncertainties associated with the risk characterization are presented in Section 6.5 of the HHRA; specific uncertainties involved with this additional evaluation are presented in Section 6.2 of this appendix. The risk calculation spreadsheets are presented at the end of this appendix.

6.1 Potential Carcinogenic Risk Results

Potential carcinogenic risks for the RME scenario are presented in Table T-26 and the potential HIs for the RME scenario are presented in Table T-27. Risks and HIs for the MLE scenario are presented in Tables T-28 and T-29, respectively. The construction worker is assumed to be exposed to COPCs in subsurface soil via incidental ingestion and dermal contact and inhalation of particulate matter in excavation dust, and to COPCs in groundwater exposed in an excavation via incidental ingestion and dermal contact and inhalation of constituents volatilized into excavation air.

As indicated in Table T-26, the potential risk for the construction worker (RME) for all Sites is below or within the USEPA risk range of 10^{-4} to 10^{-6}. Table T-28 indicates that the potential risks for the MLE scenario are also below or within the USEPA risk range of 10^{-4} to 10^{-6}.

The following scenarios resulted in risks below the target risk range (i.e., risks less than 10^{-6}):

Site G - MLE construction worker

Site L - MLE construction worker

The following scenarios [and risk-driving constituents-environmental medium] resulted in risks between 10^{-6} and 10^{-5}, which is within the target risk range:

Site G - RME construction worker [Pentachlorophenol - subsurface soil and leachate]

Site L - RME construction worker [PCBs - subsurface soil]

Site H - MLE construction worker [PCBs - subsurface soil]

Site I - MLE construction worker [Pentachlorophenol - leachate]

The following scenarios [and risk-driving constituents-environmental medium] resulted in risks between 10^{-5} and 10^{-6}, which is within the target risk range:

Site H - RME construction worker [PCBs - subsurface soil]

Site I - RME construction worker [Pentachlorophenol - leachate; Hexachlorobenzene - subsurface soil]

6.2 Potential Noncarcinogenic Hazard Results

Table T-27 indicates that the potential HIs for the construction worker (RME) are above the target HI of 1 in each Site. The HI for the construction worker for the MLE scenario presented in Table T-29 is above 1 for all Sites with the exception of Site L.

The RME HI exceeds 1 in Site G primarily due to potential ingestion and dermal contact with PCBs and phosphorous in subsurface soil and secondarily due to potential inhalation exposure to benzene due to volatilization from standing groundwater.

The RME HI exceeds 1 in Site H due potential ingestion and dermal contact with PCBs in subsurface soil, potential inhalation of manganese in particulates, potential ingestion and dermal contact with cadmium in groundwater, and potential inhalation of benzene from standing groundwater.

The RME HI exceeds 1 in Site I due potential ingestion and dermal contact with PCBs and antimony in subsurface soil, and due to potential inhalation exposure to chloroform and chlorobenzene due to volatilization from standing groundwater.

The RME HI exceeds 1 in Site L due to potential ingestion and dermal contact with PCBs in subsurface soil.

The MLE HI exceeds 1 in Site G due to potential ingestion and dermal contact with PCBs and phosphorous in subsurface soil. The MLE HI exceeds 1 in Site H due potential ingestion and dermal contact with PCBs in subsurface soil. The MLE HI exceeds 1 in Site I due potential ingestion and dermal contact with PCBs in subsurface soil, and due to potential inhalation exposure to chloroform due to volatilization from standing groundwater.

6.3 Lead Evaluation

Lead was identified as a COPC in both soil (Site I) and groundwater (Sites G, H, and I). Because of the uncertainties in the dose-response relationship between exposure to lead and biological effects, it is unclear whether the noncarcinogenic effects of lead exhibit a threshold response. Therefore, an RfD for lead is not available. Although USEPA has classified lead as a B2 (probable human) carcinogen, no cancer slope factor (CSF) has been developed. Therefore, potential exposures to lead cannot be evaluated using the traditional methods of risk assessment. However, the USEPA has developed a model for assessing adult exposures to lead in multiple environmental media (air, soil, and water) in an industrial/commercial setting is available in the peer reviewed literature (Bowers et al., 1994). The model is described in detail in Appendix Q. The results for the construction worker are summarized below.

As can be seen in Table T-30, an average expected blood lead level of 2.59 ug/dL is predicted for a hypothetical construction worker potentially exposed to lead in excavation, air, soil and groundwater in Site G, of 2.87 ug/dL in Site H, and of 3.43 ug/dL in Site I. These predictions are below acceptable Occupational Safety and Health Administration (OSHA) standards for adult workers (29 CFR, Part 1910.1025). The OSHA standards for blood lead levels are as follows: 1) Blood lead levels of workers (male and female) intending to have children should remain below 30 µg/dL; and 2) OSHA allows 40 ug/dL as a "permissible" blood lead level in lead-exposed workers, below which no further medical monitoring or workplace intervention is required. These values are also below the USEPA target blood lead level of 10 ug/dL for protection of a developing fetus (USEPA, 1996).

6.4 Uncertainty Analysis

Within any of the four steps of the human health risk assessment process, assumptions must be made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less support. Every assumption introduces some degree of uncertainty into the risk assessment process. Regulatory risk assessment methodology requires that conservative assumptions be made throughout the risk assessment to ensure that public health is protected. Therefore, when all of the assumptions are combined, it is much more likely that risks are overestimated rather than underestimated.

The assumptions that introduce the greatest amount of uncertainty in this risk assessment are discussed in Section 6.5 of the HHRA. Additional uncertainties associated with the scenarios presented in this appendix are discussed below. They are discussed in qualitative terms, because for most of the assumptions there is not enough information to assign a numerical value to the uncertainty that can be factored into the calculation of risk.

Sample Statistics. Site subsurface soil data were not collected as part of the current investigation. Therefore, unvalidated historical data were used in this evaluation. Detection limits were not available

for the majority of the results reported as not detected. Therefore, only detected concentrations were employed. This overestimates the EPCs for the subsurface soil data, because it is standard practice to use ½ the detection limit as a proxy concentration for results reported as not detected. Because the results were not validated, it is possible that there were unidentified sample collection or laboratory issues with the data. TCLP data were used as a proxy for groundwater data, introducing another source of uncertainty, which is likely to overestimate potential risks.

Environmental Degradation. The subsurface soil data used in this evaluation date back to the early 1980's. Organic constituents are naturally degraded in the environment by a variety of processes (i.e., photodegradation, microbial activity, hydrolysis, etc.). USEPA has recognized the validity and utility of natural attenuation and biodegradation as a remedial option and has recently published guidance for its site-specific implementation (USEPA, 1997d). Environmental half-lives vary for specific constituents based on environmental conditions (i.e., presence of bacteria, pH, exposures to sunlight and oxygen), and there are respected literature sources of such information. However, environmental degradation is not typically accounted for in the calculation of risks for the site. This has likely resulted in an over-estimation of site risks.

7.0 CONCLUSIONS

This construction worker evaluation (for subsurface soil and leachate) was conducted as a supplement to the original construction worker scenario presented in the main body of the report (surface soil and groundwater). Potential carcinogenic risks for this supplemental scenario are within the target risk range for all Sites. To evaluate potential additivity of risks for the two evaluations, risks calculated for the original and the supplemental risk assessments have been summed as shown in Tables T-31 and T-32 for the RME and MLE scenarios, respectively. The results indicate that the combined risks for each Site are still within the target risk range. With the exception of the MLE scenario for Site L, as the HIs for the supplemental risk assessment are all above 1, the combined HIs are also above 1. The combined HI for the MLE scenario for Site L is slightly above 1 (at 1.1).

Must state HI risks (non-cancer) exist!

These results support the original conclusion in the risk assessment that construction/excavation activities should not occur in Sites G, H, I, and now L without use of proper personal protective equipment and monitoring for air emissions from standing water.

These are risks that must be managed not just w/ PPE

8.0 REFERENCES

Sauget Area 1 Data Tables/Maps, Ecology and Environmental, Inc., February 1998, prepared for USEPA Region 5 Office of Superfund, Chicago, IL, ARCS Contract No. 68-W8-0086, Work Assignment No. 47-5N60.

Other references are presented in the main text of the report.

AAFs FOR CONSTITUENTS IN APPENDIX T NOT PRESENTED IN APPENDIX O

1,2-DICHLOROBENZENE

The oral RfD for 1,2-dichlorobenzene (9.0E-02 mg/kg-day) is based upon a corn oil gavage study in rats. Absorption is assumed to be virtually complete (100%) by this route. It is assumed that absorption is the same in animals and humans for gavage, drinking water, and soil ingestion exposures. Thus, the AAF (oral-water, oral-diet, oral-soil) are all 1.

ENSR has used a recommended default value for organics of 1% absorption for dermal exposures to soil and sediment (EPA, 2000). Thus, the AAF (dermal-soil, dermal-sediment) is 0.01.

The AAF (dermal-water) is used when estimating the human risks posed by dermally contacting surface water when wading or swimming or bathing. The methodology for quantitating risks posed by this exposure pathway uses a chemical-specific permeability constant that estimates the rate at which the chemical passes into and through the skin from an aqueous solution. By definition, the dose estimated by this procedure is an absorbed dose. Most dose-response criteria, however, are based on administered doses. An adjustment is necessary to account for the absorption in the dose-response study. In order to use consistent dose-response criteria across all exposure pathways, the AAF is used to make an adjustment to the absorbed dermal dose, instead of adjusting the dose-response criteria. Here, the AAF is defined as (100%)/(estimated absorption in the dose-response study). For 1,2-dichlorobenzene, the AAF (dermal-water) is (100%)/(100%) = 1.

Summary of AAFs for 1,2-Dichlorobenzene

Oral-Water	1
Oral-Diet	1
Oral-Soil	1
Dermal-Soil	0.01
Dermal-Water	1
Inhalation	NA

REFERENCES

USEPA. 2000. Region 4 Human Health Risk Assessment Bulletins - - Supplement to RAGS. USEPA Region 4. Atlanta, GA. Update 05/30/00. [URL:http://www.epa.gov/region4/waste/oftecser/healthbul.htm]

2,4-DINITROTOLUENE

The oral RfD for 2,4-dinitrotoluene of 2.0E-03 mg/kg-day is based on a study in dogs that received the dose via oral capsule. Limited information is available about the absorption of 2,4-dinitrotoluene. However, it is assumed that gastrointestinal absorption for this compound is complete. Furthermore, it is assumed that absorption is the same in animals and humans for oral capsule, drinking water, diet and soil ingestion exposures. Thus the AAF (oral-water), the AAF (oral-diet), and the AAF (oral-soil) are all 1.

A recommended default value for organics of 1% absorption from dermal exposures to soil containing organics (USEPA, 2000) has been used. Thus, the AAF (dermal-soil/sediment) is (1%/100%) = 0.01.

The AAF (dermal-water) is used when estimating the human risks posed by dermally contacting surface water when wading or swimming. The methodology for quantitating risks posed by this exposure pathway uses a chemical-specific permeability constant that estimates the rate at which the chemical passes into and through the skin from an aqueous solution. By definition, the dose estimated by this procedure is an absorbed dose. Most dose-response criteria, however, are based on administered doses. An adjustment is necessary to account for the absorption in the dose-response study. In order to use consistent dose-response criteria across all exposure pathways, the AAF is used to make an adjustment to the absorbed dermal dose, instead of adjusting the dose-response criteria. Here, the AAF is defined as (100%)/(estimated absorption in the dose-response study). For 2,4-dinitrotoluene, the AAF (dermal-water) is 100%/100% = 1.

Summary of AAFs for 2,4-Dinitrotoluene

Oral-water	1
Oral-diet	1
Oral-soil	1
Dermal-soil	0.01
Dermal-water	1
Inhalation	NA

REFERENCES

USEPA. 2000. Region 4 Human Health Risk Assessment Bulletins - - Supplement to RAGS. USEPA Region 4. Atlanta, GA. Update 05/30/00. [URL:http://www.epa.gov/region4/waste/oftecser/healthbul.htm]

BARIUM

The USEPA oral RfD for barium (7E-02 mg/kg-day) is based on a drinking water study in humans in which healthy male volunteers consumed barium chloride. The gastrointestinal absorption in humans of other forms of barium from surface water or groundwater is assumed to be the same. Thus, the AAF (oral-water) is 1. The absorption of barium in humans from dietary constituents is reported to be greater than 91% (Lisk et al., 1988). It is assumed that the absorption from drinking water is 100%. Thus, the AAF (oral-diet) is 1. It is further assumed that the gastrointestinal absorption from soil is the same as from the diet (91-100%). Thus, the AAF (oral-soil) is assumed to be 1.

A recommended default value for inorganics of 0.1% was assumed for dermal absorption from soil in the absence of data on the dermal absorption of barium (USEPA, 2000). Thus, the AAF (dermal-soil) is 0.001.

The inhalation dose-response value for barium (1.43E-04 mg/kg-day) is based on the USEPA RfC, which is derived from an inhalation study in rats. It is assumed that absorption in humans from respirable particles retained in the lung is the same as absorption of $BaCO_3$ dust particles in rats. Thus, the AAF (inhalation) is 1.

The AAF (dermal-water) is used when estimating the human risks posed by dermally contacting surface water when wading or swimming. The methodology for quantitating risks posed by this exposure pathway uses a chemical-specific permeability constant that estimates the rate at which the chemical passes into and through the skin from an aqueous solution. By definition, the dose estimated by this procedure is an absorbed dose. Most dose-response criteria, however, are based on administered doses. An adjustment is necessary to account for the absorption in the dose-response study. In order to use consistent dose-response criteria across all exposure pathways, the AAF is used to make an adjustment to the absorbed dermal dose, instead of adjusting the dose-response criteria. Here, the AAF is defined as (100%)/(estimated absorption in the dose-response study). For barium the AAF (dermal-water) is (100%)/(100%) = 1.

Summary of AAFs for Barium

Oral-Water	1
Oral-Diet	1
Oral-Soil	1
Dermal-Soil	0.001
Dermal-Water	1
Inhalation	1

REFERENCES

Lisk, D.J., C.A. Bache, L.A. Essick, C.M. Reid, M. Rutzke, and K. Crown. 1988. Absorption and excretion of selenium and barium in humans from consumption of brazil nuts. Nutrition Reports International 38:183-192.

USEPA. 2000. Region 4 Human Health Risk Assessment Bulletins - - Supplement to RAGS. USEPA Region 4. Atlanta, GA. Update 05/30/00. [URL:http://www.epa.gov/region4/waste/oftecser/healthbul.htm]

BERYLLIUM

The USEPA oral RfD of 2E-03 mg/kg-day is based on a dietary study in dogs. Beryllium is very poorly absorbed across the gastrointestinal tract with several investigators reporting less than 1% absorption of ingested beryllium (ATSDR, 1987). It is assumed that the absorption of beryllium in the diet, soil and sediment is the same as that in drinking water. Thus, the AAF (oral-diet), the AAF (oral-soil), the AAF (oral-sediment), and the AAF (oral-water) are all 1.

Dermal absorption of beryllium is also reported to be poor, although specific estimates were not located (ATSDR, 1987). A recommended default value for inorganics of 0.1% for the dermal absorption from soil has been used (USEPA, 2000). Assuming that the gastrointestinal absorption of beryllium from the drinking water study was 1%, results in an AAF (dermal-soil/sediment) of (0.1%)/(1%) = 0.1.

The AAF (dermal-water) is used when estimating the human risks posed by dermally contacting surface water when wading or swimming. The methodology for quantifying risks posed by this exposure pathway uses a chemical-specific permeability constant that estimates the rate at which the chemical passes into and through the skin from an aqueous solution. By definition, the dose estimated by this procedure is an absorbed dose. Most dose-response criteria; however, are based on administered doses. An adjustment is necessary to account for the absorption in the dose-response study. In order to use consistent dose-response criteria across all exposure pathways, the AAF is used to make adjustment to the absorbed dermal dose, rather than adjusting the dose-response criteria. Here, the AAF is defined as (100%)/(estimated absorption in the dose-response study). For beryllium, the AAF (dermal-water) is (100%)/(1%) = 100.

Both the inhalation CSF of 8.4 $(mg/kg\text{-}day)^{-1}$ and the inhalation of RfD of 5.71E-06 mg/kg-day were derived from epidemiological data based on occupationally exposed workers. It is assumed that the absorption of inhaled beryllium in the environment is the same as in the dose-response study. Thus, the AAF (inhalation) is 1.

Summary of AAFs for Beryllium

Oral-Water	1
Oral-Diet	1
Oral-Soil	1
Dermal-Soil	0.1

Dermal-Water	100
Inhalation	1

REFERENCES

ATSDR (Agency for Toxic Substances and Disease Registry). 1987. Draft Toxicological Profile for Beryllium. ATSDR, Atlanta, GA.

USEPA. 2000. Region 4 Human Health Risk Assessment Bulletins - - Supplement to RAGS. USEPA Region 4. Atlanta, GA. Update 05/30/00. [URL:http://www.epa.gov/region4/waste/oftecser/healthbul.htm]

HEXACHLOROBENZENE

The oral and inhalation cancer slope factor of 1.6 $(mg/kg\text{-}day)^{-1}$ and the oral reference dose of 8E-04 mg/kg-day are based on dietary studies in rats. Therefore, the AAFs are the same for carcinogenic and noncarcinogenic risk assessment. Limited information was available concerning the absorption of hexachlorobenzene, so information on the structurally related constituent polychlorinated biphenyls was used to derive appropriate AAFs. The detailed derivations of the AAFs are presented under polychlorinated biphenyls. As for PCBs, absorption of hexachlorobenzene from oil gavage has been show to be about 80% (ATSDR, 1989). The AAFs (oral-water and oral-diet) are 1. The AAF (oral-soil) is 0.83. The absorption factor for dermal-soil is 0.04 and for dermal-water is 1.1. The inhalation AAF is 1.

REFERENCES

ATSDR (Agency for Toxic Substances and Disease Registry). 1989. Draft Toxicological Profile for hexachlorobenzene. ATSDR: Atlanta, GA.

MANGANESE

The oral RfD for dietary intake of manganese is 1.4E-01 mg/kg-day based on human consumption studies. Because these are dietary studies, the AAF (oral-diet) is by definition 1.

The oral RfD for exposure to manganese in non-food media such as drinking water, soil, etc., is 4.7E-02 mg/kg-day. This value is based on the dietary RfD after the application of a modifying factor of 3. The AAF (oral-water) and AAF (oral-soil) are assumed to be 1.

No studies have been found that address the dermal absorption of manganese from soils. A default value for the absorption of metals from soil is 0.1% (USEPA, 2000). Assuming a 10% absorption of manganese from the diet, the AAF (dermal-soil) is (0.1%/10%) = 0.01.

The USEPA inhalation RfC for manganese is 5.0E-05 mg/m^3. This corresponds to an inhalation RfD of 1.43E-05 mg/kg-day. The value is based on a human occupational epidemiological study. Absorption of airborne manganese is assumed not to differ from that in the dose-response study. Therefore, the AAF (inhalation) is 1.

The AAF (dermal-water) is used when estimating the human risks posed by dermally contacting surface water when wading or swimming. The methodology for quantifying risks posed by this exposure pathway uses a chemical-specific permeability constant that estimates the rate at which the chemical passes into and through the skin from an aqueous solution. By definition, the dose estimated by this procedure is an absorbed dose. Most dose-response criteria, however, are based on administered doses. An adjustment is necessary to account for the absorption in the dose-response study. In order to use consistent dose-response criteria across all exposure pathways, the AAF is used to make adjustment to the absorbed dermal dose, rather than adjusting the dose-response criteria. Here, the AAF is defined as (100%)/(estimated absorption in the dose-response study). For manganese, the AAF (dermal-water) is 100%/10% = 10.

Summary of AAFs for Manganese

Oral-water	1
Oral-diet	1
Oral-soil	1
Dermal-soil	0.01
Dermal-water	10
Inhalation	1

REFERENCES

USEPA. 2000. Region 4 Human Health Risk Assessment Bulletins - - Supplement to RAGS. USEPA Region 4. Atlanta, GA. Update 05/30/00. [URL:http://www.epa.gov/region4/waste/oftecser/healthbul.htm]

METHYLENE CHLORIDE

The oral CSF for methylene chloride (7.5E-03 $(mg/kg/day)^{-1}$) is based on drinking water and inhalation studies in mice. The oral RfD (6E-02 mg/kg/day) is based on a drinking water study in rats. Therefore, the derived AAFs for oral and dermal exposure routes will be the same for evaluating both carcinogenic and noncarcinogenic effects. The USEPA (1985) reports that absorption of methylene chloride by the gastrointestinal tract is high regardless of vehicle. Based on this information and other absorption information on other volatile organic compounds, it is assumed that absorption is the same in animals and humans for gavage, drinking water, inhalation, and soil or sediment ingestion exposures. Thus, the AAF (oral-water), the AAF (oral-diet), and the AAF (oral-soil) are 1.

A recommended default value for VOCs of 1% was assumed for dermal absorption of methylene chloride from soil and sediment (USEPA, 2000). An estimate of the gastrointestinal absorption of methylene chloride in the dose-response studies was derived from the USEPA (1985) in which several absorption estimates were listed. The average of four estimates was 63%. Thus, the AAF (dermal-soil) is (1%/63%) = 0.016.

The AAF (dermal-water) is used when estimating the human risks posed by dermally contacting surface water when wading or swimming. The methodology for quantitating risks posed by this exposure pathway uses a chemical-specific permeability constant that estimates the rate at which the chemical passes into and through the skin from an aqueous solution. Be definition, the dose estimated by this procedure is an absorbed dose. Most dose-response criteria, however, are based on administered doses. An adjustment is necessary to account for the absorption in the dose-response study. In order to use consistent dose-response criteria across all exposure pathways, the AAF is used to make an adjustment to the absorbed dermal dose, instead of adjusting the dose-response criteria. Here, the AAF is defined (100%)/(estimated absorption in the dose-response study). For methylene chloride, the AAF (dermal-water) is (100%)/(63%) = 1.6.

The inhalation RfC, 3.0 mg/m^3 (8.57E-01 mg/kg/day), is derived from an inhalation study in rats. It is assumed that absorption of methylene chloride in humans is the same as in the rats used in the dose-response study. Thus the AAF (inhalation) is 1 for noncarcinogenic effects. The inhalation cancer unit risk factor for methylene chloride is 4.7E-07 per $(\mu g/m^3)^{-1}$, equivalent to 1.65E-03 $(mg/kg/day)^{-1}$). It is derived from an inhalation study in mice. This value was derived by incorporating a physiologically based pharmacokinetic model to account for extrapolation of metabolism at high doses to low doses. It is assumed that no further adjustments are required, so the AAF (inhalation-vapor, inhalation) is 1 for cancer risk.

Summary of AAFs for Methylene Chloride

Oral-Water	1
Oral-Diet	1
Oral-Soil	1
Dermal-Soil	0.016
Dermal-Water	1.6
Inhalation	1 (for both carcinogenic and noncarcinogenic effects)

REFERENCES

U.S. EPA. 1985. Health Assessment Document for Dichloromethane (Methylene Chloride). Final Report. Office of Health and Environmental Assessment, Washington, D.C. EPA/600/8-82/004F.

USEPA. 2000. Region 4 Human Health Risk Assessment Bulletins - - Supplement to RAGS. USEPA Region 4. Atlanta, GA. Update 05/30/00. [URL:http://www.epa.gov/region4/waste/oftecser/healthbul.htm]

SELENIUM

The oral dose-response value for selenium (5E-03 mg/kg-day) is based on a human dietary study. According to ATSDR (1988) selenium is completely absorbed from drinking water as well as dietary constituents. This is supported by a study by Van Barweld (as cited in ATSDR) who showed that 90-95% of selenium given to mice in drinking water was absorbed. In addition, Lisk et al. (1988) showed that >87% of barium from food was absorbed by humans. It is assumed that gastrointestinal absorption from soil is also complete. Thus, the AAF (oral-water), AAF (oral-diet) and AAF (oral-soil) are all 1. The USEPA recommended default value of 0.1% for a dermal absorption of inorganics from soil has been used (USEPA, 2000). Thus, the AAF (dermal-soil) = (0.1%/100%) = 0.001.

The AAF (dermal-water) is used when estimating the human risks posed by dermally contacting surface water when wading or swimming. The methodology for quantitating risks posed by this exposure pathway uses a chemical-specific permeability constant that estimates the rate at which the chemical passes into and through the skin from an aqueous solution. By definition, the dose estimated by this procedure is an absorbed dose. Most dose-response criteria, however, are based on administered doses. An adjustment is necessary to account for the absorption in the dose-response study. In order to use consistent dose-response criteria across all exposure pathways, the AAF is used to make an adjustment to the absorbed dermal dose, instead of adjusting the dose-response criteria. Here, the AAF is defined as (100%)/(estimated absorption in the dose-response study). For selenium, the AAF (dermal-water) is 100%/100% = 1.

Summary of AAFs for Selenium

Oral-water	1
Oral-diet	1
Oral-soil	1
Dermal-soil	0.001
Dermal-water	1

REFERENCES

ATSDR (Agency for Toxic Substances and Disease Registry). 1988. Toxicological Profile for Selenium (Agency for Toxic Substances and Disease Registry). Atlanta, GA.

Lisk, D. J., C. A. Bache, L. A. Essick, C.M. Reid, M. Rutzke, and K. Crown. 1988. Absorption and Excretion of Selenium and Barium in Humans From Consumption of Brazil Nuts. Nutrition Reports International 38:183-192.

USEPA. 2000. Region 4 Human Health Risk Assessment Bulletins - - Supplement to RAGS. USEPA Region 4. Atlanta, GA. Update 05/30/00. [URL:http://www.epa.gov/region4/waste/oftecser/healthbul.htm]

PYRIDINE

The oral noncarcinogenic dose response value for pyridine (0.001 mg/kg-day) is based upon an oil gavage study in rats. Limited data are available describing oral absorption and these generally represent minimum estimates of the absorbed dose. Thus, it was assumed that 100% of the gavage dose administered in the dose-response study was absorbed. Furthermore, it was assumed that absorption is the same in animals and humans for gavage, drinking water, diet, and soil or sediment ingestion exposures. Thus, the oral-water AAF, the oral-diet AAF, and the oral-soil AAFs are all 1 for use with the oral dose response value.

We have used a recommended default value for VOCs of 1.0% absorption from dermal exposures to soil and sediment containing organics (USEPA, 2000). Thus, the AAF (dermal-soil) is (1%/100%) = 0.01.

The AAF (dermal-water) is used when estimating the human risks posed by dermally contacting surface water when wading or swimming. The methodology for quantitating risks posed by this exposure pathway uses a chemical-specific permeability constant that estimates the rate at which the chemical passes into and through the skin from an aqueous solution. By definition, the dose estimated by this procedure is an absorbed dose. Most dose-response criteria, however, are based on administered doses. An adjustment is necessary to account for the absorption in the dose-response study. In order to use consistent dose-response criteria across all exposure pathways, the AAF is used to make an adjustment to the absorbed dermal dose, instead of adjusting the dose-response criteria. Here, the AAF is defined as (100%)/(estimated absorption in the dose-response study). For pyridine, the AAF (dermal-water) is 100%/100% = 1.

Summary of AAFs for Pyridine

Oral-water	1
Oral-diet	1
Oral-soil	1
Dermal-soil	0.01
Dermal-water	1

REFERENCES

USEPA. 2000. Region 4 Human Health Risk Assessment Bulletins - - Supplement to RAGS. USEPA Region 4. Atlanta, GA. Update 05/30/00. [URL:http://www.epa.gov/region4/waste/oftecser/healthbul.htm]

PHOSPHOROUS

The oral noncarcinogenic dose response value for phosphorous (2E-05 mg/kg-day) is based upon an oil gavage study in rats. It was assumed that 100% of the gavage dose administered in the dose-response study was absorbed. Furthermore, it was assumed that absorption is the same in animals and humans for gavage, drinking water, diet, and soil or sediment ingestion exposures. Thus, the oral-water AAF, the oral-diet AAF, and the oral-soil AAF are all 1 for use with the oral dose response value.

A recommended default value for inorganics of 0.1% absorption from dermal exposures to soil has been used (USEPA, 2000). Thus, the AAF (dermal-soil and dermal-sediment) is (1%/100%) = 0.001.

The AAF (dermal-water) is used when estimating the human risks posed by dermally contacting surface water when wading or swimming. The methodology for quantitating risks posed by this exposure pathway uses a chemical-specific permeability constant that estimates the rate at which the chemical passes into and through the skin from an aqueous solution. By definition, the dose estimated by this procedure is an absorbed dose. Most dose-response criteria, however, are based on administered doses. An adjustment is necessary to account for the absorption in the dose-response study. In order to use consistent dose-response criteria across all exposure pathways, the AAF is used to make an adjustment to the absorbed dermal dose, instead of adjusting the dose-response criteria. Here, the AAF is defined as (100%)/(estimated absorption in the dose-response study). For phosphorous, the AAF (dermal-water) is 100%/100% = 1.

Summary of AAFs for Phosphorous

Oral-water	1
Oral-diet	1
Oral-soil	1
Dermal-soil	0.001
Dermal-water	1

REFERENCES

USEPA. 2000. Region 4 Human Health Risk Assessment Bulletins - - Supplement to RAGS. USEPA Region 4. Atlanta, GA. Update 05/30/00. [URL:http://www.epa.gov/region4/waste/oftecser/healthbul.htm]

2,4-D

The oral noncarcinogenic dose response value for 2,4-D (1E-02 mg/kg-day) is based upon a dietary study in rats. It is assumed that 100% of the dose in the dose-response study was absorbed. Furthermore, it was assumed that absorption is the same in animals and humans for drinking water, diet, and soil ingestion exposures. Thus, the oral-water AAF, the oral-diet AAF, and the oral-soil AAFs are all 1 for use with the oral dose response value.

A recommended default value for organics of 1.0% absorption from dermal exposures to soil has been used (USEPA, 2000). Thus, the AAF (dermal-soil) is (1%/100%) = 0.01.

The AAF (dermal-water) is used when estimating the human risks posed by dermally contacting surface water when wading or swimming. The methodology for quantitating risks posed by this exposure pathway uses a chemical-specific permeability constant that estimates the rate at which the chemical passes into and through the skin from an aqueous solution. By definition, the dose estimated by this procedure is an absorbed dose. Most dose-response criteria, however, are based on administered doses. An adjustment is necessary to account for the absorption in the dose-response study. In order to use consistent dose-response criteria across all exposure pathways, the AAF is used to make an adjustment to the absorbed dermal dose, instead of adjusting the dose-response criteria. Here, the AAF is defined as (100%)/(estimated absorption in the dose-response study). For 2,4-D, the AAF (dermal-water) is 100%/100% = 1.

Summary of AAFs for 2,4-D

Oral-water	1
Oral-diet	1
Oral-soil	1
Dermal-soil	0.01
Dermal-water	1

REFERENCES

USEPA. 2000. Region 4 Human Health Risk Assessment Bulletins - - Supplement to RAGS. USEPA Region 4. Atlanta, GA. Update 05/30/00. [URL:http://www.epa.gov/region4/waste/oftecser/healthbul.htm]

TOXAPHENE

The oral CSF for toxaphene of 1.1 $(mg/kg\text{-}day)^{-1}$ is based upon a dietary study in mice. It was assumed that 100% of the dose in the dose-response study was absorbed. Furthermore, it was assumed that absorption is the same in animals and humans for drinking water, diet, and soil ingestion exposures. Thus, the oral-water AAF, the oral-diet AAF, and the oral-soil AAF are all 1 for use with the oral dose response value.

A recommended default value for organics of 1.0% absorption from dermal exposures to soil has been used (USEPA, 2000). Thus, the AAF (dermal-soil) is (1%/100%) = 0.01.

The AAF (dermal-water) is used when estimating the human risks posed by dermally contacting surface water when wading or swimming. The methodology for quantitating risks posed by this exposure pathway uses a chemical-specific permeability constant that estimates the rate at which the chemical passes into and through the skin from an aqueous solution. By definition, the dose estimated by this procedure is an absorbed dose. Most dose-response criteria, however, are based on administered doses. An adjustment is necessary to account for the absorption in the dose-response study. In order to use consistent dose-response criteria across all exposure pathways, the AAF is used to make an adjustment to the absorbed dermal dose, instead of adjusting the dose-response criteria. Here, the AAF is defined as (100%)/(estimated absorption in the dose-response study). For toxaphene, the AAF (dermal-water) is 100%/100% = 1.

The inhalation CSF of 1.12 $(mg/kg\text{-}day)^{-1}$ is based on the dietary study in mice. Due to the lack of chemical-specific information, it is assumed that absorption is the same for humans as in the dose-response study. Thus, the AAF (inhalation) is 1.

Summary of AAFs for Toxaphene

Oral-water	1
Oral-diet	1
Oral-soil	1
Dermal-soil	0.01
Dermal-water	1
Inhalation	1

REFERENCES

USEPA. 2000. Region 4 Human Health Risk Assessment Bulletins - - Supplement to RAGS. USEPA Region 4. Atlanta, GA. Update 05/30/00. [URL:http://www.epa.gov/region4/waste/oftecser/healthbul.htm]

TABLE T-1
SAMPLES USED IN CALCULATION OF SITE CONCENTRATIONS
SUBSURFACE SOIL (a)

Site	Sample	Date Collected
G	B-B2	10/18/91
G	B-B3	10/18/91
G	DC-G1-26	1/12/87
G	DC-G1-27	1/12/87
G	DC-G2-30	1/14/87
G	DC-G2-31	1/14/87
G	DC-G2-33	1/26/87
G	DC-G4-35	1/26/87
G	DC-G5-37	1/27/87
G	DC-G6-67	2/23/87
G	DC-G7-69	2/24/87
G	DC-G8-70	2/24/87
G	DC-G9-71	2/24/87
G	G106 (10'-11.5	10/1/84
G	G106 (18'-19.5'	10/1/84
G	G106 (20'-21.5'	10/1/84
G	G106 (7.5'-9')	10/1/84
G	G106 (30'-31.5')	10/1/84
G	G106 (12.5'-13')	10/1/84
G	G106 (15.5'-17')	10/1/84
G	G107 (5'-6.5')	10/1/84
G	G107 (0.5'-2')	10/1/84
H	DC-H1-14	12/18/86
H	DC-H1-15	12/18/87
H	DC-H2-16	1/5/87
H	DC-H3-17	1/6/87
H	DC-H3-18	1/6/87
H	DC-H4-19	1/6/87
H	DC-H5-21	1/7/87
H	DC-H6-22	1/8/87
H	DC-H7-23	1/8/87
H	DC-H8-24	1/9/87
H	DC-H9-28	1/13/87

TABLE T-1
SAMPLES USED IN CALCULATION OF SITE CONCENTRATIONS
SUBSURFACE SOIL (a)

Site	Sample	Date Collected
I	DC-I10-50	2/4/87
I	DC-I11-51	2/5/87
I	DC-I11-52	2/13/87
I	DC-I12-57	2/13/87
I	DC-I12-58	2/13/87
I	DC-I1-38	1/27/87
I	DC-I2-39	1/28/87
I	DC-I3-40	1/29/87
I	DC-I5-41	1/30/87
I	DC-I5-42	1/30/87
I	DC-I6-43	2/2/87
I	DC-I7-45	2/3/87
I	DC-I7-46	2/3/87
I	DC-I7-47	2/3/87
I	DC-I9-48	2/4/87
I	DC-I9-49	2/4/87
L	DC-L1-02	12/12/86
L	DC-L2-03	12/12/86
L	DC-L3-04	12/12/86
L	DC-L4-09	12/17/86
L	DC-L4-10	12/17/86
L	GML 1 (LB-16/LB-17)1	10/16/91
L	GML 1 (LB-16/LB-17)2	10/16/91
L	GML 1 (LB-17)(1st)	10/16/91
L	GML 1 (LB-17)(2nd)	10/16/91
L	L1 (LB-16/LB-17)(1st	10/16/91
L	L1 (LB-16/LB-17)(2nd	10/16/91
L	L1(LB-17)(1st)	10/16/91
L	L1(LB-17)(2nd)	10/16/91
L	L2(LB-13)	10/15/91
L	L3(LB-14)(1st)	10/16/91
L	L3(LB-14)(2nd)	10/16/91
L	L4(LB-12)	10/15/91
L	L5(LB-10)	10/15/91

(a) - Only concentrations reported as detected by the laboratory were used in the calculation of statistics for subsurface soil.

TABLE T-2
SAMPLES USED IN CALCULATION OF SITE CONCENTRATIONS
GROUNDWATER -TCLP DATA (a)

Site	Sample	Date Collected
G	WASTE-G-B3-10-12FTFD	10/11/99
G	WASTE-G-B3-COMPFD	10/11/99
G	WASTE-G-B1-2-4FT	10/8/99
G	WASTE-G-B1-COMP	10/8/99
G	WASTE-G-B2-12-14FT	10/8/99
G	WASTE-G-B2-COMP	10/8/99
G	WASTE-G-B3-10-12FT	10/11/99
G	WASTE-G-B3-COMP	10/11/99
G	WASTE-G-B4-12-14FT	10/12/99
G	WASTE-G-B4-COMP	10/12/99
H	WASTE-H-B1-4-6FT	10/1/99
H	WASTE-H-B1-COMP	10/1/99
H	WASTE-H-B2-4-6FT	10/1/99
H	WASTE-H-B2A-4-6FT	10/5/99
H	WASTE-H-B2A-COMP	10/5/99
H	WASTE-H-B2-COMP	10/1/99
H	WASTE-H-B3-2-4FT	10/4/99
H	WASTE-H-B3-COMP	10/4/99
H	WASTE-H-B4-14-16FT	10/4/99
H	WASTE-H-B4-COMP	10/4/99
I	WASTE-I-B5-24-26FTFD	10/15/99
I	WASTE-I-B5-COMPFD	10/15/99
I	WASTE-I-B1-14-16FT	10/14/99
I	WASTE-I-B1-COMP	10/14/99
I	WASTE-I-B2-2-4FT	10/15/99
I	WASTE-I-B2-COMP	10/15/99
I	WASTE-I-B4-0-2FT	10/14/99
I	WASTE-I-B4-COMP	10/14/99
I	WASTE-I-B5-24-26FT	10/15/99
I	WASTE-I-B5-COMP	10/15/99
L	WASTE-L-B1-COMP	9/29/99
L	WASTE-L-B2-COMP	9/29/99
L	WASTE-L-B3-0-2FT	9/30/99
L	WASTE-L-B3-COMP	9/30/99
L	WASTE-L-B4-0-2FT	9/30/99
L	WASTE-L-B4-COMP	9/30/99

TCLP - Toxicity Characteristic Leaching Procedure.
(a) - Leachate concentrations, as defined by the TCLP results for waste samples at each site, are evaluated as groundwater.

Table T-3
Site Concentration Selection
Subsurface Soil Statistics

Site	Constituent	Number of Samples for Statistics (d)	Shapiro-Wilke's Test for Normality (a)			Summary Statistics (mg/kg)			95% UCL (mg/kg)			Site Concentration (mg/kg) (c)
			Normal	Lognormal	Dataset Distribution	Minimum	Mean	Maximum	t-Test	H-Test	UCL (b)	
G	1,1,2,2-Tetrachloroethane	1	NC	NC	NC	5.81E-01	5.81E-01	5.81E-01	NC	NC	NC	5.81E-01
G	1,2,4-Trichlorobenzene	4	0.8264	0.8563	Lognormal	7.87E+00	6.16E+01	1.20E+02	1.30E+02	2.19E+05	2.19E+05	1.20E+02
G	1,2-Dichloroethane	1	NC	NC	NC	4.35E-01	4.35E-01	4.35E-01	NC	NC	NC	4.35E-01
G	1,4-Dichlorobenzene	2	1.0000	1.0010	Lognormal	2.38E+00	2.97E+00	3.56E+00	6.69E+00	NC	NC	3.56E+00
G	2,4,6-Trichlorophenol	1	NC	NC	NC	4.95E+01	4.95E+01	4.95E+01	NC	NC	NC	4.95E+01
G	2,4-Dichlorophenol	3	0.8853	0.9937	Lognormal	1.41E+01	6.45E+01	1.41E+02	1.79E+02	5.17E+07	5.17E+07	1.41E+02
G	2,4-Dinitrophenol	1	NC	NC	NC	1.40E+01	1.40E+01	1.40E+01	NC	NC	NC	1.40E+01
G	2-Butanone (MEK)	11	0.9180	0.7225	Normal	2.20E-02	7.39E+00	1.78E+01	1.08E+01	5.01E+04	1.08E+01	1.08E+01
G	2-Chlorophenol	1	NC	NC	NC	8.76E+00	8.76E+00	8.76E+00	NC	NC	NC	8.76E+00
G	2-Methylnapthalene	4	0.7882	0.8906	Lognormal	8.71E+00	1.84E+01	3.71E+01	3.34E+01	1.04E+02	1.04E+02	3.71E+01
G	2-Methylphenol(o-cresol)	1	NC	NC	NC	3.56E+00	3.56E+00	3.56E+00	NC	NC	NC	3.56E+00
G	4,4'-DDE	4	0.8451	0.8556	Lognormal	3.07E+00	4.88E+01	1.35E+02	1.22E+02	1.85E+08	1.85E+08	1.35E+02
G	4-Chloroaniline	3	0.7568	0.8102	Lognormal	5.97E+00	8.16E+01	2.31E+02	2.99E+02	4.20E+22	4.20E+22	2.31E+02
G	4-Methyl-2-pentanone	4	0.9103	0.9239	Lognormal	6.35E-01	2.99E+00	6.00E+00	5.97E+00	5.54E+02	5.54E+02	6.00E+00
G	Acenapthene	1	NC	NC	NC	2.67E+00	2.67E+00	2.67E+00	NC	NC	NC	2.67E+00
G	Acetone	11	0.8917	0.8177	Normal	3.20E-02	5.66E+00	1.54E+01	8.44E+00	2.80E+02	8.44E+00	8.44E+00
G	Aluminum	13	0.9477	0.9341	Normal	9.66E+02	8.17E+03	1.87E+04	1.08E+04	1.74E+04	1.08E+04	1.08E+04
G	Anthracene	1	NC	NC	NC	8.49E+00	8.49E+00	8.49E+00	NC	NC	NC	8.49E+00
G	Arsenic	5	0.8232	0.9377	Lognormal	2.50E+00	5.52E+00	1.11E+01	8.65E+00	1.37E+01	1.37E+01	1.11E+01
G	Barium	13	0.4450	0.6892	Lognormal	1.17E+02	5.00E+03	4.59E+04	1.14E+04	4.18E+04	4.18E+04	4.18E+04
G	Benzene	6	0.8552	0.7001	Normal	3.00E-03	1.53E+01	4.53E+01	2.88E+01	3.88E+13	2.88E+01	4.53E+01
G	Benzyl alcohol	1	NC	NC	NC	6.10E+00	6.10E+00	6.10E+00	NC	NC	NC	6.10E+00
G	Butyl benzyl phthalate	1	NC	NC	NC	2.33E+01	2.33E+01	2.33E+01	NC	NC	NC	2.33E+01
G	Pentachlorophenol(PCP)	5	0.7250	0.9819	Lognormal	2.35E+01	1.32E+03	4.77E+03	3.19E+03	3.34E+07	3.34E+07	4.77E+03
G	Cadmium	3	0.9231	0.9988	Lognormal	2.00E+00	7.00E+00	1.40E+01	1.75E+01	6.65E+04	6.65E+04	1.40E+01
G	Calcium	2	1.0000	1.0045	Lognormal	1.61E+04	1.73E+04	1.85E+04	2.49E+04	NC	NC	1.85E+04
G	Chlorobenzene	8	0.6735	0.9484	Lognormal	1.07E-01	1.08E+02	5.38E+02	2.34E+02	1.18E+06	1.18E+06	5.38E+02
G	Chloroform	1	NC	NC	NC	1.16E+01	1.16E+01	1.16E+01	NC	NC	NC	1.16E+01
	Chromium	13	0.3651	0.7033	Lognormal	5.00E+00	9.36E+01	9.85E+02	2.27E+02	2.28E+02	2.28E+02	2.28E+02
	Chrysene	1	NC	NC	NC	2.29E+01	2.29E+01	2.29E+01	NC	NC	NC	2.29E+01
	Cobalt	6	0.6928	0.8742	Lognormal	8.70E+00	2.05E+01	5.60E+01	3.51E+01	5.25E+01	5.25E+01	5.60E+01
G	Copper	20	0.3548	0.8810	Lognormal	8.00E+00	1.73E+02	2.22E+03	3.63E+02	3.24E+02	3.24E+02	3.24E+02
G	Di-N-butyl phthalate	4	0.7365	0.7373	Lognormal	2.79E-01	8.92E+00	1.76E+01	2.06E+01	2.10E+11	2.10E+11	1.76E+01
G	Dibenofuran	2	1.0000	0.9999	Normal	4.30E+00	1.91E+01	3.38E+01	1.12E+02	NC	1.12E+02	3.38E+01
G	Diethylphthalate	1	NC	NC	NC	2.29E+01	2.29E+01	2.29E+01	NC	NC	NC	2.29E+01
G	Ethylbenzene	6	0.8451	0.9113	Lognormal	1.64E-01	6.80E+00	1.69E+01	1.28E+01	7.35E+03	7.35E+03	1.69E+01
G	Fluoranthene	1	NC	NC	NC	6.59E+00	6.59E+00	6.59E+00	NC	NC	NC	6.59E+00
G	Fluorene	1	NC	NC	NC	1.13E+01	1.13E+01	1.13E+01	NC	NC	NC	1.13E+01
G	Hexachlorobenzene	2	1.0000	1.0004	Lognormal	2.79E+01	3.43E+01	4.06E+01	7.44E+01	NC	NC	4.06E+01
G	Iron	22	0.6593	0.9432	Lognormal	4.06E+03	1.35E+04	5.37E+04	1.72E+04	1.73E+04	1.73E+04	1.73E+04
G	Lead	18	0.3618	0.7723	Lognormal	3.00E+00	2.41E+02	3.12E+03	5.47E+02	7.30E+02	7.30E+02	7.30E+02
G	Magnesium	2	1.0000	1.0513	Lognormal	7.16E+03	7.31E+03	7.46E+03	8.26E+03	NC	NC	7.46E+03
G	Manganese	11	0.9544	0.9300	Normal	4.30E+01	2.09E+02	4.61E+02	2.75E+02	3.82E+02	2.75E+02	2.75E+02
G	Mercury	4	0.6356	0.8636	Lognormal	2.00E-02	8.66E+00	3.43E+01	2.88E+01	3.78E+21	3.78E+21	3.43E+01
G	Methylene chloride	11	0.6327	0.8626	Lognormal	3.00E-03	1.63E+00	7.11E+00	3.01E+00	4.29E+03	4.29E+03	7.11E+00
G	N-Nitrosodiphenylamine	1	NC	NC	NC	1.78E+02	1.78E+02	1.78E+02	NC	NC	NC	1.78E+02
G	Napthalene	7	0.5093	0.9141	Lognormal	4.83E+00	8.93E+02	5.43E+03	2.36E+03	9.78E+06	9.78E+06	5.43E+03
G	Nickel	19	0.4754	0.8981	Lognormal	8.00E+00	5.13E+01	3.99E+02	8.67E+01	7.98E+01	7.98E+01	7.98E+01
G	Phenanthrene	4	0.9133	0.9840	Lognormal	1.29E+01	2.84E+01	5.14E+01	4.77E+01	1.18E+02	1.18E+02	5.14E+01
G	Phenol	1	NC	NC	NC	1.78E+02	1.78E+02	1.78E+02	NC	NC	NC	1.78E+02
G	Phosphorus	9	0.8305	0.9759	Lognormal	1.83E+02	5.37E+02	1.34E+03	7.48E+02	8.98E+02	8.98E+02	8.98E+02
G	Potassium	2	1.0000	0.9970	Normal	1.47E+03	1.59E+03	1.70E+03	2.31E+03	NC	2.31E+03	1.70E+03
G	Pyrene	2	1.0000	1.0001	Lognormal	7.56E+00	1.33E+01	1.91E+01	4.96E+01	NC	NC	1.91E+01
G	Silver	1	NC	NC	NC	1.20E+01	1.20E+01	1.20E+01	NC	NC	NC	1.20E+01
G	Total PCBs	7	0.6284	0.8209	Lognormal	1.30E-01	9.08E+02	4.43E+03	2.07E+03	6.93E+16	6.93E+16	4.43E+03
G	Tetrachloroethene	8	0.8000	0.7400	Normal	9.00E-03	1.88E+01	5.86E+01	3.30E+01	3.09E+06	3.30E+01	3.30E+01
G	Tin	2	1.0000	1.0001	Lognormal	2.60E+01	5.30E+01	8.00E+01	2.23E+02	NC	NC	8.00E+01
G	Toluene	6	0.8949	0.8389	Normal	4.06E-01	4.85E+01	1.18E+02	8.71E+01	1.19E+06	8.71E+01	1.18E+02
G	Total Xylenes	6	0.8366	0.8860	Lognormal	9.20E-02	1.64E+01	4.15E+01	3.14E+01	1.36E+06	1.36E+06	4.15E+01
G	Trichloroethene	4	0.9047	0.9813	Lognormal	7.62E-01	1.94E+00	3.85E+00	3.55E+00	1.85E+01	1.85E+01	3.85E+00
G	Vanadium	11	0.3858	0.6385	Lognormal	1.40E+01	1.49E+02	1.32E+03	3.60E+02	4.44E+02	4.44E+02	4.44E+02
G	Zinc	19	0.4407	0.8137	Lognormal	2.70E+01	4.75E+02	4.26E+03	9.24E+02	1.02E+03	1.02E+03	1.02E+03
G	trans-1,2-Dichloroethene	1	NC	NC	NC	7.00E-01	7.00E-01	7.00E-01	NC	NC	NC	7.00E-01

Table T-3
Site Concentration Selection
Subsurface Soil Statistics

			Shapiro-Wilke's Test for Normality (a)			Summary Statistics (mg/kg)			95% UCL (mg/kg)			
Site	Constituent	Number of Samples for Statistics (d)	Normal	Lognormal	Dataset Distribution	Minimum	Mean	Maximum	t-Test	H-Test	UCL (b)	Site Concentration (mg/kg) (c)
H	1,2,4-Trichlorobenzene	6	0.5226	0.9308	Lognormal	6.10E-02	1.33E+03	7.58E+03	3.85E+03	4.42E+22	4.42E+22	7.58E+03
H	1,2-Dichlorobenzene	3	0.7535	0.9998	Lognormal	5.48E-01	6.48E+03	1.94E+04	2.53E+04	1.38E+134	1.38E+134	1.94E+04
H	1,2-Dichloroethane	1	NC	NC	NC	1.20E-02	1.20E-02	1.20E-02	NC	NC	NC	1.20E-02
H	1,3-Dichlorobenzene	3	0.7680	0.8664	Lognormal	7.65E+00	8.76E+01	2.42E+02	3.13E+02	1.28E+17	1.28E+17	2.42E+02
H	1,4-Dichlorobenzene	5	0.5723	0.9824	Lognormal	6.20E-02	6.32E+03	3.06E+04	1.93E+04	8.14E+38	8.14E+38	3.06E+04
H	2,4,6-Trichlorophenol	2	1.0000	1.0000	NC	1.79E-01	3.07E+02	6.13E+02	2.24E+03	NC	NC	6.13E+02
H	2,4-Dichlorophenol	5	0.5597	0.8190	Lognormal	1.67E-01	1.50E+02	7.42E+02	4.66E+02	2.30E+17	2.30E+17	7.42E+02
H	2,4-Dimethylphenol	1	NC	NC	NC	9.20E-02	9.20E-02	9.20E-02	NC	NC	NC	9.20E-02
H	2-Butanone (MEK)	5	0.8455	0.7487	Normal	3.30E-02	1.26E+01	2.72E+01	2.51E+01	1.47E+15	2.51E+01	2.72E+01
H	2-Methylnapthalene	3	0.7502	0.8055	Lognormal	1.56E-01	1.16E+02	3.47E+02	4.54E+02	1.00E+82	1.00E+82	3.47E+02
H	4,4'-DDE	2	1.0027	0.9996	Normal	5.04E-01	6.42E-01	7.80E-01	1.51E+00	NC	1.51E+00	7.80E-01
H	4,4'-DDT	2	1.0021	0.9989	Normal	7.80E-01	8.52E-01	9.23E-01	1.30E+00	NC	1.30E+00	9.23E-01
H	4-4'-DDD	1	NC	NC	NC	4.31E-01	4.31E-01	4.31E-01	NC	NC	NC	4.31E-01
H	4-Methyl-2-pentanone	4	0.7233	0.9342	Lognormal	9.00E-03	2.33E+00	7.85E+00	6.68E+00	1.90E+15	1.90E+15	7.85E+00
H	4-Methylphenol	1	NC	NC	NC	1.72E-01	1.72E-01	1.72E-01	NC	NC	NC	1.72E-01
H	4-Nitroaniline	1	NC	NC	NC	1.83E+03	1.83E+03	1.83E+03	NC	NC	NC	1.83E+03
H	Acenapthylene	3	0.7502	0.8114	Lognormal	1.30E-01	1.26E+02	3.78E+02	4.93E+02	4.03E+84	4.03E+84	3.78E+02
H	Acetone	11	0.6748	0.9456	Lognormal	1.50E-02	4.85E+00	2.11E+01	9.00E+00	1.58E+03	1.58E+03	2.11E+01
H	Aluminum	11	0.8342	0.9689	Lognormal	4.50E+02	3.85E+03	1.21E+04	5.79E+03	1.08E+04	1.08E+04	1.08E+04
H	Anthracene	4	0.6298	0.6819	Lognormal	1.29E-01	1.70E+02	6.80E+02	5.70E+02	1.80E+34	1.80E+34	6.80E+02
H	Arsenic	2	1.0000	1.0000	NC	3.00E+00	1.45E+01	2.60E+01	8.71E+01	NC	NC	2.60E+01
H	Barium	11	0.6278	0.8847	Lognormal	3.80E+01	6.05E+02	3.24E+03	1.17E+03	5.87E+03	5.87E+03	3.24E+03
H	Benzene	7	0.7383	0.8929	Lognormal	4.00E-03	1.52E+01	6.13E+01	3.20E+01	1.27E+12	1.27E+12	6.13E+01
H	Benzo(a)anthracene	3	0.7512	0.8335	Lognormal	5.54E-01	1.26E+02	3.78E+02	4.93E+02	9.26E+60	9.26E+60	3.78E+02
H	Benzo(a)pyrene	2	1.0000	1.0000	NC	7.80E-01	1.36E+02	2.72E+02	9.92E+02	NC	NC	2.72E+02
H	Benzo(b)fluoranthene	3	0.7520	0.8496	Lognormal	4.42E-01	7.10E+01	2.11E+02	2.76E+02	1.37E+50	1.37E+50	2.11E+02
H	Benzo(g,h,I)perylene	2	1.0000	1.0000	NC	4.94E-01	5.69E+01	1.13E+02	4.13E+02	NC	NC	1.13E+02
H	Benzoic acid	2	0.9998	0.9999	Lognormal	1.41E+00	2.02E+00	2.64E+00	5.91E+00	NC	NC	2.64E+00
H	Benzyl alcohol	1	NC	NC	NC	7.92E+00	7.92E+00	7.92E+00	NC	NC	NC	7.92E-
H	Cadmium	4	0.8414	0.6883	Normal	5.00E+00	1.88E+02	2.94E+02	3.36E+02	1.67E+09	3.36E+02	2.94E
H	Chlorobenzene	6	0.6554	0.9189	Lognormal	2.40E-02	9.76E+01	4.52E+02	2.45E+02	2.94E+17	2.94E+17	4.52E
H	Chloroform	2	1.0066	1.0001	Normal	5.30E-02	1.23E-01	1.92E-01	5.61E-01	NC	5.61E-01	1.92E-01
H	Chromium	8	0.8422	0.8615	Lognormal	4.00E+00	4.21E+01	1.00E+02	6.91E+01	6.37E+02	6.37E+02	1.00E+02
H	Chrysene	3	0.7559	0.9214	Lognormal	7.50E-01	1.12E+02	3.32E+02	4.33E+02	5.95E+47	5.95E+47	3.32E+02
H	Cobalt	5	0.8462	0.9859	Lognormal	3.00E+00	3.64E+01	1.05E+02	7.64E+01	7.44E+03	7.44E+03	1.05E+02
H	Copper	8	0.7075	0.9363	Lognormal	3.00E+00	5.36E+02	2.44E+03	1.10E+03	1.74E+06	1.74E+06	2.44E+03
H	Cyanide	2	NC	NC	NC	2.00E+00	2.00E+00	2.00E+00	2.00E+00	NC	NC	2.00E+00
H	Di-N-butyl phthalate	8	0.4494	0.7021	Lognormal	3.43E-01	4.03E+00	2.57E+01	9.89E+00	2.84E+01	2.84E+01	2.57E+01
H	Dibenofuran	4	0.6424	0.8606	Lognormal	1.43E-01	1.55E+01	6.04E+01	5.07E+01	2.26E+15	2.26E+15	6.04E+01
H	Dibenzo(a,h)anthracene	1	NC	NC	NC	3.17E+01	3.17E+01	3.17E+01	NC	NC	NC	3.17E+01
H	Ethylbenzene	3	0.9635	0.9109	Normal	4.38E+00	9.06E+00	1.28E+01	1.63E+01	2.14E+02	1.63E+01	1.28E+01
H	Fluoranthene	4	0.6301	0.7950	Lognormal	1.45E-01	3.33E+02	1.33E+03	1.11E+03	8.60E+34	8.60E+34	1.33E+03
H	Fluorene	3	0.7506	0.8436	Lognormal	2.47E-01	1.61E+02	4.83E+02	6.31E+02	7.75E+78	7.75E+78	4.83E+02
H	Hexachlorobenzene	1	NC	NC	NC	7.14E-01	7.14E-01	7.14E-01	NC	NC	NC	7.14E-01
H	Ideno(1,2,3-cd)pyrene	1	NC	NC	NC	1.36E+02	1.36E+02	1.36E+02	NC	NC	NC	1.36E+02
H	Iron	11	0.8095	0.9196	Lognormal	5.10E+02	2.32E+04	8.45E+04	3.84E+04	4.98E+05	4.98E+05	8.45E+04
H	Lead	2	1.0000	1.0000	NC	4.00E+00	5.77E+02	1.15E+03	4.19E+03	NC	NC	1.15E+03
H	Manganese	11	0.4040	0.9448	Lognormal	7.00E+00	3.86E+03	3.65E+04	9.80E+03	2.74E+06	2.74E+06	3.65E+04
H	Mercury	3	0.8887	0.9720	Lognormal	8.00E-01	2.03E+00	3.90E+00	4.81E+00	1.78E+03	1.78E+03	3.90E+00
H	Methylene chloride	11	0.4501	0.7879	Lognormal	6.00E-03	6.34E+00	5.56E+01	1.55E+01	8.47E+03	8.47E+03	5.56E+01
H	N-Nitrosodiphenylamine	1	NC	NC	NC	1.00E-07	1.00E-07	1.00E-07	NC	NC	NC	1.00E-07
H	Napthalene	4	0.6301	0.8770	Lognormal	4.40E-02	5.67E+02	2.27E+03	1.90E+03	1.59E+44	1.59E+44	2.27E+03
H	Nickel	10	0.4409	0.8827	Lognormal	4.00E+00	1.77E+03	1.51E+04	4.51E+03	3.57E+06	3.57E+06	1.51E+04
H	Phenanthrene	6	0.4968	0.7918	Lognormal	4.70E-02	3.53E+02	2.11E+03	1.06E+03	3.01E+14	3.01E+14	2.11E+03
H	Phenol	1	NC	NC	NC	4.22E-01	4.22E-01	4.22E-01	NC	NC	NC	4.22E-01
H	Pyrene	3	0.7503	0.7793	Lognormal	9.35E-01	2.22E+02	6.64E+02	8.68E+02	5.05E+63	5.05E+63	6.64E+02
H	Selenium	1	NC	NC	NC	2.00E+00	2.00E+00	2.00E+00	NC	NC	NC	2.00E+00
H	Silver	2	1.0000	1.0001	Lognormal	9.00E+00	2.65E+01	4.40E+01	1.37E+02	NC	NC	4.40E+01
H	Total PCBs	7	0.4881	0.9280	Lognormal	2.51E-01	2.73E+03	1.80E+04	7.68E+03	5.45E+15	5.45E+15	1.80E+04
H	Tetrachloroethene	1	NC	NC	NC	5.65E+00	5.65E+00	5.65E+00	NC	NC	NC	5.65E+00
H	Thallium	1	NC	NC	NC	1.00E+00	1.00E+00	1.00E+00	NC	NC	NC	1.00E+00
H	Tin	3	0.9330	1.0000	Lognormal	1.40E+01	5.50E+01	1.11E+02	1.40E+02	1.05E+07	1.05E+07	1.11E+02
H	Toluene	5	0.8004	0.9165	Lognormal	1.45E-01	2.28E+01	7.65E+01	5.31E+01	2.05E+10	2.05E+10	7.65E+01
H	Total Xylenes	3	0.8885	0.8041	Normal	1.51E+00	1.48E+01	2.36E+01	3.46E+01	1.69E+12	3.46E+01	2.36E+01
H	Trichloroethene	1	NC	NC	NC	1.00E-02	1.00E-02	1.00E-02	NC	NC	NC	1.00E-02
H	Vanadium	6	0.7425	0.9068	Lognormal	7.00E+00	3.23E+01	9.50E+01	5.88E+01	1.97E+02	1.97E+02	9.50E+01
H	Zinc	11	0.4749	0.8703	Lognormal	8.00E+00	4.74E+03	3.95E+04	1.12E+04	1.61E+07	1.61E+07	3.95E
H	bis(2-ethylhexyl)phthalate	4	0.8901	0.8934	Lognormal	2.51E-01	4.28E-01	6.14E-01	6.36E-01	1.10E+00	1.10E+00	6.14E

Table T-3
Site Concentration Selection
Subsurface Soil Statistics

Site	Constituent	Number of Samples for Statistics (d)	Shapiro-Wilke's Test for Normality (a)			Summary Statistics (mg/kg)			95% UCL (mg/kg)			Site Concentration (mg/kg) (c)
			Normal	Lognormal	Dataset Distribution	Minimum	Mean	Maximum	t-Test	H-Test	UCL (b)	
I	1,1,1-Trichloroethane	2	0.9999	1.0000	Lognormal	4.32E-01	1.06E+00	1.69E+00	5.04E+00	NC	NC	1.69E+00
I	1,2,4-Trichlorobenzene	8	0.5547	0.9662	Lognormal	6.71E+00	1.40E+03	8.26E+03	3.28E+03	1.17E+06	1.17E+06	8.26E+03
I	1,2-Dichlorobenzene	6	0.7151	0.9101	Lognormal	2.68E+00	8.29E+01	3.24E+02	1.89E+02	7.93E+04	7.93E+04	3.24E+02
I	1,3-Dichlorobenzene	2	1.0000	1.0000	NC	1.89E+01	4.45E+01	7.01E+01	2.06E+02	NC	NC	7.01E+01
I	1,4-Dichlorobenzene	8	0.4541	0.9451	Lognormal	1.60E+00	2.55E+02	1.84E+03	6.83E+02	1.26E+05	1.26E+05	1.84E+03
I	2,4-Dichlorophenol	1	NC	NC	NC	9.00E+00	9.00E+00	9.00E+00	NC	NC	NC	9.00E+00
I	2-Butanone (MEK)	15	0.8813	0.7557	Normal	1.20E-02	6.86E+00	1.69E+01	9.61E+00	1.14E+04	9.61E+00	9.61E+00
I	2-Methylnapthalene	7	0.6826	0.9542	Lognormal	1.70E+00	3.85E+01	1.69E+02	8.33E+01	2.64E+03	2.64E+03	1.69E+02
I	4,4'-DDT	1	NC	NC	NC	4.31E+00	4.31E+00	4.31E+00	NC	NC	NC	4.31E+00
I	4-4'-DDD	2	1.0000	1.0000	NC	6.64E+00	1.82E+01	2.97E+01	9.09E+01	NC	NC	2.97E+01
I	4-Chloroaniline	1	NC	NC	NC	4.32E+01	4.32E+01	4.32E+01	NC	NC	NC	4.32E+01
I	4-Methyl-2-pentanone	2	1.0000	1.0000	NC	1.00E-03	2.08E+00	4.16E+00	1.52E+01	NC	NC	4.16E+00
I	Acenapthene	1	NC	NC	NC	1.40E+01	1.40E+01	1.40E+01	NC	NC	NC	1.40E+01
I	Acetone	16	0.8710	0.8844	Lognormal	5.49E-01	6.66E+00	1.69E+01	9.18E+00	2.17E+01	2.17E+01	1.69E+01
I	Aluminum	16	0.7510	0.8587	Lognormal	1.01E+03	4.17E+03	1.35E+04	6.02E+03	7.92E+03	7.92E+03	7.92E+03
I	Anthracene	2	1.0000	1.0000	NC	2.31E+01	1.13E+02	2.03E+02	6.82E+02	NC	NC	2.03E+02
I	Antimony	3	0.7504	0.7805	Lognormal	1.40E+01	2.23E+03	6.66E+03	8.70E+03	5.78E+53	5.78E+53	6.66E+03
I	Arsenic	9	0.8557	0.9388	Lognormal	1.00E+00	6.56E+00	1.40E+01	9.73E+00	2.05E+01	2.05E+01	1.40E+01
I	Barium	10	0.6673	0.9340	Lognormal	8.00E+00	9.83E+02	3.60E+03	1.79E+03	4.82E+04	4.82E+04	3.60E+03
I	Benzene	10	0.5528	0.9824	Lognormal	2.30E-02	3.81E+00	2.41E+01	8.05E+00	2.34E+02	2.34E+02	2.41E+01
I	Benzo(a)anthracene	2	1.0000	1.0001	Lognormal	2.47E+00	4.59E+00	6.72E+00	1.80E+01	NC	NC	6.72E+00
I	Benzo(a)pyrene	1	NC	NC	NC	2.47E+00	2.47E+00	2.47E+00	NC	NC	NC	2.47E+00
I	Benzo(b)fluoranthene	2	1.0000	1.0000	NC	1.51E+00	1.70E+01	3.24E+01	1.15E+02	NC	NC	3.24E+01
I	Benzoic acid	1	NC	NC	NC	6.21E+01	6.21E+01	6.21E+01	NC	NC	NC	6.21E+01
I	Beryllium	1	NC	NC	NC	1.53E+03	1.53E+03	1.53E+03	NC	NC	NC	1.53E+03
I	Butyl benzyl phthalate	1	NC	NC	NC	1.39E+02	1.39E+02	1.39E+02	NC	NC	NC	1.39E+02
I	Pentachlorophenol(PCP)	1	NC	NC	NC	1.92E+02	1.92E+02	1.92E+02	NC	NC	NC	1.92E+02
I	Cadmium	7	0.7936	0.8249	Lognormal	2.00E+00	5.57E+00	1.30E+01	8.99E+00	1.84E+01	1.84E+01	1.30E+01
	Chlorobenzene	12	0.7420	0.8842	Lognormal	1.00E-02	3.47E+01	1.27E+02	5.90E+01	7.16E+04	7.16E+04	1.27E+02
	Chromium	14	0.4232	0.8499	Lognormal	4.00E+00	7.61E+01	7.31E+02	1.67E+02	3.60E+02	3.60E+02	3.60E+02
	Chrysene	2	1.0000	0.9996	Normal	3.97E+00	4.78E+00	5.59E+00	9.88E+00	NC	9.88E+00	5.59E+00
I	Cobalt	7	0.6027	0.8307	Lognormal	1.30E+01	3.89E+01	1.40E+02	7.20E+01	1.05E+02	1.05E+02	1.40E+02
I	Copper	8	0.8815	0.9111	Lognormal	2.30E+01	2.98E+02	6.30E+02	4.57E+02	2.10E+03	2.10E+03	6.30E+02
I	Cyanide	3	0.7502	0.7911	Lognormal	2.00E+00	1.06E+03	3.18E+03	4.16E+03	1.14E+80	1.14E+80	3.18E+03
I	Di-N-butyl phthalate	8	0.5461	0.8356	Lognormal	1.34E-01	3.71E+01	2.03E+02	8.26E+01	3.15E+04	3.15E+04	2.03E+02
I	Dibenofuran	1	NC	NC	NC	5.59E+00	5.59E+00	5.59E+00	NC	NC	NC	5.59E+00
I	Diethylphthalate	1	NC	NC	NC	1.69E+01	1.69E+01	1.69E+01	NC	NC	NC	1.69E+01
I	Ethylbenzene	10	0.8681	0.9374	Lognormal	9.60E-02	4.65E+00	1.51E+01	7.53E+00	1.14E+02	1.14E+02	1.51E+01
I	Fluoranthene	3	0.7869	0.9134	Lognormal	8.91E+00	7.69E+01	2.03E+02	2.61E+02	3.81E+13	3.81E+13	2.03E+02
I	Fluorene	3	0.8211	0.9421	Lognormal	3.08E+00	1.49E+01	3.54E+01	4.50E+01	7.33E+08	7.33E+08	3.54E+01
I	Hexachlorobenzene	7	0.5543	0.8822	Lognormal	3.23E+01	2.58E+02	1.27E+03	5.88E+02	2.10E+03	2.10E+03	1.27E+03
I	Hexachloroethane	1	NC	NC	NC	3.01E+00	3.01E+00	3.01E+00	NC	NC	NC	3.01E+00
I	Iron	16	0.8292	0.9521	Lognormal	5.43E+02	1.17E+04	4.15E+04	1.66E+04	3.11E+04	3.11E+04	3.11E+04
I	Lead	15	0.3919	0.9224	Lognormal	3.00E+00	2.06E+03	2.33E+04	4.81E+03	3.08E+05	3.08E+05	2.33E+04
I	Manganese	1	NC	NC	NC	9.80E+01	9.80E+01	9.80E+01	NC	NC	NC	9.80E+01
I	Mercury	5	0.9776	0.9768	Normal	5.00E-01	1.70E+00	3.20E+00	2.69E+00	7.71E+00	2.69E+00	3.20E+00
I	Methylene chloride	16	0.7062	0.8791	Lognormal	7.00E-03	1.52E+00	6.77E+00	2.49E+00	1.64E+02	1.64E+02	6.77E+00
I	N-Nitrosodiphenylamine	2	1.0000	1.0000	NC	4.59E+01	7.31E+01	1.00E+02	2.45E+02	NC	NC	1.00E+02
I	Napthalene	7	0.5804	0.9039	Lognormal	1.10E+00	9.81E+01	5.15E+02	2.34E+02	5.75E+05	5.75E+05	5.15E+02
I	Nickel	12	0.5338	0.9727	Lognormal	9.00E-01	3.35E+02	2.41E+03	7.01E+02	2.50E+04	2.50E+04	2.41E+03
I	Phenanthrene	5	0.8349	0.9715	Lognormal	1.32E+00	3.43E+01	1.02E+02	7.41E+01	6.24E+04	6.24E+04	1.02E+02
I	Phenol	2	1.0000	1.0000	NC	1.52E+01	2.11E+01	2.70E+01	5.82E+01	NC	NC	2.70E+01
I	Pyrene	4	0.8690	0.8704	Lognormal	2.21E+00	1.96E+01	4.93E+01	4.57E+01	8.42E+05	8.42E+05	4.93E+01
I	Selenium	1	NC	NC	NC	1.32E+03	1.32E+03	1.32E+03	NC	NC	NC	1.32E+03
I	Total PCBs	5	0.9709	0.8928	Normal	2.04E+01	1.81E+02	3.43E+02	3.06E+02	7.24E+03	3.06E+02	3.43E+02
I	Tetrachloroethene	5	0.9500	0.9612	Lognormal	6.12E-01	2.57E+00	5.27E+00	4.27E+00	1.81E+01	1.81E+01	5.27E+00
I	Tin	9	0.7616	0.9293	Lognormal	2.00E+00	1.92E+01	5.50E+01	3.25E+01	1.15E+02	1.15E+02	5.50E+01
I	Toluene	11	0.5354	0.9704	Lognormal	4.80E-02	1.13E+01	7.79E+01	2.39E+01	4.10E+02	4.10E+02	7.79E+01
I	Total Xylenes	10	0.7955	0.9206	Lognormal	8.00E-02	4.96E+00	1.92E+01	8.52E+00	2.70E+02	2.70E+02	1.92E+01
I	Toxaphene	1	NC	NC	NC	4.93E+02	4.93E+02	4.93E+02	NC	NC	NC	4.93E+02
I	Trichloroethene	2	1.0000	0.9999	Normal	6.48E-01	2.23E+00	3.81E+00	1.22E+01	NC	1.22E+01	3.81E+00
I	Vanadium	7	0.5279	0.7761	Lognormal	1.80E+01	1.07E+02	5.53E+02	2.52E+02	8.22E+02	8.22E+02	5.53E+02
I	Zinc	16	0.4241	0.9283	Lognormal	1.30E+01	6.24E+02	6.33E+03	1.30E+03	5.00E+03	5.00E+03	5.00E+03
I	bis(2-ethylhexyl)phthalate	7	0.7482	0.9948	Lognormal	2.38E+00	3.49E+01	1.31E+02	6.82E+01	7.45E+02	7.45E+02	1.31E+02
I	trans-1,2-Dichloroethene	1	NC	NC	NC	3.00E-03	3.00E-03	3.00E-03	NC	NC	NC	3.00E-03

Table T-3
Site Concentration Selection
Subsurface Soil Statistics

			Shapiro-Wilke's Test for Normality (a)			Summary Statistics (mg/kg)			95% UCL (mg/kg)			
Site	Constituent	Number of Samples for Statistics (d)	Normal	Lognormal	Dataset Distribution	Minimum	Mean	Maximum	t-Test	H-Test	UCL (b)	Site Concentration (mg/kg) (c)
L	1,2,4-Trichlorobenzene	3	0.8108	0.7722	Normal	5.50E+00	5.25E+01	7.90E+01	1.21E+02	4.45E+12	1.21E+02	7.90E+01
L	1,2-Dichlorobenzene	4	0.9546	0.7541	Normal	1.00E-02	3.50E+00	7.70E+00	7.23E+00	1.09E+12	7.23E+00	7.70E+00
L	1,3-Dichlorobenzene	1	NC	NC	NC	4.30E+00	4.30E+00	4.30E+00	NC	NC	NC	4.30E+00
L	1,4-Dichlorobenzene	9	0.6058	0.9226	Lognormal	1.80E-02	2.34E+01	1.00E+02	4.92E+01	1.29E+07	1.29E+07	1.00E+02
L	2,4,6-Trichlorophenol	1	NC	NC	NC	1.50E+00	1.50E+00	1.50E+00	NC	NC	NC	1.50E+00
L	2,4-Dichlorophenol	2	1.0000	1.0000	NC	2.40E+00	6.70E+00	1.10E+01	3.39E+01	NC	NC	1.10E+01
L	2-Butanone (MEK)	3	0.7500	0.7500	Lognormal	1.60E-02	3.34E+00	1.00E+01	1.31E+01	6.98E+61	6.98E+61	1.00E+01
L	2-Chlorophenol	3	0.8753	0.7767	Normal	1.30E-02	1.59E+00	2.60E+00	3.92E+00	5.15E+25	3.92E+00	2.60E+00
L	2-Methylnapthalene	6	0.9404	0.9188	Normal	2.10E-01	1.42E+00	3.10E+00	2.36E+00	1.92E+01	2.36E+00	3.10E+00
L	4-Chloroaniline	6	0.7367	0.8855	Lognormal	4.30E-02	9.87E+01	2.70E+02	2.06E+02	2.89E+14	2.89E+14	2.70E+02
L	4-Methyl-2-pentanone	4	0.9289	0.9414	Lognormal	8.00E-03	7.30E-02	1.67E-01	1.52E-01	1.49E+02	1.49E+02	1.67E-01
L	4-Methylphenol	5	0.9513	0.8565	Normal	8.80E-02	3.40E+00	7.10E+00	6.19E+00	3.58E+04	6.19E+00	7.10E+00
L	Acenapthene	3	0.7596	0.8590	Lognormal	4.40E-02	1.08E+00	3.10E+00	4.03E+00	3.47E+23	3.47E+23	3.10E+00
L	Acenapthylene	1	NC	NC	NC	2.80E-01	2.80E-01	2.80E-01	NC	NC	NC	2.80E-01
L	Acetone	6	0.6510	0.9621	Lognormal	1.50E-02	1.01E+00	4.56E+00	2.47E+00	2.30E+04	2.30E+04	4.56E+00
L	Aluminum	11	0.9457	0.9279	Normal	1.12E+03	5.80E+03	1.28E+04	7.82E+03	1.17E+04	7.82E+03	7.82E+03
L	Anthracene	3	0.7719	0.9650	Lognormal	2.80E-02	1.46E+00	4.20E+00	5.46E+00	3.58E+31	3.58E+31	4.20E+00
L	Antimony	1	NC	NC	NC	3.20E+01	3.20E+01	3.20E+01	NC	NC	NC	3.20E+01
L	Arsenic	10	0.8546	0.8917	Lognormal	4.90E+00	5.36E+01	1.72E+02	8.37E+01	4.08E+02	4.08E+02	1.72E+02
L	Barium	15	0.5869	0.7749	Lognormal	1.30E+00	3.00E+02	1.44E+03	5.07E+02	5.47E+04	5.47E+04	1.44E+03
L	Benzene	5	0.7695	0.8662	Lognormal	4.00E-03	2.01E+00	5.70E+00	4.61E+00	6.67E+13	6.67E+13	5.70E+00
L	Benzo(a)anthracene	4	0.7034	0.9800	Lognormal	7.50E-02	2.46E+00	8.60E+00	7.29E+00	9.54E+08	9.54E+08	8.60E+00
L	Benzo(a)pyrene	3	0.7568	0.8998	Lognormal	2.20E-02	1.80E+00	5.30E+00	6.91E+00	8.81E+35	8.81E+35	5.30E+00
L	Benzo(b)fluoranthene	3	0.7685	0.9296	Lognormal	5.80E-02	1.88E+00	5.40E+00	7.02E+00	2.48E+24	2.48E+24	5.40E+00
L	Benzo(g,h,I)perylene	1	NC	NC	NC	2.70E-02	2.70E-02	2.70E-02	NC	NC	NC	2.70E-02
L	Benzo(k)fluoranthene	1	NC	NC	NC	4.60E+00	4.60E+00	4.60E+00	NC	NC	NC	4.60E+00
L	Benzoic acid	2	1.0000	1.0000	NC	4.90E-02	1.62E+00	3.20E+00	1.16E+01	NC	NC	3.20E+00
L	Butyl benzyl phthalate	1	NC	NC	NC	5.40E+00	5.40E+00	5.40E+00	NC	NC	NC	5.40E+00
L	Corrosivity	2	0.9997	1.4450	Lognormal	8.20E+00	8.30E+00	8.40E+00	8.93E+00	NC	NC	8.40E+[illegible]
L	Pentachlorophenol(PCP)	4	0.9196	0.9476	Lognormal	1.15E+01	3.17E+01	5.82E+01	5.45E+01	2.13E+02	2.13E+02	5.82E[illegible]
L	Reactivity-Sulfide	2	1.0000	0.9999	Normal	2.40E+01	4.75E+01	7.10E+01	1.96E+02	NC	1.96E+02	7.10E+[illegible]
L	Cadmium	6	0.5818	0.8100	Lognormal	1.90E-02	8.03E+00	4.20E+01	2.19E+01	1.32E+10	1.32E+10	4.20E+01
L	Calcium	6	0.6065	0.7216	Lognormal	1.55E+04	2.81E+04	7.55E+04	4.73E+04	6.01E+04	6.01E+04	7.55E+04
L	Chlorobenzene	8	0.6831	0.8528	Lognormal	1.20E-02	1.25E+00	5.30E+00	2.62E+00	2.41E+03	2.41E+03	5.30E+00
L	Chloroform	3	0.7517	0.8325	Lognormal	4.90E-02	6.80E+00	2.03E+01	2.64E+01	2.66E+48	2.66E+48	2.03E+01
L	Chromium	10	0.9272	0.9405	Lognormal	3.00E+00	1.16E+01	2.70E+01	1.59E+01	2.36E+01	2.36E+01	2.36E+01
L	Chrysene	4	0.6517	0.8701	Lognormal	7.60E-02	2.20E+00	8.20E+00	6.91E+00	7.34E+08	7.34E+08	8.20E+00
L	Cobalt	7	0.8532	0.8385	Normal	5.90E+00	7.70E+00	9.00E+00	8.67E+00	8.95E+00	8.67E+00	9.00E+00
L	Copper	10	0.8192	0.9142	Lognormal	9.70E+00	9.27E+01	3.08E+02	1.44E+02	4.33E+02	4.33E+02	3.08E+02
L	Cresol(m,p)	4	0.8616	0.8787	Lognormal	1.00E-01	1.43E-01	1.90E-01	1.95E-01	2.58E-01	2.58E-01	1.90E-01
L	Cyanide	1	NC	NC	NC	4.60E-01	4.60E-01	4.60E-01	NC	NC	NC	4.60E-01
L	Di-N-butyl phthalate	4	0.9031	0.9217	Lognormal	1.71E-01	1.28E+00	2.78E+00	2.74E+00	3.15E+03	3.15E+03	2.78E+00
L	Dibenofuran	2	1.0000	1.0000	NC	4.20E-02	1.52E+00	3.00E+00	1.09E+01	NC	NC	3.00E+00
L	Diethylphthalate	2	1.0002	1.0002	Lognormal	3.10E-01	6.55E-01	1.00E+00	2.83E+00	NC	NC	1.00E+00
L	Ethylbenzene	1	NC	NC	NC	4.00E-02	4.00E-02	4.00E-02	NC	NC	NC	4.00E-02
L	Fluoranthene	4	0.6500	0.8682	Lognormal	1.30E-01	4.27E+00	1.60E+01	1.35E+01	2.05E+09	2.05E+09	1.60E+01
L	Fluorene	2	1.0000	1.0000	NC	7.90E-02	2.54E+00	5.00E+00	1.81E+01	NC	NC	5.00E+00
L	Hexachlorobenzene	1	NC	NC	NC	4.80E+00	4.80E+00	4.80E+00	NC	NC	NC	4.80E+00
L	Hexachloroethane	1	NC	NC	NC	4.90E-02	4.90E-02	4.90E-02	NC	NC	NC	4.90E-02
L	Ideno(1,2,3-cd)pyrene	2	1.0000	1.0000	NC	1.10E-01	1.51E+00	2.90E+00	1.03E+01	NC	NC	2.90E+00
L	Iron	11	0.8801	0.8320	Normal	1.40E+03	9.96E+03	2.40E+04	1.45E+04	4.35E+04	1.45E+04	1.45E+04
L	Lead	13	0.4533	0.9293	Lognormal	2.20E-01	7.46E+01	6.64E+02	1.64E+02	5.83E+03	5.83E+03	6.64E+02
L	Magnesium	6	0.9047	0.8024	Normal	3.84E+02	4.91E+03	9.44E+03	7.92E+03	2.68E+05	7.92E+03	9.44E+03
L	Manganese	11	0.8256	0.8820	Lognormal	1.00E+01	2.19E+02	7.82E+02	3.54E+02	3.68E+03	3.68E+03	7.82E+02
L	Mercury	7	0.5326	0.8925	Lognormal	1.00E-02	3.09E-01	1.80E+00	7.94E-01	6.02E+01	6.02E+01	1.80E+00
L	Methylene chloride	5	0.5931	0.8758	Lognormal	5.00E-03	4.89E-01	2.28E+00	1.44E+00	5.92E+07	5.92E+07	2.28E+00
L	Napthalene	4	0.6744	0.8974	Lognormal	9.60E-02	2.02E+00	7.30E+00	6.17E+00	7.72E+06	7.72E+06	7.30E+00
L	Nickel	10	0.5304	0.9177	Lognormal	2.10E+01	3.78E+02	2.39E+03	7.98E+02	2.67E+03	2.67E+03	2.39E+03
L	Phenanthrene	5	0.6066	0.9575	Lognormal	9.10E-02	5.18E+00	2.30E+01	1.47E+01	1.33E+06	1.33E+06	2.30E+01
L	Phenol	5	0.8202	0.8099	Normal	3.46E-01	8.77E+00	1.60E+01	1.57E+01	2.05E+04	1.57E+01	1.60E+01
L	Potassium	6	0.7337	0.8032	Lognormal	9.75E+02	1.31E+03	2.28E+03	1.72E+03	1.86E+03	1.86E+03	2.28E+03
L	Pyrene	4	0.6397	0.8166	Lognormal	1.30E-01	5.96E+00	2.30E+01	1.93E+01	3.48E+10	3.48E+10	2.30E+01
L	Total PCBs	2	1.0000	1.0000	NC	1.60E+01	2.58E+02	5.00E+02	1.79E+03	NC	NC	5.00E+02
L	Toluene	7	0.5263	0.9490	Lognormal	5.00E-02	6.65E+01	4.00E+02	1.75E+02	3.21E+09	3.21E+09	4.00E+02
L	Total Xylenes	4	0.6669	0.8910	Lognormal	1.79E-01	3.10E+00	1.10E+01	9.30E+00	2.48E+06	2.48E+06	1.10E+01
L	Vanadium	9	0.6080	0.9192	Lognormal	7.70E+00	3.23E+01	1.31E+02	5.59E+01	7.51E+01	7.51E+01	7.51E+[illegible]
L	Zinc	11	0.4750	0.9629	Lognormal	6.40E+00	5.34E+02	4.24E+03	1.22E+03	1.61E+04	1.61E+04	4.24E[illegible]
L	bis(2-ethylhexyl)phthalate	6	0.9272	0.8206	Normal	1.70E-02	9.21E-01	2.20E+00	1.61E+00	1.65E+04	1.61E+00	2.20E+[illegible]

Table T-3
Site Concentration Selection
Subsurface Soil Statistics

Site	Constituent	Number of Samples for Statistics (d)	Shapiro-Wilke's Test for Normality (a)			Summary Statistics (mg/kg)			95% UCL (mg/kg)			Site Concentration (mg/kg) (c)
			Normal	Lognormal	Dataset Distribution	Minimum	Mean	Maximum	t-Test	H-Test	UCL (b)	

Notes:
UCL - Upper Confidence Limit.
(a) - The results of the Shapiro-Wilke test for normality indicates whether the data set is more likely to be normally distributed or lognormally distributed. The data set is considered to be normally distributed if the test result is higher in the column labeled "NORMAL". The data set is considered to be lognormally distributed if the test result is higher in the column labeled "LOGNORMAL".
(b) - 95% UCL is selected based on whether the data set is normally or lognormally distributed. The UCL based on the t-statistic is chosen for a normal distribution, and the UCL based on the H-statistic is chosen if the data are lognormally distributed. Where there are greater than 50 samples, the distribution is assumed to be lognormal.
(c) - Site Concentration is the lower of the selected 95% UCL and the Maximum Detected Concentration. Where there are fewer than 8 samples, the maximum detected concentration is selected as the site concentration.
(d) - Only concentrations reported as detected by the laboratory were used in the calculation of statistics for subsurface soil.

Table T-4
Site Concentration Selection
Groundwater-TCLP Statistics (a)

Site	Method	Constituent	Units	Number of Samples Analyzed	Number of Detects	Frequency of Detection	Number of Samples for Statistics	Summary Statistics Minimum	Mean	Maximum	Site Concentration (b)
G	HERB	2,4-D	MG/L	4	3	75%	4	4.00E-02	1.32E+01	5.00E+01	5.00E+01
G	METAL	Barium	MG/L	4	4	100%	4	1.05E+00	2.94E+00	5.30E+00	5.30E+00
G	METAL	Cadmium	MG/L	4	1	25%	4	1.20E-01	6.75E-02	1.20E-01	1.20E-01
G	METAL	Lead	MG/L	4	2	50%	4	1.60E-01	6.09E+00	2.40E+01	2.40E+01
G	PEST	gamma-BHC (Lindane)	MG/L	4	1	25%	4	4.20E-03	2.00E-03	4.20E-03	4.20E-03
G	SVOA	1,4-Dichlorobenzene	MG/L	4	3	75%	4	4.00E-02	1.10E-01	2.15E-01	2.15E-01
G	SVOA	2,4,6-Trichlorophenol	MG/L	4	2	50%	4	9.10E-03	1.27E+00	4.95E+00	4.95E+00
G	SVOA	2-Methylphenol (o-cres	MG/L	4	2	50%	4	1.40E-02	3.15E-02	6.20E-02	6.20E-02
G	SVOA	Cresol m & p	MG/L	4	2	50%	4	8.40E-02	6.73E-02	1.35E-01	1.35E-01
G	SVOA	Cresol o,m,p	MG/L	4	2	50%	4	9.70E-02	8.30E-02	1.85E-01	1.85E-01
G	SVOA	Nitrobenzene	MG/L	4	3	75%	4	1.80E-02	3.96E-02	7.35E-02	7.35E-02
G	SVOA	Pentachlorophenol	MG/L	4	1	25%	4	1.10E+00	4.63E-01	1.10E+00	1.10E+00
G	VOA	2-Butanone (MEK)	MG/L	4	1	25%	4	1.20E-01	6.75E-02	1.20E-01	1.20E-01
G	VOA	Benzene	MG/L	4	3	75%	4	3.50E-02	2.04E-01	6.00E-01	6.00E-01
G	VOA	Chlorobenzene	MG/L	4	3	75%	4	1.50E-02	8.24E-01	2.70E+00	2.70E+00
G	VOA	Tetrachloroethene	MG/L	4	3	75%	4	7.40E-03	4.39E-02	1.30E-01	1.30E-01
G	VOA	Trichloroethene	MG/L	4	4	100%	4	2.40E-03	2.45E-02	7.90E-02	7.90E-02
H	HERB	2,4-D	MG/L	5	2	40%	5	7.20E-03	9.29E-02	4.20E-01	4.20E-01
H	METAL	Arsenic	MG/L	5	1	20%	5	4.50E-01	1.70E-01	4.50E-01	4.50E-01
H	METAL	Cadmium	MG/L	5	3	60%	5	1.30E-01	4.52E+00	2.20E+01	2.20E+01
H	METAL	Lead	MG/L	5	3	60%	5	3.00E-01	8.19E+00	4.00E+01	4.00E+01
H	SVOA	1,4-Dichlorobenzene	MG/L	5	2	40%	5	1.00E-01	3.55E-01	1.60E+00	1.60E+00
H	SVOA	2,4,5-Trichlorophenol	MG/L	5	1	20%	1	2.00E-02	2.00E-02	2.00E-02	2.00E-02
H	SVOA	2,4,6-Trichlorophenol	MG/L	5	1	20%	5	5.10E-02	3.02E-02	5.10E-02	5.10E-02
H	SVOA	2-Methylphenol (o-cres	MG/L	5	2	40%	5	6.30E-03	2.73E-02	5.50E-02	5.50E-02
H	SVOA	Cresol m & p	MG/L	5	2	40%	5	6.10E-03	1.12E-01	4.80E-01	4.80E-01
H	SVOA	Cresol o,m,p	MG/L	5	2	40%	5	1.20E-02	1.25E-01	5.40E-01	5.40E-01
H	SVOA	Hexachlorobenzene	MG/L	5	1	20%	1	1.80E-02	1.80E-02	1.80E-02	1.80E-02
H	SVOA	Pentachlorophenol	MG/L	5	2	40%	5	4.60E-02	1.74E-01	4.50E-01	4.50E-01
H	VOA	Benzene	MG/L	5	2	40%	5	8.70E-02	5.23E-01	2.50E+00	2.50E+00
H	VOA	Chlorobenzene	MG/L	5	2	40%	5	1.50E+00	8.46E-01	2.70E+00	2.70E+00
H	VOA	Tetrachloroethene	MG/L	5	2	40%	4	1.30E-02	1.65E-02	3.30E-02	3.30E-02
H	VOA	Trichloroethene	MG/L	5	2	40%	2	2.70E-03	4.60E-03	6.40E-03	6.40E-03
I	HERB	2,4-D	MG/L	4	1	25%	4	1.40E-01	4.44E-02	1.40E-01	1.40E-01
I	METAL	Barium	MG/L	4	1	25%	4	5.85E+01	1.50E+01	5.85E+01	5.85E+01
I	METAL	Cadmium	MG/L	4	2	50%	4	1.70E-01	2.64E-01	7.85E-01	7.85E-01
I	METAL	Lead	MG/L	4	3	75%	4	5.80E-01	2.61E+00	8.80E+00	8.80E+00
I	SVOA	1,4-Dichlorobenzene	MG/L	4	3	75%	4	5.60E-03	5.99E-01	1.30E+00	1.30E+00
I	SVOA	2,4,5-Trichlorophenol	MG/L	4	1	25%	4	1.40E+00	3.69E-01	1.40E+00	1.40E+00
I	SVOA	2,4,6-Trichlorophenol	MG/L	4	1	25%	1	1.35E-02	1.35E-02	1.35E-02	1.35E-02
I	SVOA	2,4-Dinitrotoluene	MG/L	4	1	25%	4	3.80E-02	2.83E-02	3.80E-02	3.80E-02
I	SVOA	2-Methylphenol (o-cres	MG/L	4	1	25%	1	1.40E-02	1.40E-02	1.40E-02	1.40E-02
I	SVOA	Cresol m & p	MG/L	4	2	50%	4	1.13E-01	7.58E-02	1.40E-01	1.40E-01
I	SVOA	Cresol o,m,p	MG/L	4	2	50%	4	1.13E-01	8.08E-02	1.60E-01	1.60E-01
I	SVOA	Nitrobenzene	MG/L	4	1	25%	1	1.30E-02	1.30E-02	1.30E-02	1.30E-02
I	SVOA	Pentachlorophenol	MG/L	4	3	75%	4	4.30E-02	1.29E+00	3.80E+00	3.80E+00
I	SVOA	Pyridine	MG/L	4	1	25%	1	1.20E-02	1.20E-02	1.20E-02	1.20E-02
I	VOA	Benzene	MG/L	4	3	75%	4	6.80E-02	1.82E-01	5.10E-01	5.10E-01
I	VOA	Chlorobenzene	MG/L	4	3	75%	4	3.50E-01	2.62E+00	8.90E+00	8.90E+00
I	VOA	Chloroform	MG/L	4	1	25%	4	2.90E+00	7.33E-01	2.90E+00	2.90E+00
I	VOA	Tetrachloroethene	MG/L	4	1	25%	4	2.90E-01	8.00E-02	2.90E-01	2.90E-01
I	VOA	Trichloroethene	MG/L	4	3	75%	3	1.30E-03	3.00E-03	6.30E-03	6.30E-03
L	METAL	Arsenic	MG/L	4	1	25%	4	7.90E-01	2.73E-01	7.90E-01	7.90E-01
L	METAL	Cadmium	MG/L	4	3	75%	4	1.40E-01	1.60E-01	2.70E-01	2.70E-01
L	SVOA	1,4-Dichlorobenzene	MG/L	4	2	50%	4	9.00E-02	2.53E-01	8.70E-01	8.70E-01
L	SVOA	Cresol m & p	MG/L	4	1	25%	4	1.90E-01	6.63E-02	1.90E-01	1.90E-01
L	SVOA	Cresol o,m,p	MG/L	4	1	25%	4	1.90E-01	6.63E-02	1.90E-01	1.90E-01
L	SVOA	Pentachlorophenol	MG/L	4	1	25%	4	1.50E-01	1.31E-01	1.50E-01	1.50E-01
L	SVOA	Pyridine	MG/L	4	2	50%	4	3.70E-02	1.69E-01	3.90E-01	3.90E-01
L	VOA	Chlorobenzene	MG/L	6	2	33%	6	7.40E-03	1.32E-02	3.20E-02	3.20E-02
L	VOA	Tetrachloroethene	MG/L	6	6	100%	6	1.90E-02	3.48E-02	7.20E-02	7.20E-02
L	VOA	Trichloroethene	MG/L	6	6	100%	6	3.50E-03	6.40E-03	1.20E-02	1.20E-02

Notes:
TCLP - Toxicity Characteristic Leaching Procedure
(a) - Leachate concentrations, as defined by the TCLP results for waste samples at each site, are evaluated as groundwater
(b) - Fewer than 8 samples are available from each site. Therefore, the maximum detected concentration is selected as the site concentration.

Table T-5
Suburface Soil - Industrial TACO Screen
Site G - Historical Subsurface Soil Data

Constituent	Units	Number of Detects	Mean	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Subsurface Soil Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Construction Worker Direct Contact (DC) Concentration	Is Max>CW DC?	COPC?	Reason	
1,1,2,2-Tetrachloroethane	mg/kg	1	5.81E-01	5.81E-01	No	ND	--	No	9.00E-01	No	No		<DCcw
1,2,4-Trichlorobenzene	mg/kg	4	6.16E+01	1.20E+02	No	ND	--	No	9.20E+02	No	No		<DCcw
1,2-Dichloroethane	mg/kg	1	4.35E-01	4.35E-01	No	ND	--	No	9.90E-01	No	No		<DCcw
1,4-Dichlorobenzene	mg/kg	2	2.97E+00	3.56E+00	No	ND	--	No	3.40E+02	No	No		<DCcw
2,4,6-Trichlorophenol	mg/kg	1	4.95E+01	4.95E+01	No	ND	--	No	5.40E+02	No	No		<DCcw
2,4-Dichlorophenol	mg/kg	3	6.45E+01	1.41E+02	No	ND	--	No	6.10E+02	No	No		<DCcw
2,4-Dinitrophenol	mg/kg	1	1.40E+01	1.40E+01	No	ND	--	No	4.10E+02	No	No		<DCcw
2-Butanone (MEK)	mg/kg	11	7.39E+00	1.78E+01	No	ND	--	No	2.80E+04	No	No		<DCcw
2-Chlorophenol	mg/kg	1	8.76E+00	8.76E+00	No	ND	--	No	1.00E+04	No	No		<DCcw
2-Methylnaphthalene	mg/kg	4	1.84E+01	3.71E+01	No	ND	--	No	8.20E+03	No	No		<DCcw
2-Methylphenol (o-cresol)	mg/kg	1	3.56E+00	3.56E+00	No	ND	--	No	1.00E+05	No	No		<DCcw
4,4'-DDE	mg/kg	4	4.88E+01	1.35E+02	No	ND	--	No	3.70E+02	No	No		<DCcw
4-Chloroaniline	mg/kg	3	8.16E+01	2.31E+02	No	ND	--	No	8.20E+02	No	No		<DCcw
4-Methyl-2-pentanone (MIBK)	mg/kg	4	2.99E+00	6.00E+00	No	ND	--	No	2.90E+03	No	No		<DCcw
Acenaphthene	mg/kg	1	2.67E+00	2.67E+00	No	ND	--	No	1.20E+05	No	No		<DCcw
Acetone	mg/kg	11	5.66E+00	1.54E+01	No	1.10E-02	Yes	No	1.00E+05	No	No		<DCcw
Aluminum	mg/kg	13	8.17E+03	1.87E+04	No	2.03E+04	No	Yes	1.00E+05	No	No		<DCcw
Anthracene	mg/kg	1	8.49E+00	8.49E+00	No	ND	--	No	6.10E+05	No	No		<DCcw
Arsenic	mg/kg	5	5.52E+00	1.11E+01	No	1.74E+01	No	Yes	6.10E+01	No	No		<DCcw
Barium	mg/kg	13	5.00E+03	4.59E+04	No	3.73E+02	Yes	No	1.40E+04	Yes	Yes	>DCcw	
Benzene	mg/kg	6	1.53E+01	4.53E+01	No	ND	--	No	2.10E+00	Yes	Yes	>DCcw	
Benzyl alcohol	mg/kg	1	6.10E+00	6.10E+00	No	ND	--	No	1.00E+05	No	No		<DCcw
Butylbenzylphthalate	mg/kg	1	2.33E+01	2.33E+01	No	ND	--	No	9.30E+02	No	No		<DCcw
Cadmium	mg/kg	3	7.00E+00	1.40E+01	No	6.87E+00	Yes	No	2.00E+02	No	No		<DCcw
Calcium	mg/kg	2	1.73E+04	1.85E+04	Yes	1.61E+04	Yes	Yes	NA	No	No		EN
Chlorobenzene	mg/kg	8	1.08E+02	5.38E+02	No	ND	--	No	1.30E+00	Yes	Yes	>DCcw	
Chloroform	mg/kg	1	1.16E+01	1.16E+01	No	ND	--	No	7.60E-01	Yes	Yes	>DCcw	
Chromium	mg/kg	13	9.36E+01	9.85E+02	No	3.27E+01	Yes	No	4.10E+03	No	No		<DCcw
Chrysene	mg/kg	1	2.29E+01	2.29E+01	No	8.40E-02	Yes	No	1.70E+04	No	No		<DCcw
Cobalt	mg/kg	6	2.05E+01	5.60E+01	No	1.39E+01	Yes	No	1.20E+04	No	No		<DCcw
Copper	mg/kg	20	1.73E+02	2.22E+03	No	1.55E+02	Yes	No	8.20E+03	No	No		<DCcw
Dibenzofuran	mg/kg	2	1.91E+01	3.38E+01	No	ND	--	No	5.10E+03	No	No		<DCcw
Diethylphthalate	mg/kg	1	2.29E+01	2.29E+01	No	1.85E-01	Yes	No	2.00E+03	No	No		<DCcw
Di-n-butylphthalate	mg/kg	4	8.92E+00	1.76E+01	No	ND	--	No	2.30E+03	No	No		<DCcw
Ethylbenzene	mg/kg	6	6.80E+00	1.69E+01	No	ND	--	No	5.80E+01	No	No		<DCcw
Fluoranthene	mg/kg	1	6.59E+00	6.59E+00	No	8.40E-02	Yes	No	8.20E+04	No	No		<DCcw
Fluorene	mg/kg	1	1.13E+01	1.13E+01	No	ND	--	No	8.20E+04	No	No		<DCcw
Hexachlorobenzene	mg/kg	2	3.43E+01	4.06E+01	No	ND	--	No	2.60E+00	Yes	Yes	>DCcw	
Iron	mg/kg	22	1.35E+04	5.37E+04	Yes	3.33E+04	Yes	Yes	NA	No	No		EN
Lead	mg/kg	18	2.41E+02	3.12E+03	No	1.42E+02	Yes	No	7.50E+02	Yes	No-Avg<Tier 1	>DCcw	FALSE

Table T-5
Suburface Soil - Industrial TACO Screen
Site G - Historical Subsurface Soil Data

Constituent	Units	Number of Detects	Mean	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Subsurface Soil Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Construction Worker Direct Contact (DC) Concentration	Is Max>CW DC?	COPC?	Reason
Magnesium	mg/kg	2	7.31E+03	7.46E+03	Yes	9.33E+03	No	Yes	NA	No	No	EN
Manganese	mg/kg	11	2.09E+02	4.61E+02	No	8.00E+02	No	Yes	8.70E+03	No	No	<DCcw
Mercury	mg/kg	4	8.66E+00	3.43E+01	No	5.61E-02	Yes	No	6.10E+01	No	No	<DCcw
Methylene chloride	mg/kg	11	1.63E+00	7.11E+00	No	2.80E-03	Yes	No	3.40E+01	No	No	<DCcw
Naphthalene	mg/kg	7	8.93E+02	5.43E+03	No	ND	--	No	8.20E+03	No	No	<DCcw
Nickel	mg/kg	19	5.13E+01	3.99E+02	No	3.73E+01	Yes	No	4.10E+03	No	No	<DCcw
N-Nitrosodiphenylamine	mg/kg	1	1.78E+02	1.78E+02	No	ND	--	No	2.50E+04	No	No	<DCcw
Pentachlorophenol	mg/kg	5	1.32E+03	4.77E+03	No	ND	--	No	5.20E+02	Yes	Yes	>DCcw
Phenanthrene	mg/kg	4	2.84E+01	5.14E+01	No	ND	--	No	6.10E+05	No	No	<DCcw
Phenol	mg/kg	1	1.78E+02	1.78E+02	No	ND	--	No	1.20E+05	No	No	<DCcw
Phosphorus	mg/kg	9	5.37E+02	1.34E+03	No	ND	--	No	4.10E+01	Yes	Yes	>DCcw
Potassium	mg/kg	2	1.59E+03	1.70E+03	Yes	4.20E+03	No	Yes	NA	No	No	EN
Pyrene	mg/kg	2	1.33E+01	1.91E+01	No	ND	--	No	6.10E+04	No	No	<DCcw
Silver	mg/kg	1	1.20E+01	1.20E+01	No	1.39E+00	Yes	No	1.00E+03	No	No	<DCcw
Tetrachloroethene	mg/kg	8	1.88E+01	5.86E+01	No	ND	--	No	2.80E+01	Yes	Yes	>DCcw
Tin	mg/kg	2	5.30E+01	8.00E+01	No	ND	--	No	1.00E+05	No	No	<DCcw
Toluene	mg/kg	6	4.85E+01	1.18E+02	No	ND	--	No	4.20E+01	Yes	Yes	>DCcw
Total PCBs	mg/kg	7	9.08E+02	4.43E+03	No	ND	--	No	1.00E+00	Yes	Yes	>DCcw
trans-1,2-Dichloroethene	mg/kg	1	7.00E-01	7.00E-01	No	ND	--	No	3.10E+03	No	No	<DCcw
Trichloroethene	mg/kg	4	1.94E+00	3.85E+00	No	ND	--	No	1.20E+01	No	No	<DCcw
Vanadium	mg/kg	11	1.49E+02	1.32E+03	No	5.80E+01	Yes	No	1.40E+03	No	No	<DCcw
Xylenes, Total	mg/kg	6	1.64E+01	4.15E+01	No	ND	--	No	4.10E+02	No	No	<DCcw
Zinc	mg/kg	19	4.75E+02	4.26E+03	No	6.41E+02	Yes	No	6.10E+04	No	No	<DCcw

Table T-6
Suburface Soil - Industrial TACO Screen
Site H - Historical Subsurface Soil Data

Constituent	Units	Number of Detects	Mean	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Subsurface Soil Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Construction Worker Direct Contact (DC) Concentration	Is Max>CW DC?	COPC?	Reason
1,2,4-Trichlorobenzene	mg/kg	6	1.33E+03	7.58E+03	No	ND	--	No	9.20E+02	Yes	Yes	>DCcw
1,2-Dichlorobenzene	mg/kg	3	6.48E+03	1.94E+04	No	ND	--	No	3.10E+02	Yes	Yes	>DCcw
1,2-Dichloroethane	mg/kg	1	1.20E-02	1.20E-02	No	ND	--	No	9.90E-01	No	No	<DCcw
1,3-Dichlorobenzene	mg/kg	3	8.76E+01	2.42E+02	No	ND	--	No	3.10E+02	No	No	<DCcw
1,4-Dichlorobenzene	mg/kg	5	6.32E+03	3.06E+04	No	ND	--	No	3.40E+02	Yes	Yes	>DCcw
2,4,6-Trichlorophenol	mg/kg	2	3.07E+02	6.13E+02	No	ND	--	No	5.40E+02	Yes	Yes	>DCcw
2,4-Dichlorophenol	mg/kg	5	1.50E+02	7.42E+02	No	ND	--	No	6.10E+02	Yes	Yes	>DCcw
2,4-Dimethylphenol	mg/kg	1	9.20E-02	9.20E-02	No	ND	--	No	4.10E+04	No	No	<DCcw
2-Butanone (MEK)	mg/kg	5	1.26E+01	2.72E+01	No	ND	--	No	2.80E+04	No	No	<DCcw
2-Methylnaphthalene	mg/kg	3	1.16E+02	3.47E+02	No	ND	--	No	8.20E+03	No	No	<DCcw
4,4'-DDD	mg/kg	1	4.31E-01	4.31E-01	No	ND	--	No	5.20E+02	No	No	<DCcw
4,4'-DDE	mg/kg	2	6.42E-01	7.80E-01	No	ND	--	No	3.70E+02	No	No	<DCcw
4,4'-DDT	mg/kg	2	8.52E-01	9.23E-01	No	ND	--	No	1.00E+02	No	No	<DCcw
4-Methyl-2-pentanone (MIBK)	mg/kg	4	2.33E+00	7.85E+00	No	ND	--	No	2.90E+03	No	No	<DCcw
4-Methylphenol	mg/kg	1	1.72E-01	1.72E-01	No	ND	--	No	1.00E+05	No	No	<DCcw
4-Nitroaniline	mg/kg	1	1.83E+03	1.83E+03	No	ND	--	No	5.00E+01	Yes	Yes	>DCcw
Acenaphthylene	mg/kg	3	1.26E+02	3.78E+02	No	ND	--	No	1.20E+05	No	No	<DCcw
Acetone	mg/kg	11	4.85E+00	2.11E+01	No	1.10E-02	Yes	No	1.00E+05	No	No	<DCcw
Aluminum	mg/kg	11	3.85E+03	1.21E+04	No	2.03E+04	No	Yes	1.00E+05	No	No	<DCcw
Anthracene	mg/kg	4	1.70E+02	6.80E+02	No	ND	--	No	6.10E+05	No	No	<DCcw
Arsenic	mg/kg	2	1.45E+01	2.60E+01	No	1.74E+01	Yes	No	6.10E+01	No	No	<DCcw
Barium	mg/kg	11	6.05E+02	3.24E+03	No	3.73E+02	Yes	No	1.40E+04	No	No	<DCcw
Benzene	mg/kg	7	1.52E+01	6.13E+01	No	ND	--	No	2.10E+00	Yes	Yes	>DCcw
Benzo(a)anthracene	mg/kg	3	1.26E+02	3.78E+02	No	5.20E-02	Yes	No	1.70E+02	Yes	Yes	>DCcw
Benzo(a)pyrene	mg/kg	2	1.36E+02	2.72E+02	No	ND	--	No	1.70E+01	Yes	Yes	>DCcw
Benzo(b)fluoranthene	mg/kg	3	7.10E+01	2.11E+02	No	ND	--	No	1.70E+02	Yes	Yes	>DCcw
Benzo(g,h,i)perylene	mg/kg	2	5.69E+01	1.13E+02	No	6.80E-02	Yes	No	6.10E+04	No	No	<DCcw
Benzoic acid	mg/kg	2	2.02E+00	2.64E+00	No	ND	--	No	8.20E+05	No	No	<DCcw
Benzyl alcohol	mg/kg	1	7.92E+00	7.92E+00	No	ND	--	No	1.00E+05	No	No	<DCcw
bis(2-ethylhexyl)phthalate	mg/kg	4	4.28E-01	6.14E-01	No	ND	--	No	4.10E+03	No	No	<DCcw
Cadmium	mg/kg	4	1.88E+02	2.94E+02	No	6.87E+00	Yes	No	2.00E+02	Yes	Yes	>DCcw
Chlorobenzene	mg/kg	6	9.76E+01	4.52E+02	No	ND	--	No	1.30E+00	Yes	Yes	>DCcw
Chloroform	mg/kg	2	1.23E-01	1.92E-01	No	ND	--	No	7.60E-01	No	No	<DCcw
Chromium	mg/kg	8	4.21E+01	1.00E+02	No	3.27E+01	Yes	No	4.10E+03	No	No	<DCcw
Chrysene	mg/kg	3	1.12E+02	3.32E+02	No	8.40E-02	Yes	No	1.70E+04	No	No	<DCcw
Cobalt	mg/kg	5	3.64E+01	1.05E+02	No	1.39E+01	Yes	No	1.20E+04	No	No	<DCcw
Copper	mg/kg	8	5.36E+02	2.44E+03	No	1.55E+02	Yes	No	8.20E+03	No	No	<DCcw
Cyanide, Total	mg/kg	2	2.00E+00	2.00E+00	No	ND	--	No	4.10E+03	No	No	<DCcw
Dibenzo(a,h)anthracene	mg/kg	1	3.17E+01	3.17E+01	No	ND	--	No	1.70E+01	Yes	Yes	>DCcw
Dibenzofuran	mg/kg	4	1.55E+01	6.04E+01	No	ND	--	No	5.10E+03	No	No	<DCcw

Table T-6
Suburface Soil - Industrial TACO Screen
Site H - Historical Subsurface Soil Data

Constituent	Units	Number of Detects	Mean	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Subsurface Soil Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Construction Worker Direct Contact (DC) Concentration	Is Max>CW DC?	COPC?	Reason
Di-n-butylphthalate	mg/kg	8	4.03E+00	2.57E+01	No	ND	--	No	2.30E+03	No	No	<DCcw
Ethylbenzene	mg/kg	3	9.06E+00	1.28E+01	No	ND	--	No	5.80E+01	No	No	<DCcw
Fluoranthene	mg/kg	4	3.33E+02	1.33E+03	No	8.40E-02	Yes	No	8.20E+04	No	No	<DCcw
Fluorene	mg/kg	3	1.61E+02	4.83E+02	No	ND	--	No	8.20E+04	No	No	<DCcw
Hexachlorobenzene	mg/kg	1	7.14E-01	7.14E-01	No	ND	--	No	2.60E+00	No	No	<DCcw
Indeno(1,2,3-cd)pyrene	mg/kg	1	1.36E+02	1.36E+02	No	ND	--	No	1.70E+02	No	No	<DCcw
Iron	mg/kg	11	2.32E+04	8.45E+04	Yes	3.33E+04	Yes	Yes	NA	No	No	EN
Lead	mg/kg	2	5.77E+02	1.15E+03	No	1.42E+02	Yes	No	7.50E+02	Yes	No-Avg<Tier 1	>DCcw FALSE
Manganese	mg/kg	11	3.86E+03	3.65E+04	No	8.00E+02	Yes	No	8.70E+03	Yes	Yes	>DCcw
Mercury	mg/kg	3	2.03E+00	3.90E+00	No	5.61E-02	Yes	No	6.10E+01	No	No	<DCcw
Methylene chloride	mg/kg	11	6.34E+00	5.56E+01	No	2.80E-03	Yes	No	3.40E+01	Yes	Yes	>DCcw
Naphthalene	mg/kg	4	5.67E+02	2.27E+03	No	ND	--	No	8.20E+03	No	No	<DCcw
Nickel	mg/kg	10	1.77E+03	1.51E+04	No	3.73E+01	Yes	No	4.10E+03	Yes	Yes	>DCcw
N-Nitrosodiphenylamine	mg/kg	1	1.00E-07	1.00E-07	No	ND	--	No	2.50E+04	No	No	<DCcw
Phenanthrene	mg/kg	6	3.53E+02	2.11E+03	No	ND	--	No	6.10E+05	No	No	<DCcw
Phenol	mg/kg	1	4.22E-01	4.22E-01	No	ND	--	No	1.20E+05	No	No	<DCcw
Pyrene	mg/kg	3	2.22E+02	6.64E+02	No	ND	--	No	6.10E+04	No	No	<DCcw
Selenium	mg/kg	1	2.00E+00	2.00E+00	No	ND	--	No	1.00E+03	No	No	<DCcw
Silver	mg/kg	2	2.65E+01	4.40E+01	No	1.39E+00	Yes	No	1.00E+03	No	No	<DCcw
Tetrachloroethene	mg/kg	1	5.65E+00	5.65E+00	No	ND	--	No	2.80E+01	No	No	<DCcw
Thallium	mg/kg	1	1.00E+00	1.00E+00	No	ND	--	No	1.60E+02	No	No	<DCcw
Tin	mg/kg	3	5.50E+01	1.11E+02	No	ND	--	No	1.00E+05	No	No	<DCcw
Toluene	mg/kg	5	2.28E+01	7.65E+01	No	ND	--	No	4.20E+01	Yes	Yes	>DCcw
Total PCBs	mg/kg	7	2.73E+03	1.80E+04	No	ND	--	No	1.00E+00	Yes	Yes	>DCcw
Trichloroethene	mg/kg	1	1.00E-02	1.00E-02	No	ND	--	No	1.20E+01	No	No	<DCcw
Vanadium	mg/kg	6	3.23E+01	9.50E+01	No	5.80E+01	Yes	No	1.40E+03	No	No	<DCcw
Xylenes, Total	mg/kg	3	1.48E+01	2.36E+01	No	ND	--	No	4.10E+02	No	No	<DCcw
Zinc	mg/kg	11	4.74E+03	3.95E+04	No	6.41E+02	Yes	No	6.10E+04	No	No	<DCcw

Table T-7
Suburface Soil - Industrial TACO Screen
Site I - Historical Subsurface Soil Data

Constituent	Units	Number of Detects	Mean	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Subsurface Soil Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Construction Worker Direct Contact (DC) Concentration	Is Max>CW DC?	COPC?	Reason
1,1,1-Trichloroethane	mg/kg	2	1.06E+00	1.69E+00	No	ND	--	No	1.20E+03	No	No	<DCcw
1,2,4-Trichlorobenzene	mg/kg	8	1.40E+03	8.26E+03	No	ND	--	No	9.20E+02	Yes	Yes	>DCcw
1,2-Dichlorobenzene	mg/kg	6	8.29E+01	3.24E+02	No	ND	--	No	3.10E+02	Yes	Yes	>DCcw
1,3-Dichlorobenzene	mg/kg	2	4.45E+01	7.01E+01	No	ND	--	No	3.10E+02	No	No	<DCcw
1,4-Dichlorobenzene	mg/kg	8	2.55E+02	1.84E+03	No	ND	--	No	3.40E+02	Yes	Yes	>DCcw
2,4-Dichlorophenol	mg/kg	1	9.00E+00	9.00E+00	No	ND	--	No	6.10E+02	No	No	<DCcw
2-Butanone (MEK)	mg/kg	15	6.86E+00	1.69E+01	No	ND	--	No	2.80E+04	No	No	<DCcw
2-Methylnaphthalene	mg/kg	7	3.85E+01	1.69E+02	No	ND	--	No	8.20E+03	No	No	<DCcw
4,4'-DDD	mg/kg	2	1.82E+01	2.97E+01	No	ND	--	No	5.20E+02	No	No	<DCcw
4,4'-DDT	mg/kg	1	4.31E+00	4.31E+00	No	ND	--	No	1.00E+02	No	No	<DCcw
4-Chloroaniline	mg/kg	1	4.32E+01	4.32E+01	No	ND	--	No	8.20E+02	No	No	<DCcw
4-Methyl-2-pentanone (MIBK)	mg/kg	2	2.08E+00	4.16E+00	No	ND	--	No	2.90E+03	No	No	<DCcw
Acenaphthene	mg/kg	1	1.40E+01	1.40E+01	No	ND	--	No	1.20E+05	No	No	<DCcw
Acetone	mg/kg	16	6.66E+00	1.69E+01	No	1.10E-02	Yes	No	1.00E+05	No	No	<DCcw
Aluminum	mg/kg	16	4.17E+03	1.35E+04	No	2.03E+04	No	Yes	1.00E+05	No	No	<DCcw
Anthracene	mg/kg	2	1.13E+02	2.03E+02	No	ND	--	No	6.10E+05	No	No	<DCcw
Antimony	mg/kg	3	2.23E+03	6.66E+03	No	2.40E+00	Yes	No	8.20E+01	Yes	Yes	>DCcw
Arsenic	mg/kg	9	6.56E+00	1.40E+01	No	1.74E+01	No	Yes	6.10E+01	No	No	<DCcw
Barium	mg/kg	10	9.83E+02	3.60E+03	No	3.73E+02	Yes	No	1.40E+04	No	No	<DCcw
Benzene	mg/kg	10	3.81E+00	2.41E+01	No	ND	--	No	2.10E+00	Yes	Yes	>DCcw
Benzo(a)anthracene	mg/kg	2	4.59E+00	6.72E+00	No	5.20E-02	Yes	No	1.70E+02	No	No	<DCcw
Benzo(a)pyrene	mg/kg	1	2.47E+00	2.47E+00	No	ND	--	No	1.70E+01	No	No	<DCcw
Benzo(b)fluoranthene	mg/kg	2	1.70E+01	3.24E+01	No	ND	--	No	1.70E+02	No	No	<DCcw
Benzoic acid	mg/kg	1	6.21E+01	6.21E+01	No	ND	--	No	8.20E+05	No	No	<DCcw
Beryllium	mg/kg	1	1.53E+03	1.53E+03	No	1.27E+00	Yes	No	4.08E+02	Yes	Yes	>DCcw
bis(2-ethylhexyl)phthalate	mg/kg	7	3.49E+01	1.31E+02	No	ND	--	No	4.10E+03	No	No	<DCcw
Butylbenzylphthalate	mg/kg	1	1.39E+02	1.39E+02	No	ND	--	No	9.30E+02	No	No	<DCcw
Cadmium	mg/kg	7	5.57E+00	1.30E+01	No	6.87E+00	Yes	No	2.00E+02	No	No	<DCcw
Chlorobenzene	mg/kg	12	3.47E+01	1.27E+02	No	ND	--	No	1.30E+00	Yes	Yes	>DCcw
Chromium	mg/kg	14	7.61E+01	7.31E+02	No	3.27E+01	Yes	No	4.10E+03	No	No	<DCcw
Chrysene	mg/kg	2	4.78E+00	5.59E+00	No	8.40E-02	Yes	No	1.70E+04	No	No	<DCcw
Cobalt	mg/kg	7	3.89E+01	1.40E+02	No	1.39E+01	Yes	No	1.20E+04	No	No	<DCcw
Copper	mg/kg	8	2.98E+02	6.30E+02	No	1.55E+02	Yes	No	8.20E+03	No	No	<DCcw
Cyanide, Total	mg/kg	3	1.06E+03	3.18E+03	No	ND	--	No	4.10E+03	No	No	<DCcw
Dibenzofuran	mg/kg	1	5.59E+00	5.59E+00	No	ND	--	No	5.10E+03	No	No	<DCcw
Diethylphthalate	mg/kg	1	1.69E+01	1.69E+01	No	1.85E-01	Yes	No	2.00E+03	No	No	<DCcw
Di-n-butylphthalate	mg/kg	8	3.71E+01	2.03E+02	No	ND	--	No	2.30E+03	No	No	<DCcw
Ethylbenzene	mg/kg	10	4.65E+00	1.51E+01	No	ND	--	No	5.80E+01	No	No	<DCcw
Fluoranthene	mg/kg	3	7.69E+01	2.03E+02	No	8.40E-02	Yes	No	8.20E+04	No	No	<DCcw
Fluorene	mg/kg	3	1.49E+01	3.54E+01	No	ND	--	No	8.20E+04	No	No	<DCcw

Table T-7
Subsurface Soil - Industrial TACO Screen
Site I - Historical Subsurface Soil Data

Constituent	Units	Number of Detects	Mean	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Subsurface Soil Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Construction Worker Direct Contact (DC) Concentration	Is Max>CW DC?	COPC?	Reason
Hexachlorobenzene	mg/kg	7	2.58E+02	1.27E+03	No	ND	--	No	2.60E+00	Yes	Yes	>DCcw
Hexachloroethane	mg/kg	1	3.01E+00	3.01E+00	No	ND	--	No	2.00E+03	No	No	<DCcw
Iron	mg/kg	16	1.17E+04	4.15E+04	Yes	3.33E+04	Yes	Yes	NA	No	No	EN
Lead	mg/kg	15	2.06E+03	2.33E+04	No	1.42E+02	Yes	No	7.50E+02	Yes	Yes	>DCcw
Manganese	mg/kg	1	9.80E+01	9.80E+01	No	8.00E+02	No	Yes	8.70E+03	No	No	<DCcw
Mercury	mg/kg	5	1.70E+00	3.20E+00	No	5.61E-02	Yes	No	6.10E+01	No	No	<DCcw
Methylene chloride	mg/kg	16	1.52E+00	6.77E+00	No	2.80E-03	Yes	No	3.40E+01	No	No	<DCcw
Naphthalene	mg/kg	7	9.81E+01	5.15E+02	No	ND	--	No	8.20E+03	No	No	<DCcw
Nickel	mg/kg	12	3.35E+02	2.41E+03	No	3.73E+01	Yes	No	4.10E+03	No	No	<DCcw
N-Nitrosodiphenylamine	mg/kg	2	7.31E+01	1.00E+02	No	ND	--	No	2.50E+04	No	No	<DCcw
Pentachlorophenol	mg/kg	1	1.92E+02	1.92E+02	No	ND	--	No	5.20E+02	No	No	<DCcw
Phenanthrene	mg/kg	5	3.43E+01	1.02E+02	No	ND	--	No	6.10E+05	No	No	<DCcw
Phenol	mg/kg	2	2.11E+01	2.70E+01	No	ND	--	No	1.20E+05	No	No	<DCcw
Pyrene	mg/kg	4	1.96E+01	4.93E+01	No	ND	--	No	6.10E+04	No	No	<DCcw
Selenium	mg/kg	1	1.32E+03	1.32E+03	No	ND	--	No	1.00E+03	Yes	Yes	>DCcw
Tetrachloroethene	mg/kg	5	2.57E+00	5.27E+00	No	ND	--	No	2.80E+01	No	No	<DCcw
Tin	mg/kg	9	1.92E+01	5.50E+01	No	ND	--	No	1.00E+05	No	No	<DCcw
Toluene	mg/kg	11	1.13E+01	7.79E+01	No	ND	--	No	4.20E+01	Yes	Yes	>DCcw
Total PCBs	mg/kg	5	1.81E+02	3.43E+02	No	ND	--	No	1.00E+00	Yes	Yes	>DCcw
Toxaphene	mg/kg	1	4.93E+02	4.93E+02	No	ND	--	No	1.10E+02	Yes	Yes	>DCcw
trans-1,2-Dichloroethene	mg/kg	1	3.00E-03	3.00E-03	No	ND	--	No	3.10E+03	No	No	<DCcw
Trichloroethene	mg/kg	2	2.23E+00	3.81E+00	No	ND	--	No	1.20E+01	No	No	<DCcw
Vanadium	mg/kg	7	1.07E+02	5.53E+02	No	5.80E+01	Yes	No	1.40E+03	No	No	<DCcw
Xylenes, Total	mg/kg	10	4.96E+00	1.92E+01	No	ND	--	No	4.10E+02	No	No	<DCcw
Zinc	mg/kg	16	6.24E+02	6.33E+03	No	6.41E+02	Yes	No	6.10E+04	No	No	<DCcw

Table T-8
Suburface Soil - Industrial TACO Screen
Site L - Historical Subsurface Soil Data

Constituent	Units	Number of Detects	Mean	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Subsurface Soil Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Construction Worker Direct Contact (DC) Concentration	Is Max>CW DC?	COPC?	Reason
1,2,4-Trichlorobenzene	mg/kg	3	5.25E+01	7.90E+01	No	ND	--	No	9.20E+02	No	No	<DCcw
1,2-Dichlorobenzene	mg/kg	4	3.50E+00	7.70E+00	No	ND	--	No	3.10E+02	No	No	<DCcw
1,3-Dichlorobenzene	mg/kg	1	4.30E+00	4.30E+00	No	ND	--	No	3.10E+02	No	No	<DCcw
1,4-Dichlorobenzene	mg/kg	9	2.34E+01	1.00E+02	No	ND	--	No	3.40E+02	No	No	<DCcw
2,4,6-Trichlorophenol	mg/kg	1	1.50E+00	1.50E+00	No	ND	--	No	5.40E+02	No	No	<DCcw
2,4-Dichlorophenol	mg/kg	2	6.70E+00	1.10E+01	No	ND	--	No	6.10E+02	No	No	<DCcw
2-Butanone (MEK)	mg/kg	3	3.34E+00	1.00E+01	No	ND	--	No	2.80E+04	No	No	<DCcw
2-Chlorophenol	mg/kg	3	1.59E+00	2.60E+00	No	ND	--	No	1.00E+04	No	No	<DCcw
2-Methylnaphthalene	mg/kg	6	1.42E+00	3.10E+00	No	ND	--	No	8.20E+03	No	No	<DCcw
3&4-Methylphenol (m&p-cresol)	mg/kg	4	1.43E-01	1.90E-01	No	ND	--	No	1.00E+05	No	No	<DCcw
4-Chloroaniline	mg/kg	6	9.87E+01	2.70E+02	No	ND	--	No	8.20E+02	No	No	<DCcw
4-Methyl-2-pentanone (MIBK)	mg/kg	4	7.30E-02	1.67E-01	No	ND	--	No	2.90E+03	No	No	<DCcw
4-Methylphenol	mg/kg	5	3.40E+00	7.10E+00	No	ND	--	No	1.00E+05	No	No	<DCcw
Acenaphthene	mg/kg	3	1.08E+00	3.10E+00	No	ND	--	No	1.20E+05	No	No	<DCcw
Acenaphthylene	mg/kg	1	2.80E-01	2.80E-01	No	ND	--	No	1.20E+05	No	No	<DCcw
Acetone	mg/kg	6	1.01E+00	4.56E+00	No	1.10E-02	Yes	No	1.00E+05	No	No	<DCcw
Aluminum	mg/kg	11	5.80E+03	1.28E+04	No	2.03E+04	No	Yes	1.00E+05	No	No	<DCcw
Anthracene	mg/kg	3	1.46E+00	4.20E+00	No	ND	--	No	6.10E+05	No	No	<DCcw
Antimony	mg/kg	1	3.20E+01	3.20E+01	No	2.40E+00	Yes	No	8.20E+01	No	No	<DCcw
Arsenic	mg/kg	10	5.36E+01	1.72E+02	No	1.74E+01	Yes	No	6.10E+01	Yes	Yes	>DCcw
Barium	mg/kg	15	3.00E+02	1.44E+03	No	3.73E+02	Yes	No	1.40E+04	No	No	<DCcw
Benzene	mg/kg	5	2.01E+00	5.70E+00	No	ND	--	No	2.10E+00	Yes	Yes	>DCcw
Benzo(a)anthracene	mg/kg	4	2.46E+00	8.60E+00	No	5.20E-02	Yes	No	1.70E+02	No	No	<DCcw
Benzo(a)pyrene	mg/kg	3	1.80E+00	5.30E+00	No	ND	--	No	1.70E+01	No	No	<DCcw
Benzo(b)fluoranthene	mg/kg	3	1.88E+00	5.40E+00	No	ND	--	No	1.70E+02	No	No	<DCcw
Benzo(g,h,i)perylene	mg/kg	1	2.70E-02	2.70E-02	No	6.80E-02	No	Yes	6.10E+04	No	No	<DCcw
Benzo(k)fluoranthene	mg/kg	1	4.60E+00	4.60E+00	No	ND	--	No	1.70E+03	No	No	<DCcw
Benzoic acid	mg/kg	2	1.62E+00	3.20E+00	No	ND	--	No	8.20E+05	No	No	<DCcw
bis(2-ethylhexyl)phthalate	mg/kg	6	9.21E-01	2.20E+00	No	ND	--	No	4.10E+03	No	No	<DCcw
Butylbenzylphthalate	mg/kg	1	5.40E+00	5.40E+00	No	ND	--	No	9.30E+02	No	No	<DCcw
Cadmium	mg/kg	6	8.03E+00	4.20E+01	No	6.87E+00	Yes	No	2.00E+02	No	No	<DCcw
Calcium	mg/kg	6	2.81E+04	7.55E+04	Yes	1.61E+04	Yes	Yes	NA	No	No	EN
Chlorobenzene	mg/kg	8	1.25E+00	5.30E+00	No	ND	--	No	1.30E+00	Yes	Yes	>DCcw
Chloroform	mg/kg	3	6.80E+00	2.03E+01	No	ND	--	No	7.60E-01	Yes	Yes	>DCcw
Chromium	mg/kg	10	1.16E+01	2.70E+01	No	3.27E+01	No	Yes	4.10E+03	No	No	<DCcw
Chrysene	mg/kg	4	2.20E+00	8.20E+00	No	8.40E-02	Yes	No	1.70E+04	No	No	<DCcw
Cobalt	mg/kg	7	7.70E+00	9.00E+00	No	1.39E+01	No	Yes	1.20E+04	No	No	<DCcw
Copper	mg/kg	10	9.27E+01	3.08E+02	No	1.55E+02	Yes	No	8.20E+03	No	No	<DCcw
Cyanide, Total	mg/kg	1	4.60E-01	4.60E-01	No	ND	--	No	4.10E+03	No	No	<DCcw
Dibenzofuran	mg/kg	2	1.52E+00	3.00E+00	No	ND	--	No	5.10E+03	No	No	<DCcw

Table T-8
Suburface Soil - Industrial TACO Screen
Site L - Historical Subsurface Soil Data

Constituent	Units	Number of Detects	Mean	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Subsurface Soil Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Construction Worker Direct Contact (DC) Concentration	Is Max>CW DC?	COPC?	Reason
Diethylphthalate	mg/kg	2	6.55E-01	1.00E+00	No	1.85E-01	Yes	No	2.00E+03	No	No	<DCcw
Di-n-butylphthalate	mg/kg	4	1.28E+00	2.78E+00	No	ND	--	No	2.30E+03	No	No	<DCcw
Ethylbenzene	mg/kg	1	4.00E-02	4.00E-02	No	ND	--	No	5.80E+01	No	No	<DCcw
Fluoranthene	mg/kg	4	4.27E+00	1.60E+01	No	8.40E-02	Yes	No	8.20E+04	No	No	<DCcw
Fluorene	mg/kg	2	2.54E+00	5.00E+00	No	ND	--	No	8.20E+04	No	No	<DCcw
Hexachlorobenzene	mg/kg	1	4.80E+00	4.80E+00	No	ND	--	No	2.60E+00	Yes	Yes	>DCcw
Hexachloroethane	mg/kg	1	4.90E-02	4.90E-02	No	ND	--	No	2.00E+03	No	No	<DCcw
Indeno(1,2,3-cd)pyrene	mg/kg	2	1.51E+00	2.90E+00	No	ND	--	No	1.70E+02	No	No	<DCcw
Iron	mg/kg	11	9.96E+03	2.40E+04	Yes	3.33E+04	No	Yes	NA	No	No	EN
Lead	mg/kg	13	7.46E+01	6.64E+02	No	1.42E+02	Yes	No	7.50E+02	No	No	<DCcw
Magnesium	mg/kg	6	4.91E+03	9.44E+03	Yes	9.33E+03	Yes	Yes	NA	No	No	EN
Manganese	mg/kg	11	2.19E+02	7.82E+02	No	8.00E+02	No	Yes	8.70E+03	No	No	<DCcw
Mercury	mg/kg	7	3.09E-01	1.80E+00	No	5.61E-02	Yes	No	6.10E+01	No	No	<DCcw
Methylene chloride	mg/kg	5	4.89E-01	2.28E+00	No	2.80E-03	Yes	No	3.40E+01	No	No	<DCcw
Naphthalene	mg/kg	4	2.02E+00	7.30E+00	No	ND	--	No	8.20E+03	No	No	<DCcw
Nickel	mg/kg	10	3.78E+02	2.39E+03	No	3.73E+01	Yes	No	4.10E+03	No	No	<DCcw
Pentachlorophenol	mg/kg	4	3.17E+01	5.82E+01	No	ND	--	No	5.20E+02	No	No	<DCcw
Phenanthrene	mg/kg	5	5.18E+00	2.30E+01	No	ND	--	No	6.10E+05	No	No	<DCcw
Phenol	mg/kg	5	8.77E+00	1.60E+01	No	ND	--	No	1.20E+05	No	No	<DCcw
Potassium	mg/kg	6	1.31E+03	2.28E+03	Yes	4.20E+03	No	Yes	NA	No	No	EN
Pyrene	mg/kg	4	5.96E+00	2.30E+01	No	ND	--	No	6.10E+04	No	No	<DCcw
Toluene	mg/kg	7	6.65E+01	4.00E+02	No	ND	--	No	4.20E+01	Yes	Yes	>DCcw
Total PCBs	mg/kg	2	2.58E+02	5.00E+02	No	ND	--	No	1.00E+00	Yes	Yes	>DCcw
Vanadium	mg/kg	9	3.23E+01	1.31E+02	No	5.80E+01	Yes	No	1.40E+03	No	No	<DCcw
Xylenes, Total	mg/kg	4	3.10E+00	1.10E+01	No	ND	--	No	4.10E+02	No	No	<DCcw
Zinc	mg/kg	11	5.34E+02	4.24E+03	No	6.41E+02	Yes	No	6.10E+04	No	No	<DCcw

Table T-9
Comparison of Groundwater Data to TACO Tier I Screening Criteria
Construction Worker

Constituent	Summary Statistics				COPC Selection - Chronic Exposure Screen								Short-Term Exposure Screen	
	Number of Samples	Number of Detects	Average (mg/L)	Maximum (MAX) Detection (mg/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (mg/L)	Is Max> BK?	Pass EN/BK?	TACO Class II Groundwater Criteria (mg/L)	Is Max> Class II?	COPC?	Reason	100 Times TACO Class II Groundwater Criteria (mg/L)	Is Average> 100*Class II?
Site G														
2,4-D	4	3	1.32E+01	5.00E+01	No	ND	--	No	3.50E-01	Yes	Yes	>Tier 1	3.50E+01	No
Barium	4	4	2.94E+00	5.30E+00	No	6.17E-01	Yes	No	2.00E+00	Yes	Yes	>Tier 1	2.00E+02	No
Cadmium	4	1	6.75E-02	1.20E-01	No	ND	--	No	5.00E-02	Yes	Yes	>Tier 1	5.00E+00	No
Lead	4	2	6.09E+00	2.40E+01	No	ND	--	No	1.00E-01	Yes	Yes	>Tier 1	1.00E+01	No
gamma-BHC (Lindane)	4	1	2.00E-03	4.20E-03	No	1.01E-05	Yes	No	1.00E-03	Yes	Yes	>Tier 1	1.00E-01	No
1,4-Dichlorobenzene	4	3	1.10E-01	2.15E-01	No	ND	--	No	3.75E-01	No	No	<Tier 1	3.75E+01	No
2,4,6-Trichlorophenol	4	2	1.27E+00	4.95E+00	No	ND	--	No	3.20E-02	Yes	Yes	>Tier 1	3.20E+00	No
2-Methylphenol (o-cresol)	4	2	3.15E-02	6.20E-02	No	ND	--	No	3.50E-01	No	No	<Tier 1	3.50E+01	No
3&4-Methylphenol (m&p-cresol)	4	2	6.73E-02	1.35E-01	No	ND	--	No	3.50E-01	No	No	<Tier 1	3.50E+01	No
2&3&4-Methylphenol (o&m&p-cresol)	4	2	8.30E-02	1.85E-01	No	ND	--	No	3.50E-01	No	No	<Tier 1	3.50E+01	No
Nitrobenzene	4	3	3.96E-02	7.35E-02	No	ND	--	No	3.50E-03	Yes	Yes	>Tier 1	3.50E-01	No
Pentachlorophenol	4	1	4.63E-01	1.10E+00	No	ND	--	No	5.00E-03	Yes	Yes	>Tier 1	5.00E-01	No
2-Butanone (MEK)	4	1	6.75E-02	1.20E-01	No	ND	--	No	1.90E+00	No	No	<Tier 1	1.90E+02	No
Benzene	4	3	2.04E-01	6.00E-01	No	ND	--	No	2.50E-02	Yes	Yes	>Tier 1	2.50E+00	No
Chlorobenzene	4	3	8.24E-01	2.70E+00	No	ND	--	No	5.00E-01	Yes	Yes	>Tier 1	5.00E+01	No
Tetrachloroethene	4	3	4.39E-02	1.30E-01	No	ND	--	No	2.50E-02	Yes	Yes	>Tier 1	2.50E+00	No
Trichloroethene	4	4	2.45E-02	7.90E-02	No	ND	--	No	2.50E-02	Yes	Yes	>Tier 1	2.50E+00	No
Site H														
2,4-D	5	2	9.29E-02	4.20E-01	No	ND	--	No	3.50E-01	Yes	Yes	>Tier 1	3.50E+01	No
Arsenic	5	1	1.70E-01	4.50E-01	No	1.17E-02	Yes	No	2.00E-01	Yes	Yes	>Tier 1	2.00E+01	No
Cadmium	5	3	4.52E+00	2.20E+01	No	ND	--	No	5.00E-02	Yes	Yes	>Tier 1	5.00E+00	No
Lead	5	3	8.19E+00	4.00E+01	No	ND	--	No	1.00E-01	Yes	Yes	>Tier 1	1.00E+01	No
1,4-Dichlorobenzene	5	2	3.55E-01	1.60E+00	No	ND	--	No	3.75E-01	Yes	Yes	>Tier 1	3.75E+01	No
2,4,5-Trichlorophenol	5	1	2.00E-02	2.00E-02	No	ND	--	No	3.50E+00	No	No	<Tier 1	3.50E+02	No
2,4,6-Trichlorophenol	5	1	3.02E-02	5.10E-02	No	ND	--	No	3.20E-02	Yes	Yes	>Tier 1	3.20E+00	No
2-Methylphenol (o-cresol)	5	2	2.73E-02	5.50E-02	No	ND	--	No	3.50E-01	No	No	<Tier 1	3.50E+01	No
3&4-Methylphenol (m&p-cresol)	5	2	1.12E-01	4.80E-01	No	ND	--	No	3.50E-01	Yes	Yes	>Tier 1	3.50E+01	No
2&3&4-Methylphenol (o&m&p-cresol)	5	2	1.25E-01	5.40E-01	No	ND	--	No	3.50E-01	Yes	Yes	>Tier 1	3.50E+01	No
Hexachlorobenzene	5	1	1.80E-02	1.80E-02	No	ND	--	No	3.00E-04	Yes	Yes	>Tier 1	3.00E-02	No
Pentachlorophenol	5	2	1.74E-01	4.50E-01	No	ND	--	No	5.00E-03	Yes	Yes	>Tier 1	5.00E-01	No
Benzene	5	2	5.23E-01	2.50E+00	No	ND	--	No	2.50E-02	Yes	Yes	>Tier 1	2.50E+00	No
Chlorobenzene	5	2	8.46E-01	2.70E+00	No	ND	--	No	5.00E-01	Yes	Yes	>Tier 1	5.00E+01	No
Tetrachloroethene	5	2	1.65E-02	3.30E-02	No	ND	--	No	2.50E-02	Yes	Yes	>Tier 1	2.50E+00	No
Trichloroethene	5	2	4.60E-03	6.40E-03	No	ND	--	No	2.50E-02	No	No	<Tier 1	2.50E+00	No
Site I														
2,4-D	4	1	4.44E-02	1.40E-01	No	ND	--	No	3.50E-01	No	No	<Tier 1	3.50E+01	No
Barium	4	1	1.50E+01	5.85E+01	No	6.17E-01	Yes	No	2.00E+00	Yes	Yes	>Tier 1	2.00E+02	No
Cadmium	4	2	2.64E-01	7.85E-01	No	ND	--	No	5.00E-02	Yes	Yes	>Tier 1	5.00E+00	No
Lead	4	3	2.61E+00	8.80E+00	No	ND	--	No	1.00E-01	Yes	Yes	>Tier 1	1.00E+01	No
1,4-Dichlorobenzene	4	3	5.99E-01	1.30E+00	No	ND	--	No	3.75E-01	Yes	Yes	>Tier 1	3.75E+01	No
2,4,5-Trichlorophenol	4	1	3.69E-01	1.40E+00	No	ND	--	No	3.50E+00	No	No	<Tier 1	3.50E+02	No
2,4,6-Trichlorophenol	4	1	1.35E-02	1.35E-02	No	ND	--	No	3.20E-02	No	No	<Tier 1	3.20E+00	No
2,4-Dinitrotoluene	4	1	2.83E-02	3.80E-02	No	ND	--	No	2.00E-05	Yes	Yes	>Tier 1	2.00E-03	Yes
2-Methylphenol (o-cresol)	4	1	1.40E-02	1.40E-02	No	ND	--	No	3.50E-01	No	No	<Tier 1	3.50E+01	No
3&4-Methylphenol (m&p-cresol)	4	2	7.58E-02	1.40E-01	No	ND	--	No	3.50E-01	No	No	<Tier 1	3.50E+01	No
2&3&4-Methylphenol (o&m&p-cresol)	4	2	8.08E-02	1.60E-01	No	ND	--	No	3.50E-01	No	No	<Tier 1	3.50E+01	No
Nitrobenzene	4	1	1.30E-02	1.30E-02	No	ND	--	No	3.50E-03	Yes	Yes	>Tier 1	3.50E-01	No
Pentachlorophenol	4	3	1.29E+00	3.80E+00	No	ND	--	No	5.00E-03	Yes	Yes	>Tier 1	5.00E-01	Yes
Pyridine	4	1	1.20E-02	1.20E-02	No	ND	--	No	3.60E-02	No	No	<Tier 1	3.60E+00	No
Benzene	4	3	1.82E-01	5.10E-01	No	ND	--	No	2.50E-02	Yes	Yes	>Tier 1	2.50E+00	No
Chlorobenzene	4	3	2.62E+00	8.90E+00	No	ND	--	No	5.00E-01	Yes	Yes	>Tier 1	5.00E+01	No

Table T-9
Comparison of Groundwater Data to TACO Tier I Screening Criteria
Construction Worker

	Summary Statistics				COPC Selection - Chronic Exposure Screen								Short-Term Exposure Screen	
Constituent	Number of Samples	Number of Detects	Average (mg/L)	Maximum (MAX) Detection (mg/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (mg/L)	Is Max> BK?	Pass EN/BK?	TACO Class II Groundwater Criteria (mg/L)	Is Max> Class II?	COPC?	Reason	100 Times TACO Class II Groundwater Criteria (mg/L)	Is Average> 100*Class II?
Chloroform	4	1	7.33E-01	2.90E+00	No	ND	--	No	1.00E-04	Yes	Yes	>Tier 1	1.00E-02	Yes
Tetrachloroethene	4	1	8.00E-02	2.90E-01	No	ND	--	No	2.50E-02	Yes	Yes	>Tier 1	2.50E+00	No
Trichloroethene	4	3	3.00E-03	6.30E-03	No	ND	--	No	2.50E-02	No	No	<Tier 1	2.50E+00	No
Site L														
Arsenic	4	1	2.73E-01	7.90E-01	No	1.17E-02	Yes	No	2.00E-01	Yes	Yes	>Tier 1	2.00E+01	No
Cadmium	4	3	1.60E-01	2.70E-01	No	ND	--	No	5.00E-02	Yes	Yes	>Tier 1	5.00E+00	No
1,4-Dichlorobenzene	4	2	2.53E-01	8.70E-01	No	ND	--	No	3.75E-01	Yes	Yes	>Tier 1	3.75E+01	No
3&4-Methylphenol (m&p-cresol)	4	1	6.63E-02	1.90E-01	No	ND	--	No	3.50E-01	No	No	<Tier 1	3.50E+01	No
2&3&4-Methylphenol (o&m&p-cresol)	4	1	6.63E-02	1.90E-01	No	ND	--	No	3.50E-01	No	No	<Tier 1	3.50E+01	No
Pentachlorophenol	4	1	1.31E-01	1.50E-01	No	ND	--	No	5.00E-03	Yes	Yes	>Tier 1	5.00E-01	No
Pyridine	4	2	1.69E-01	3.90E-01	No	ND	--	No	3.60E-02	Yes	Yes	>Tier 1	3.60E+00	No
Chlorobenzene	6	2	1.32E-02	3.20E-02	No	ND	--	No	5.00E-01	No	No	<Tier 1	5.00E+01	No
Tetrachloroethene	6	6	3.48E-02	7.20E-02	No	ND	--	No	2.50E-02	Yes	Yes	>Tier 1	2.50E+00	No
Trichloroethene	6	6	6.40E-03	1.20E-02	No	ND	--	No	2.50E-02	No	No	<Tier 1	2.50E+00	No

TABLE T-10
DOSE-RESPONSE INFORMATION FOR COMPOUNDS WITH POTENTIAL NONCARCINOGENIC EFFECTS FROM CHRONIC EXPOSURE THROUGH THE ORAL ROUTE
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS Number	Oral Dose-Response Value (mg/kg-day)	Reference (Last Verified) Type	EPA Confidence Level	Uncertainty Factor	Modifing Factor	Targent Organ/ Critical Effect at LOAEL	Study Animal	Study Method
1,4-Dichlorobenzene	106-46-7	3.00E-02	NCEA (e)	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	88-06-2	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	120-83-2	3.00E-03	IRIS (11/2000)	LOW	100	1	Decreased delayed hypersensitivity response	RAT	ORAL:DRINKING WATER
3/4-Methylphenol	(a)	5.00E-02 (b)	IRIS (11/2000)	MEDIUM	1000	1	Decreased body weight, neurotoxicity	RAT	ORAL GAVAGE
4-Nitroaniline	100-01-6	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	4.00E-04	IRIS (11/2000)	LOW	1000	1	Decreased longevity, dec. blood glucose and cholesterol changes	RAT	ORAL:DRINKING WATER
Arsenic	7440-38-2	3.00E-04	IRIS (11/2000)	MEDIUM	3	1	Hyperpigmentation and keratosis of the skin and poss. vascular complications	HUMAN	ORAL:DRINKING WATER
Benzene	71-43-2	3.00E-03	NCEA (7/29/96)	MEDIUM-LOW	3000	NA	Hematological and Immunological	RAT	ORAL GAVAGE
Benzo(a)anthracene	56-55-3	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	5.00E-04	IRIS (11/2000)	HIGH	10	1	Proteinuria	HUMAN	ORAL
Chlorobenzene	108-90-7	2.00E-02	IRIS (11/2000)	MEDIUM	1000	1	Histopathologic changes in liver	DOG	ORAL CAPSULE
Chloroform	67-66-3	1.00E-02	IRIS (11/2000)	MEDIUM	1000	1	Fatty cyst formation in liver	DOG	ORAL CAPSULE
Dibenzo(a,h)anthracene	53-70-3	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
gamma-BHC	58-89-9	3.00E-04	IRIS (11/2000)	MEDIUM	1000	1	Liver and kidney toxicity	RAT	ORAL DIET
Lead	7439-92-1	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	2.00E-02	IRIS (11/2000)	MEDIUM	300	1	Decreased body & organ wts	RAT	ORAL DIET
Nitrobenzene	98-95-3	5.00E-04	IRIS (11/2000)	LOW	10000	1	Hematologic effects, and adrenal, renal & hepatic lesions	RAT/MOUSE	INHALATION
Pentachlorophenol	87-86-5	3.00E-02	IRIS (11/2000)	MEDIUM	100	1	Liver & kidney pathology	RAT	ORAL DIET
Tetrachloroethene	127-18-4	1.00E-02	IRIS (11/2000)	MEDIUM	1000	1	Hepatotoxicity in mice, decreased weight gain in rats	MOUSE/RAT	ORAL GAVAGE/DRINKING WATER
Toluene	108-88-3	2.00E-01	IRIS (11/2000)	MEDIUM	1000	1	Changes in liver and kidney weights	RAT	ORAL GAVAGE
Total PCBs	1336-36-3	2.00E-05 (d)	IRIS (11/2000)	MEDIUM	300	1	Ocular, meibomiam gland, finger and toenail, and immune effects	MONKEY	ORAL CAPSULE
Trichloroethene	79-01-6	6.00E-03	NCEA (e)	LOW	3000	1	Increased relative liver weight	MOUSE	ORAL DRINKING WATER
1,2,4-Trichlorobenzene	120-82-1	1.00E-02	IRIS (3/2001)	MEDIUM	1000	1	Increased adrenal weights, vacuolization of zona fasciculata in cortex	RAT	ORAL DRINKING WATER
1,2-Dichlorobenzene	95-50-1	9.00E-02	IRIS (3/2001)	LOW	1000	1	No adverse effects	RAT	ORAL GAVAGE
2,4-D	94-75-7	1.00E-02	IRIS (3/2001)	MEDIUM	100	1	Hematologic, hepatic, and renal toxicity	RAT	ORAL DIET
2,4-Dinitrotoluene	121-14-2	2.00E-03	IRIS (3/2001)	HIGH	100	1	Neurotoxicity, Heinz bodies, and biliary tract hyperplasia	DOG	ORAL CAPSULE
Barium	7440-39-3	7.00E-02	IRIS (3/2001)	MEDIUM	3	1	Increased kidney weight	HUMAN	OCCUPATIONAL
Beryllium	7440-41-7	2.00E-03	IRIS (3/2001)	LOW-MEDIUM	300	1	Small instestine lesions	DOG	ORAL DIET
Hexachlorobenzene	118-74-1	8.00E-04	IRIS (3/2001)	MEDIUM	100	1	Liver effects	RAT	ORAL DIET
Manganese	7439-96-5	4.67E-02 (c)	IRIS (3/2001)	MEDIUM	1	3	CNS Effects	HUMAN	ORAL CHRONIC
Methylene Chloride	75-09-2	6.00E-02	IRIS (3/2001)	MEDIUM	100	1	Liver effects	RAT	ORAL DRINKING WATER
Phosphorous	7723-14-0	2.00E-05	IRIS (3/2001)	LOW	1000	1	Parturition mortality; forelimb hair loss	RAT	ORAL GAVAGE
Pyridine	110-86-1	1.00E-03	IRIS (3/2001)	MEDIUM	1000	1	Increased liver weight	RAT	ORAL GAVAGE
Selenium	7782-49-2	5.00E-03	IRIS (3/2001)	HIGH	3	1	Clinical selenosis	HUMAN	EPIDEMIOLOGICAL
Toxaphene	8001-35-2	NA	IRIS (3/2001)	NA	NA	NA	NA	NA	NA

Notes:
CAS - Chemical Abstracts Service
LOAEL - Lowest Observed Adverse Effects Level
RfD - Reference Dose
NCEA - National Center for Environmental Assessment
IRIS - Integrated Risk Information System, an on-line computer database of toxicological information (USEPA, 2000c)
HEAST - Health Effects Assessment Summary Tables, published annually by the USEPA (1997b)
(a) The CAS numbers for 3-Methylphenol and 4-Methylphenol are 106-44-5 and 108-39-4, respectively
(b) Value for 3-Methylphenol, IRIS value for 4-Methylphenol has been withdrawn
(c) Value for non-food
(d) Value for Aroclor 1254 (IRIS)
(e) As reported in the USEPA Region 9 PRG Table (10/1999)

TABLE T-11
DOSE-RESPONSE INFORMATION FOR COMPOUNDS WITH POTENTIAL NONCARCINOGENIC EFFECTS THROUGH THE INHALATION ROUTE
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS Number	Inhalation Dose-Response Value (mg/kg-day)	Inhalation Reference Concentration (mg/m³)	Reference (Last Verified) Type	EPA Confidence Level	Uncertainty Factor	Modifying Factor	Target Organ/ Critical Effect at LOAEL	Study Animal	Study Method
1,4-Dichlorobenzene	106-46-7	2.29E-01	8.05E-01	IRIS (11/2000)	MEDIUM	100	1	Increased liver weight	RAT	INHALATION
2,4,6-Trichlorophenol	88-06-2	NA	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	120-83-2	NA	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
3/4-Methylphenol	(a)	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	100-01-6	5.71E-05 (b)	NA	NA	NA	10000	1	Hematological effects	RAT	INHALATION INTERMITTENT
Antimony	7440-36-0	NA	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	NA	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
Benzene	71-43-2	1.70E-03	6.00E-03	NCEA (7/2/96)	MEDIUM	1000	NA	Hematopoietic Effects	MOUSE	INHALATION VAPOR
Benzo(a)anthracene	56-55-3	NA	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8	NA	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2	NA	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	NA	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
Chlorobenzene	108-90-7	5.71E-03	2.00E-02	HEAST	NA	10000	1	Liver and kidney effects	RAT	INHALATION INTERMITTENT
Chloroform	67-66-3	8.60E-05	NA	NCEA 12/1/97	NA	NA	NA	Nasal Effects	NA	NA
Dibenzo(a,h)anthracene	53-70-3	NA	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
gamma-BHC	58-89-9	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	NA	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
Nitrobenzene	98-95-3	5.70E-04	2.00E-03	HEAST	NA	10000	1	Hematological effects and adrenal, renal, and heptatic lesions	MOUSE/RAT	INHALATION
Pentachlorophenol	87-86-5	NA	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
Tetrachloroethene	127-18-4	1.14E-01	4.00E-01	NCEA (c)	MEDIUM	300	1	Hepatotoxicity and renal toxicity	MOUSE	INHALATION
Toluene	108-88-3	1.14E-01	4.00E-01	IRIS (11/2000)	MEDIUM	300	1	Neurological effects	HUMAN	INHALATION OCCUPATIONAL
Total PCBs	1336-36-3	NA	NA	IRIS (11/2000)	NA	NA	NA	NA	NA	NA
Trichloroethene	79-01-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	5.71E-02	2.00E-01	HEAST	NA	1000	NA	Liver Nonadverse weight changes	RAT,RABBIT, DOG, MONKEY	INHALATION
1,2-Dichlorobenzene	95-50-1	NA	NA	IRIS (3/2001)	NA	NA	NA	NA	NA	NA
2,4-D	94-75-7	NA	NA	IRIS (3/2001)	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	121-14-2	NA	NA	IRIS (3/2001)	NA	NA	NA	NA	NA	NA
Barrum	7440-39-3	1.43E-04	5.00E-04	HEAST (ALT)	NA	1000	NA	Fetotoxicity	RAT	INHALATION INTERMITTENT
Beryllium	7440-41-7	5.71E-06	2.00E-05	IRIS (3/2001)	MEDIUM	10	1	Lung - Chronic Beryllium Disease	HUMAN	INHALATION OCCUPATIONAL
Hexachlorobenzene	118-74-1	NA	NA	IRIS (3/2001)	NA	NA	NA	NA	NA	NA
Manganese	7439-96-5	1.43E-05	5.00E-05	IRIS (3/2001)	MEDIUM	1000	1	Neurological effects	HUMAN	INHALATION OCCUPATIONAL
Methylene Chloride	75-09-2	8.60E-01	NA	HEAST	NA	NA	NA	NA	NA	NA
Phosphorous	7723-14-0	NA	NA	IRIS (3/2001)	NA	NA	NA	NA	NA	NA
Pyridine	110-86-1	NA	NA	IRIS (3/2001)	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	NA	NA	IRIS (3/2001)	NA	NA	NA	NA	NA	NA
Toxaphene	8001-35-2	NA	NA	IRIS (3/2001)	NA	NA	NA	NA	NA	NA

Notes:
CAS - Chemical Abstracts Service
LOAEL - Lowest Observed Adverse Effects Level
RfC - Reference Concentration
NCEA - National Center for Environmental Assessment
IRIS - Integrated Risk Information System, an on-line computer database of toxicological information (USEPA, 2000c)
HEAST - Health Effects Assessment Summary Tables, published annually by the USEPA (1997b)
(a) The CAS numbers for 3-Methylphenol and 4-Methylphenol are 106-44-5 and 108-39-4, respectively
(b) Due to structural similarities, value for 2-Nitroaniline used
(c) As reported in the USEPA Region 9 PRG Table (10/1999)

TABLE T-12
DOSE-RESPONSE INFORMATION FOR COMPOUNDS WITH POTENTIAL CARCINOGENIC EFFECTS BY THE ORAL ROUTE OF EXPOSURE
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS Number	EPA Carcinogen Class	Oral CSF $(mg/kg\text{-}day)^{-1}$	Oral CSF Reference (Last Verified)	Oral CSF Study Animal	Oral CSF Study Method
1,4-Dichlorobenzene	106-46-7	C	2.40E-02	HEAST (1997)	MOUSE	ORAL:GAVAGE
2,4,6-Trichlorophenol	88-06-2	B2	1.10E-02	IRIS (11/2000)	RAT	ORAL:DIET
2,4-Dichlorophenol	120-83-2	NA	NA	IRIS (11/2000)	NA	NA
3/4-Methylphenol	(a)	C	NA	IRIS (11/2000)	NA	NA
4-Nitroaniline	100-01-6	NA	NA	NA	NA	NA
Antimony	7440-36-0	NA	NA	IRIS (11/2000)	NA	NA
Arsenic	7440-38-2	A	1.50E+00	IRIS (11/2000)	HUMAN	ORAL:DRINKING WATER
Benzene	71-43-2	A	1.50E-02 (b)	IRIS (11/2000)	HUMAN	INHALATION: OCCUPATIONAL
Benzo(a)anthracene	56-55-3	B2	7.30E-01 (c)	IRIS (11/2000)	NA	NA
Benzo(a)pyrene	50-32-8	B2	7.30E+00	IRIS (11/2000)	MOUSE	ORAL:DIET
Benzo(b)fluoranthene	205-99-2	B2	7.30E-01 (c)	IRIS (11/2000)	NA	NA
Cadmium	7440-43-9	B1	NA	IRIS (11/2000)	NA	NA
Chlorobenzene	108-90-7	D	NA	IRIS (11/2000)	NA	NA
Chloroform	67-66-3	B2	6.10E-03	IRIS (11/2000)	RAT	ORAL:DRINKING WATER
Dibenzo(a,h)anthracene	53-70-3	B2	7.30E+00 (f)	IRIS (11/2000)	NA	NA
gamma-BHC	58-89-9	B2-C	1.30E+00	HEAST	MOUSE	ORAL:DIET
Lead	7439-92-1	B2	NA	NA	NA	NA
Nickel	7440-02-0	NA	NA (i)	IRIS (11/2000)	NA	NA
Nitrobenzene	98-95-3	D	NA	IRIS (11/2000)	NA	NA
Pentachlorophenol	87-86-5	B2	1.20E-01	IRIS (11/2000)	MOUSE	ORAL:DIET
Tetrachloroethene	127-18-4	NA	5.20E-02	NCEA (k)	NA	NA
Toluene	108-88-3	D	NA	IRIS (11/2000)	NA	NA
Total PCBs	1336-36-3	B2	2.00E+00 (g)	IRIS (11/2000)	RAT	ORAL:DIET
Trichloroethene	79-01-6	NA	1.10E-02	NCEA (k)	MOUSE	ORAL:GAVAGE
1,2,4-Trichlorobenzene	120-82-1	D	NA	IRIS (3/2001)	NA	NA
1,2-Dichlorobenzene	95-50-1	D	NA	IRIS (3/2001)	NA	NA
2,4-D	94-75-7	NA	NA	IRIS (3/2001)	NA	NA
2,4-Dinitrotoluene	121-14-2	NA	NA	IRIS (3/2001)	NA	NA
Barium	7440-39-3	NA	NA	IRIS (3/2001)	NA	NA
Beryllium	7440-41-7	B1	NA	IRIS (3/2001)	NA	NA
Hexachlorobenzene	118-74-1	B2	1.60E+00	IRIS (3/2001)	RAT	ORAL:DIET
Manganese	7439-96-5	D	NA	IRIS (3/2001)	NA	NA
Methylene Chloride	75-09-2	B2	7.50E-03	IRIS (3/2001)	MOUSE	INHALATION AND DRINKING WATER
Phosphorous	7723-14-0	NA	NA	IRIS (3/2001)	NA	NA
Pyridine	110-86-1	NA	NA	IRIS (3/2001)	NA	NA
Selenium	7782-49-2	D	NA	IRIS (3/2001)	NA	NA
Toxaphene	8001-35-2	B2	1.10E+00	IRIS (3/2001)	MOUSE	ORAL:DIET

Notes:
CAS - Chemical Abstracts Service.
CSF - Cancer Slope Factor.
NCEA - National Center for Environmental Assessment
IRIS - Integrated Risk Information System, an online computer database of toxicological infomation (USEPA, 2000c).
HEAST - Health Effects Assessment Summary Tables, published annually by the USEPA (1997b).
(a) The CAS numbers for 3-Methylphenol and 4-Methylphenol are 106-44-5 and 108-39-4, respectively.
(b) IRIS provides a range of CSF for benzene of 1.5E-02 to 5.5E-02 kg*day/mg. IRIS states that each value within this range has equal scientific plausibility.
(c) CSF based on that for benzo(a)pyrene and applying a relative potency factor of 0.1 per USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993d).
(d) CSF based on that for benzo(a)pyrene and applying a relative potency factor of 0.01 per USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993d).
(e) Cis-1,2-Dichloroethene has a carcinogen class of D; trans-1,2-Dichloroethene has not been classified; per IRIS.
(f) CSF based on that for benzo(a)pyrene and applying a relative potency factor of 1.0 per USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993d).
(g) This is the upperbound CSF for high risk and persistence PCBs. USEPA provides a range of slope factor or IRIS; these will be discussed in the risk characterization.
(h) Value provided by IRIS for continuous adult exposure. This value used in calculations as vinyl chloride was not identified as a constituent of potential concern in residential areas.
(i) - Information for nickel, soluble salts on IRIS.

T-13

DOSE-RESPONSE INFORMATION FOR COMPOUNDS WITH POTENTIAL CARCINOGENIC EFFECTS BY THE INHALATION ROUTE OF EXPOSURE
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS Number	EPA Carcinogen Class	Inhalation CSF (mg/kg-day)$^{-1}$ (i)		Unit Risk Factor (ug/m^{3})$^{-1}$	Inhalation CSF Reference (Last Verified)	Inhalation CSF Study Animal	Inhalation CSF Study Method
1,4-Dichlorobenzene	106-46-7	C	2.20E-02		NA	NCEA (k)	NA	NA
2,4,6-Trichlorophenol	88-06-2	B2	1.09E-02		3.10E-06	IRIS (11/2000)	RAT	ORAL DIET
2,4-Dichlorophenol	120-83-2	NA	NA		NA	IRIS (11/2000)	NA	NA
3/4-Methylphenol	(a)	C	NA		NA	IRIS (11/2000)	NA	NA
4-Nitroaniline	100-01-6	NA	NA		NA	NA	NA	NA
Antimony	7440-36-0	NA	NA		NA	NA	NA	NA
Arsenic	7440-38-2	A	1.50E+01		4.30E-03	IRIS (11/2000)	HUMAN	INHALATION: OCCUPATIONAL
Benzene	71-43-2	A	7.70E-03	(b)	2.20E-06	IRIS (11/2000)	HUMAN	INHALATION: OCCUPATIONAL
Benzo(a)anthracene	56-55-3	B2	3.10E-01	(c)	NA	IRIS (11/2000)	NA	NA
Benzo(a)pyrene	50-32-8	B2	3.10E+00		NA	NCEA (k)	NA	NA
Benzo(b)fluoranthene	205-99-2	B2	3.10E-01	(c)	NA	IRIS (11/2000)	NA	NA
Cadmium	7440-43-9	B1	6.30E+00		1.80E-03	IRIS (11/2000)	HUMAN	INHALATION: OCCUPATIONAL
Chlorobenzene	108-90-7	D	NA		NA	IRIS (11/2000)	NA	NA
Chloroform	67-66-3	B2	8.05E-02		2.30E-05	IRIS (11/2000)	MOUSE	ORAL:GAVAGE
Dibenzo(a,h)anthracene	53-70-3	B2	3.10E+00	(f)	NA	IRIS (11/2000)	NA	NA
gamma-BHC	58-89-9	B2-C	NA		NA	IRIS (11/2000)	NA	NA
Lead	7439-92-1	B2	NA		NA	IRIS (11/2000)	NA	NA
Nickel	7440-02-0	NA	NA	(j)	NA	IRIS (11/2000)	NA	NA
Nitrobenzene	98-95-3	D	NA		NA	IRIS (11/2000)	NA	NA
Pentachlorophenol	87-86-5	B2	NA		NA	IRIS (11/2000)	NA	NA
Tetrachloroethene	127-18-4	NA	2.00E-03		5.80E-07	NCEA (k)	NA	NA
Toluene	108-88-3	D	NA		NA	IRIS (11/2000)	NA	NA
Total PCBs	1336-36-3	B2	2.00E+00	(g)	NA	IRIS (11/2000)	RAT	ORAL DIET
Trichloroethene	79-01-6	NA	6.00E-03		NA	NCEA (k)	NA	NA
1,2,4-Trichlorobenzene	120-82-1	D	NA		NA	IRIS (3/2001)	NA	NA
1,2-Dichlorobenzene	95-50-1	D	NA		NA	IRIS (3/2001)	NA	NA
2,4-D	94-75-7	NA	NA		NA	IRIS (3/2001)	NA	NA
2,4-Dinitrotoluene	121-14-2	NA	NA		NA	IRIS (3/2001)	NA	NA
Barium	7440-39-3	NA	NA		NA	IRIS (3/2001)	NA	NA
Beryllium	7440-41-7	B1	8.40E+00		2.40E-03	IRIS (3/2001)	HUMAN	INHALATION: OCCUPATIONAL
Hexachlorobenzene	118-74-1	B2	1.61E+00		4.60E-04	IRIS (3/2001)	RAT	ORAL:DIET
Manganese	7439-96-5	D	NA		NA	IRIS (3/2001)	NA	NA
Methylene Chloride	75-09-2	B2	1.65E-03		4.70E-07	IRIS (3/2001)	MOUSE	INHALATION
Phosphorous	7723-14-0	NA	NA		NA	IRIS (3/2001)	NA	NA
Pyridine	110-86-1	NA	NA		NA	IRIS (3/2001)	NA	NA
Selenium	7782-49-2	D	NA		NA	IRIS (3/2001)	NA	NA
Toxaphene	8001-35-2	B2	1.12E+00		3.20E-04	IRIS (3/2001)	MOUSE	ORAL DIET

Notes:
CAS - Chemical Abstracts Service
CSF - Cancer Slope Factor
NCEA - National Center for Environmental Assessment
IRIS - Integrated Risk Information System, an online computer database of toxicological information (USEPA, 2000c).
HEAST - Health Effects Assessment Summary Tables, published annually by the USEPA (1997b).
(a) The CAS numbers for 3-Methylphenol and 4-Methylphenol are 106-44-5 and 108-39-4, respectively.
(b) IRIS provides a range of inhalation unit risk factors for benzene of 2.2E-06 to 7.8E-06 m^3/ug. These are equivalent to an CSF range of 7.7 E-03 to 2.7E-02 kg*day/mg. IRIS states that each value within this range has equal scientific plausibility.
(c) CSF based on that for benzo(a)pyrene and applying a relative potency factor of 0.1 per USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993d).
(d) CSF based on that for benzo(a)pyrene and applying a relative potency factor of 0.01 per USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993d).
(e) Cis-1,2-Dichloroethene has a carcinogen class of D; trans-1,2-Dichloroethene has not been classified, per IRIS.
(f) CSF based on that for benzo(a)pyrene and applying a relative potency factor of 1.0 per USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993d).
(g) This is the upperbound CSF for high risk and persistence PCBs. USEPA provides a range of slope factor or IRIS; these will be discussed in the risk characterization.
(h) Value provided by IRIS for continuous adult exposure. This value used in calculations as vinyl chloride was not identified as a constituent of potential concern in residential areas.
(i) Inhalation CSF calculated from the unit risk factor, where available, assuring a 70 kg adult breathes 20 m^3 of air per day.
(j) - Information for nickel, soluble salts, on IRIS.
(k) As reported in the USEPA Region 9 PRG Table (10/1999).

TABLE T-14
SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - CONSTRUCTION WORKER
SAUGET AREA 1 EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Parameter	RME Future Construction/Utility Worker		MLE Future Construction/Utility Worker	
Parameters Used in the Subsurface Soil Inhalation Pathway				
Exposure Time (hr/day)	8	(a)	8	(a)
Exposure Frequency (days/year)	40	(b)	20	(c)
Exposure Duration (yr)	1	(d)	1	(d)
Inhalation Rate (m^3/hour)	2.5	(e)	1.5	(f)
Body Weight (kg)	70	(g)	70	(g)
Parameters Used in the Subsurface Soil Pathway				
Exposure Frequency (days/year)	40	(b)	20	(c)
Exposure Duration (yr)	1	(d)	1	(d)
Soil Ingestion Rate (mg/day)	100	(g)	64	(h)
Skin Contacting Medium (cm^2)	3339	(i)	3339	(i)
Soil on Skin (mg/cm^2)	0.19	(j)	0.19	(j)
Body Weight (kg)	70	(g)	70	(g)
Parameters Used in the Groundwater Pathway				
Exposure Time (hr/event)	1	(k)	1	(k)
Exposure Frequency (days/year)	10	(k)	5	(k)
Exposure Duration (yr)	1	(d)	1	(d)
Water Ingestion Rate (l/event)	0.005	(l)	0.005	(l)
Skin Contacting Medium (cm^2)	3339	(i)	3339	(i)
Body Weight (kg)	70	(g)	70	(g)
Parameters Used in the Groundwater Inhalation Pathway				
Exposure Time (hr/day)	8	(a)	8	(a)
Exposure Frequency (days/year)	40	(b)	20	(c)
Exposure Duration (yr)	1	(d)	1	(d)
Inhalation Rate (m^3/hour)	2.5	(e)	1.5	(f)
Body Weight (kg)	70	(g)	70	(g)

Notes:
MLE - Most Likely Exposure.
RME - Reasonable Maximum Exposure.
(a) - USEPA, 1997a. Exposure Factors Handbook. 50th percentile time spent at work, males and females, all ages. Table 15-68.
(b) - Exposure frequency is equivalent to 5 days per week for 2 months.
(c) - Exposure frequency is equivalent to five days per week for one month.
(d) - Construction activities are assumed to occur over a 1 year period.
(e) - USEPA, 1997a. Exposure Factors Handbook. Inhalation rate is the value for heavy activity for an outdoor worker listed in Table 5-23.
(f) - USEPA, 1997a. Exposure Factors Handbook. Inhalation rate is the value for moderate activity for an outdoor worker listed in Table 5-23.
(g) - USEPA, 1991b. Standard Default Exposure Factors.
(h) - ENSR-derived value; described briefly in the text.
(i) - USEPA, 1997a. Exposure Factors Handbook. Represents 50th percentile values for males and females based on hands, forearms, and face.
(j) - USEPA, 1997a. Exposure Factors Handbook. See Table 5-10 for calculation.
(k) - Assumed that contact with water occurs only for a fraction of the total exposure duration and time.
(l) - USEPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Value is one-tenth of that assumed to occur during a swimming event.

3/14/01

TABLE T-15
ABSORPTION ADJUSTMENT FACTORS (AAFs) FOR CHRONIC EXPOSURE
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Exposure Route (Medium)									
	Oral	(Water)	Oral	(Soil)	Dermal	(Water)	Dermal	(Soil)	Inhalation	
Constituent	Carc.	Noncarc.	Carc.	Noncarc.	Carc.	Noncarc.	Carc.	Noncarc.	Carc.	Noncarc.
1,4-Dichlorobenzene	1	1	1	1	1	1	0.01	0.01	1	1
2,4,6-Trichlorophenol	1	NA	1	NA	1	NA	0.01	NA	1	NA
2,4-Dichlorophenol	NA	1	NA	1	NA	1	NA	0.01	1	1
3/4-Methylphenol	NA	1	NA	1	NA	1	NA	0.01	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	1
Antimony	NA	1	NA	1	NA	6.7	NA	0.007	NA	NA
Arsenic	1	1	0.3	0.3	1	1	0.001	0.001	1	NA
Benzene	1	1	1	1	2.13	2.13	0.02	0.02	1	1
Benzo(a)anthracene	1	NA	0.29	NA	1	NA	0.02	NA	1	NA
Benzo(a)pyrene	1	NA	0.29	NA	1	NA	0.02	NA	1	NA
Benzo(b)fluoranthene	1	NA	0.29	NA	1	NA	0.02	NA	1	NA
Cadmium	NA	1	NA	1	NA	40	NA	0.04	1	NA
Chlorobenzene	NA	1	NA	1	NA	1	NA	0.01	NA	1
Chloroform	1	1	1	1	1	1	0.01	0.01	0.66	1
Dibenzo(a,h)anthracene	1	NA	0.29	NA	1	NA	0.02	NA	1	NA
gamma-BHC	1	1	1	1	1	1	0.01	0.01	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	1	NA	1	NA	77	NA	0.08	NA	NA
Nitrobenzene	NA	1	NA	1	NA	1	NA	0.01	NA	1
Pentachlorophenol	1	1	1	1	1	1	0.01	0.01	NA	NA
Tetrachloroethene	1	1	1	1	1	1	0.01	0.01	1	1
Toluene	NA	1	NA	1	NA	1	NA	0.01	NA	1
Total PCBs	1	1	0.83	0.83	1.1	1.1	0.04	0.04	1	NA
Trichloroethene	1	1	1	1	1	1	0.01	0.01	1	NA
1,2,4-Trichlorobenzene	NA	1	NA	1	NA	1	NA	0.01	NA	1
1,2-Dichlorobenzene	NA	1	NA	1	NA	1	NA	0.01	NA	NA
2,4-D	NA	1	NA	1	NA	1	NA	0.01	NA	NA
2,4-Dinitrotoluene	NA	1	NA	1	NA	1	NA	0.01	NA	NA
Barium	NA	1	NA	1	NA	1	NA	0.001	NA	1
Beryllium	NA	1	NA	1	NA	100	NA	0.1	1	1
Hexachlorobenzene	1	1	0.83	0.83	1.1	1.1	0.04	0.04	1.1	NA
Manganese	NA	1	NA	1	NA	10	NA	0.01	NA	1
Methylene Chloride	1	1	1	1	1.6	1.6	0.016	0.016	1	1
Phosphorous	NA	1	NA	1	NA	1	NA	0.001	NA	NA
Pyridine	NA	1	NA	1	NA	1	NA	0.01	NA	NA
Selenium	NA	1	NA	1	NA	1	NA	0.001	NA	NA
Toxaphene	1	NA	1	NA	1	NA	0.01	NA	1	NA

Notes:
All Absorption Adjustment Factors were derived by ENSR.
Carc. - The value derived is for assessing the compound's carcinogenic potential.
Noncarc. - The value derived is for assessing the compound's noncarcinogenic potential.

TABLE T-16
DERMAL PERMEABILITY CONSTANTS
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	Dermal Permeability Constant (cm/hr) (a)	
1,4-Dichlorobenzene	6.20E-02	
2,4,6-Trichlorophenol	5.00E-02	
2,4-Dichlorophenol	2.30E-02	
3/4-Methylphenol	1.00E-02	(b)
4-Nitroaniline	2.66E-03	(k)
Antimony	1.60E-04	(d)
Arsenic	1.60E-04	(d)
Benzene	2.10E-02	
Benzo(a)anthracene	8.10E-01	
Benzo(a)pyrene	1.20E+00	
Benzo(b)fluoranthene	1.20E+00	
Cadmium	1.00E-03	(e)
Chlorobenzene	4.10E-02	
Chloroform	8.90E-03	
Dibenzo(a,h)anthracene	2.70E+00	
gamma-BHC	1.40E-02	
Lead	4.00E-06	(g)
Nickel	5.45E-05	(h)
Nitrobenzene	6.96E-03	(k)
Pentachlorophenol	6.50E-01	
Tetrachloroethene	4.80E-02	
Toluene	4.50E-02	
Total PCBs	7.10E-01	(i)
Trichloroethene	1.60E-02	
1,2,4-Trichlorobenzene	1.00E-01	
1,2-Dichlorobenzene	6.10E-02	
2,4-D	8.45E-03	(k)
2,4-Dinitrotoluene	3.80E-03	
Barium	1.60E-04	(d)
Beryllium	1.60E-04	(d)
Hexachlorobenzene	2.10E-01	
Manganese	1.60E-04	(d)
Methylene Chloride	4.50E-03	
Phosphorous	1.60E-04	(d)
Pyridine	1.82E-03	(k)
Selenium	1.60E-04	(d)
Toxaphene	1.50E-02	

Notes:
(a) All values are from USEPA, 1992b, Dermal Exposure Assessment: Principles and Applications, Table 5-7, unless otherwise noted.
(b) Average value of 3-Methylphenol and 4-methylphenol
(d) Value for water (USEPA, 1992b, Table 5-7)
(e) Value for cadmium chloride (USEPA, 1992b, Table 5-3)
(g) Value for lead acetate (USEPA, 1992b, Table 5-3)
(h) Average of values for nickel chloride and nickel sulfate (USEPA, 1992b, Table 5-3)
(i) Value for PCB hexachlorobiphenyl (USEPA, 1992b, Table 5-7)
(k) Calculated in Table 5-43 using logKow, molecular weight, and equation 5.8 from USEPA, 1992b.

TABLE T-17
DERMAL PERMEABILITY CONSTANTS - CALCULATED VALUES (c)
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	Molecular Weight (grams/mol) (a)	Log Kow (a)	Log PC	Dermal Permeability Constant (cm/hr) (b)
4-Nitroaniline	138.13	1.39	-2.575693	2.66E-03
Nitrobenzene	123.11	1.85	-2.157471	6.96E-03
2,4-D	221.04	2.81	-2.073244	8.45E-03
Pyridine	79.1	0.65	-2.74101	1.82E-03

Notes:
Kow - Octanol-Water Partition Coefficient.
PC - Permeability Constant.
(a) Handbook of RCRA Groundwater Monitoring Constituents. Physical and Chemical Properties. USEPA. September 1992d.
(b) USEPA, 1992b Dermal Exposure Equation 5.8: Log Kp = -2.72 + 0.71 log Kow - 0.0061 MW
(c) - Values not presented in USEPA 1992d.

TABLE T-18
EXPOSURE POINT CONCENTRATIONS (RME) - SITE SOILS
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS Number	Construction Scenario EPCs Site (mg/kg)			
		G	H	I	L
1,4-Dichlorobenzene	106-46-7	--	3.06E+04	1.84E+03	--
2,4,6-Trichlorophenol	88-06-2	--	6.13E+02	--	--
2,4-Dichlorophenol	120-83-2	--	7.42E+02	--	--
4-Nitroaniline	100-01-6	--	1.83E+03	--	--
Antimony	7440-36-0	--	--	6.66E+03	--
Arsenic	7440-38-2	--	--	--	1.72E+02
Benzene	71-43-2	4.53E+01	6.13E+01	2.41E+01	5.70E+00
Benzo(a)anthracene	56-55-3	--	3.78E+02	--	--
Benzo(a)pyrene	50-32-8	--	2.72E+02	--	--
Benzo(b)fluoranthene	205-99-2	--	2.11E+02	--	--
Cadmium	7440-43-9	--	2.94E+02	--	--
Chlorobenzene	108-90-7	5.38E+02	4.52E+02	1.27E+02	5.30E+00
Chloroform	67-66-3	1.16E+01	--	--	2.03E+01
Dibenzo(a,h)anthracene	53-70-3	--	3.17E+01	--	--
Lead	7439-92-1	--	--	2.06E+03	--
Nickel	7440-02-0	--	1.51E+04	--	--
Pentachlorophenol	87-86-5	4.77E+03	--	--	--
Tetrachloroethene	127-18-4	3.30E+01	--	--	--
Toluene	108-88-3	1.18E+02	7.65E+01	7.79E+01	4.00E+02
Total PCBs	1336-36-3	4.43E+03	1.80E+04	3.43E+02	5.00E+02
1,2,4-Trichlorobenzene	120-82-1	--	7.58E+03	8.26E+03	--
1,2-Dichlorobenzene	95-50-1	--	1.94E+04	3.24E+02	--
Barium	7440-39-3	4.18E+04	--	--	--
Beryllium	7440-41-7	--	--	1.53E+03	--
Hexachlorobenzene	118-74-1	4.06E+01	--	1.27E+03	4.80E+00
Manganese	7439-96-5	--	3.65E+04	--	--
Methylene Chloride	75-09-2	--	5.56E+01	--	--
Phosphorous	7723-14-0	8.98E+02	--	--	--
Selenium	7782-49-2	--	--	1.32E+03	--
Toxaphene	8001-35-2	--	--	4.93E+02	--

Notes:
-- - Not a COPC in this area/medium.
CAS - Chemical Abstracts Service.
COPC - Constituent of Potential Concern.
EPC - Exposure Point Concentration.
RME - Reasonable Maximum Exposure.

TABLE T-19
EXPOSURE POINT CONCENTRATIONS (RME) - SITE SOILS - OUTDOOR EXCAVATION AIR
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS Number	Construction Scenario EPCs for Air Site (mg/m3) (a)			
		G	H	I	L
1,4-Dichlorobenzene	106-46-7	--	1.84E-03	1.10E-04	--
2,4,6-Trichlorophenol	88-06-2	--	3.68E-05	--	--
2,4-Dichlorophenol	120-83-2	--	4.45E-05	--	--
4-Nitroaniline	100-01-6	--	1.10E-04	--	--
Antimony	7440-36-0	--	--	4.00E-04	--
Arsenic	7440-38-2	--	--	--	1.03E-05
Benzene	71-43-2	2.72E-06	3.68E-06	1.45E-06	3.42E-07
Benzo(a)anthracene	56-55-3	--	2.27E-05	--	--
Benzo(a)pyrene	50-32-8	--	1.63E-05	--	--
Benzo(b)fluoranthene	205-99-2	--	1.27E-05	--	--
Cadmium	7440-43-9	--	1.76E-05	--	--
Chlorobenzene	108-90-7	3.23E-05	2.71E-05	7.61E-06	3.18E-07
Chloroform	67-66-3	6.98E-07	--	--	1.22E-06
Dibenzo(a,h)anthracene	53-70-3	--	1.90E-06	--	--
Lead	7439-92-1	--	--	1.24E-04	--
Nickel	7440-02-0	--	9.06E-04	--	--
Pentachlorophenol	87-86-5	2.86E-04	--	--	--
Tetrachloroethene	127-18-4	1.98E-06	--	--	--
Toluene	108-88-3	7.06E-06	4.59E-06	4.67E-06	2.40E-05
Total PCBs	1336-36-3	2.66E-04	1.08E-03	2.06E-05	3.00E-05
1,2,4-Trichlorobenzene	120-82-1	--	4.55E-04	4.95E-04	--
1,2-Dichlorobenzene	95-50-1	--	1.16E-03	1.94E-05	--
Barium	7440-39-3	2.51E-03	--	--	--
Beryllium	7440-41-7	--	--	9.18E-05	--
Hexachlorobenzene	118-74-1	2.44E-06	--	7.62E-05	2.88E-07
Manganese	7439-96-5	--	2.19E-03	--	--
Methylene Chloride	75-09-2	--	3.34E-06	--	--
Phosphorous	7723-14-0	5.39E-05	--	--	--
Selenium	7782-49-2	--	--	7.92E-05	--
Toxaphene	8001-35-2	--	--	2.96E-05	--

Notes:
-- - Not a COPC in this area/medium.
CAS - Chemical Abstracts Service.
COPC - Constituent of Potential Concern.
EPC - Exposure Point Concentration.
RME - Reasonable Maximum Exposure.
(a) - Excavation air concentrations are the soil concentration (mg/kg) multiplied by the PM10 (Particulate Matter of 10 microns in diameter) dust concentration (0.06 mg/m3) (MADEP, 1995) multiplied by a unit correction factor (1E-6 kg/mg).

TABLE T-20
EXPOSURE POINT CONCENTRATIONS (RME) - GROUNDWATER
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS Number	Groundwater EPCs (mg/L) (a)			
		Site G	Site H	Site I	Site L
1,4-Dichlorobenzene	106-46-7	--	1.60E+00	1.30E+00	8.70E-01
2,4,6-Trichlorophenol	88-06-2	4.95E+00	5.10E-02	--	--
3/4-Methylphenol	(a)	--	4.80E-01	--	--
Arsenic	7440-38-2	--	4.50E-01	--	7.90E-01
Benzene	71-43-2	6.00E-01	2.50E+00	5.10E-01	--
Cadmium	7440-43-9	1.20E-01	2.20E+01	7.85E-01	2.70E-01
Chlorobenzene	108-90-7	2.70E+00	2.70E+00	8.90E+00	--
Chloroform	67-66-3	--	--	2.90E+00	--
gamma-BHC	58-89-9	4.20E-03	--	--	--
Lead	7439-92-1	6.09E+00	8.19E+00	2.61E+00	--
Nitrobenzene	98-95-3	7.35E-02	--	1.30E-02	--
Pentachlorophenol	87-86-5	1.10E+00	4.50E-01	3.80E+00	1.50E-01
Tetrachloroethene	127-18-4	1.30E-01	3.30E-02	2.90E-01	7.20E-02
Trichloroethene	79-01-6	7.90E-02	--	--	--
2,4-D	94-75-7	5.00E+01	4.20E-01	--	--
2,4-Dinitrotoluene	121-14-2	--	--	3.80E-02	--
Barium	7440-39-3	5.30E+00	--	5.85E+01	--
Hexachlorobenzene	118-74-1	--	1.80E-02	--	--
Pyridine	110-86-1	--	--	--	3.90E-01

Notes:
-- - Not a COPC in this area/medium.
CAS - Chemical Abstracts Service.
COPC - Constituent of Potential Concern.
EPC - Exposure Point Concentration.
RME - Reasonable Maximum Exposure.
TCLP - Toxicity Characteristic Leaching Procedure.
(a) - Leachate concentrations, as defined by the TCLP results for waste samples at each site, are evaluated as groundwater.

TABLE T-21
EXPOSURE POINT CONCENTRATIONS (RME) - EXCAVATION AIR, VOLATILIZATION FROM EXPOSED GROUNDWATER
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	Site Location	CAS Number	Site Excavation Air EPCs (mg/m3) (a)			
			Site G	Site H	Site I	Site L
Benzene		71-43-2	1.62E-02	6.77E-02	1.38E-02	--
Chlorobenzene		108-90-7	6.74E-02	6.74E-02	2.22E-01	--
Chloroform		67-66-3	--	--	7.95E-02	--
Tetrachloroethene		127-18-4	3.13E-03	7.95E-04	6.99E-03	1.74E-03
Trichloroethene		79-01-6	1.03E-02	--	--	--

Notes:
-- - Not a COPC in this area/medium.
CAS - Chemical Abstracts Service.
COPC - Constituent of Potential Concern.
EPC - Exposure Point Concentration.
RME - Reasonable Maximum Exposure.
(a) Excavation air concentration (mg/m3) = groundwater concentration (mg/l) * groundwater-to-air attenuation factor (l/m^3) calculated in Appendix L.

TABLE T-22
EXPOSURE POINT CONCENTRATIONS (MLE) - SITE SOILS
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS Number	Construction Scenario EPCs Site (mg/kg)			
		G	H	I	L
1,4-Dichlorobenzene	106-46-7	--	6.32E+03	2.55E+02	--
2,4,6-Trichlorophenol	88-06-2	--	3.07E+02	--	--
2,4-Dichlorophenol	120-83-2	--	1.50E+02	--	--
4-Nitroaniline	100-01-6	--	1.83E+03	--	--
Antimony	7440-36-0	--	--	2.23E+03	--
Arsenic	7440-38-2	--	--	--	5.36E+01
Benzene	71-43-2	1.53E+01	1.52E+01	3.81E+00	2.01E+00
Benzo(a)anthracene	56-55-3	--	1.26E+02	--	--
Benzo(a)pyrene	50-32-8	--	1.36E+02	--	--
Benzo(b)fluoranthene	205-99-2	--	7.10E+01	--	--
Cadmium	7440-43-9	--	1.88E+02	--	--
Chlorobenzene	108-90-7	1.08E+02	9.76E+01	3.47E+01	1.25E+00
Chloroform	67-66-3	1.16E+01	--	--	6.80E+00
Dibenzo(a,h)anthracene	53-70-3	--	3.17E+01	--	--
Lead	7439-92-1	--	--	2.06E+03	--
Nickel	7440-02-0	--	1.77E+03	--	--
Pentachlorophenol	87-86-5	1.32E+03	--	--	--
Tetrachloroethene	127-18-4	1.88E+01	--	--	--
Toluene	108-88-3	4.85E+01	2.28E+01	1.13E+01	6.65E+01
Total PCBs	1336-36-3	9.08E+02	2.73E+03	1.81E+02	2.58E+02
1,2,4-Trichlorobenzene	120-82-1	--	1.33E+03	1.40E+03	--
1,2-Dichlorobenzene	95-50-1	--	6.48E+03	8.29E+01	--
Barium	7440-39-3	5.00E+03	--	--	--
Beryllium	7440-41-7	--	--	1.53E+03	--
Hexachlorobenzene	118-74-1	3.43E+01	--	2.58E+02	4.80E+00
Manganese	7439-96-5	--	3.86E+03	--	--
Methylene Chloride	75-09-2	--	6.34E+00	--	--
Phosphorous	7723-14-0	5.37E+02	--	--	--
Selenium	7782-49-2	--	--	1.32E+03	--
Toxaphene	8001-35-2	--	--	4.93E+02	--

Notes:
-- - Not a COPC in this area/medium.
CAS - Chemical Abstracts Service.
COPC - Constituent of Potential Concern.
EPC - Exposure Point Concentration.
MLE - Most Likely Exposure.

TABLE T-23
EXPOSURE POINT CONCENTRATIONS (MLE) - SITE SOILS - OUTDOOR EXCAVATION AIR
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS Number	Construction Scenario EPCs for Air Site (mg/m3) (a)			
		G	H	I	L
1,4-Dichlorobenzene	106-46-7	--	3.79E-04	1.53E-05	--
2,4,6-Trichlorophenol	88-06-2	--	1.84E-05	--	--
2,4-Dichlorophenol	120-83-2	--	9.01E-06	--	--
4-Nitroaniline	100-01-6	--	1.10E-04	--	--
Antimony	7440-36-0	--	--	1.34E-04	--
Arsenic	7440-38-2	--	--	--	3.22E-06
Benzene	71-43-2	9.21E-07	9.13E-07	2.28E-07	1.20E-07
Benzo(a)anthracene	56-55-3	--	7.58E-06	--	--
Benzo(a)pyrene	50-32-8	--	8.18E-06	--	--
Benzo(b)fluoranthene	205-99-2	--	4.26E-06	--	--
Cadmium	7440-43-9	--	1.13E-05	--	--
Chlorobenzene	108-90-7	6.51E-06	5.86E-06	2.08E-06	7.49E-08
Chloroform	67-66-3	6.98E-07	--	--	4.08E-07
Dibenzo(a,h)anthracene	53-70-3	--	1.90E-06	--	--
Lead	7439-92-1	--	--	1.24E-04	--
Nickel	7440-02-0	--	1.06E-04	--	--
Pentachlorophenol	87-86-5	7.91E-05	--	--	--
Tetrachloroethene	127-18-4	1.13E-06	--	--	--
Toluene	108-88-3	2.91E-06	1.37E-06	6.76E-07	3.99E-06
Total PCBs	1336-36-3	5.45E-05	1.64E-04	1.08E-05	1.55E-05
1,2,4-Trichlorobenzene	120-82-1	--	7.99E-05	8.39E-05	--
1,2-Dichlorobenzene	95-50-1	--	3.89E-04	4.97E-06	--
Barium	7440-39-3	3.00E-04	--	--	--
Beryllium	7440-41-7	--	--	9.18E-05	--
Hexachlorobenzene	118-74-1	2.06E-06	--	1.55E-05	2.88E-07
Manganese	7439-96-5	--	2.32E-04	--	--
Methylene Chloride	75-09-2	--	3.80E-07	--	--
Phosphorous	7723-14-0	3.22E-05	--	--	--
Selenium	7782-49-2	--	--	7.92E-05	--
Toxaphene	8001-35-2	--	--	2.96E-05	--

Notes:
-- - Not a COPC in this area/medium.
CAS - Chemical Abstracts Service.
COPC - Constituent of Potential Concern.
EPC - Exposure Point Concentration.
MLE - Most Likely Exposure.
(a) - Excavation air concentrations are the soil concentration (mg/kg) multiplied by the PM10 (Particulate Matter of 10 microns in diameter) dust concentration (0.06 mg/m3) (MADEP, 1995) multiplied by a unit correction factor (1E-6 kg/mg).

TABLE T-24
EXPOSURE POINT CONCENTRATIONS (MLE) - GROUNDWATER
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS Number	Groundwater EPCs (mg/L) (a)			
		Site G	Site H	Site I	Site L
1,4-Dichlorobenzene	106-46-7	--	3.55E-01	5.99E-01	2.53E-01
2,4,6-Trichlorophenol	88-06-2	1.27E+00	3.02E-02	--	--
3/4-Methylphenol	(a)	--	1.12E-01	--	--
Arsenic	7440-38-2	--	1.70E-01	--	2.73E-01
Benzene	71-43-2	2.04E-01	5.23E-01	1.82E-01	--
Cadmium	7440-43-9	6.75E-02	4.52E+00	2.64E-01	1.60E-01
Chlorobenzene	108-90-7	8.24E-01	8.46E-01	2.62E+00	--
Chloroform	67-66-3	--	--	7.33E-01	--
gamma-BHC	58-89-9	2.00E-03	--	--	--
Lead	7439-92-1	6.09E+00	8.19E+00	2.61E+00	--
Nitrobenzene	98-95-3	3.96E-02	--	1.30E-02	--
Pentachlorophenol	87-86-5	4.63E-01	1.74E-01	1.29E+00	1.31E-01
Tetrachloroethene	127-18-4	4.39E-02	1.65E-02	8.00E-02	3.48E-02
Trichloroethene	79-01-6	2.45E-02	--	--	--
2,4-D	94-75-7	1.32E+01	9.29E-02	--	--
2,4-Dinitrotoluene	121-14-2	--	--	2.83E-02	--
Barium	7440-39-3	2.94E+00	--	1.50E+01	--
Hexachlorobenzene	118-74-1	--	1.80E-02	--	--
Pyridine	110-86-1	--	--	--	1.69E-01

Notes:
-- - Not a COPC in this area/medium.
CAS - Chemical Abstracts Service.
COPC - Constituent of Potential Concern.
EPC - Exposure Point Concentration.
MLE - Most Likely Exposure.
TCLP - Toxicity Characteristic Leaching Procedure.
(a) - Leachate concentrations, as defined by the TCLP results for waste samples at each site, are evaluated as groundwater.

TABLE T-25
EXPOSURE POINT CONCENTRATIONS (MLE) - EXCAVATION AIR, VOLATILIZATION FROM EXPOSED GROUNDWATER
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	Location	Site	CAS Number	Site Excavation Air EPCs (mg/m3) (a)			
				Site G	Site H	Site I	Site L
Benzene			71-43-2	5.52E-03	1.42E-02	4.93E-03	--
Chlorobenzene			108-90-7	2.06E-02	2.11E-02	6.53E-02	--
Chloroform			67-66-3	--	--	2.01E-02	--
Tetrachloroethene			127-18-4	1.06E-03	3.98E-04	1.93E-03	8.39E-04
Trichloroethene			79-01-6	3.21E-03	--	--	--

Notes:
-- - Not a COPC in this area/medium.
CAS - Chemical Abstracts Service.
COPC - Constituent of Potential Concern.
EPC - Exposure Point Concentration.
MLE - Most Likely Exposure.
(a) Excavation air concentration (mg/m3) = groundwater concentration (mg/l) * groundwater-to-air attenuation factor (l/m^3) calculated in Appendix L.

TABLE T-26
TOTAL POTENTIAL CARCINOGENIC RISK
CONSTRUCTION WORKER - RME
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Site G					Site H				
	Subsurface Soil		Groundwater		Total	Subsurface Soil		Groundwater		Total
Constituent	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	Risk	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	Risk
1,4-Dichlorobenzene	NC	NC	NC	NC	NC	1.75E-06	1.81E-08	4.55E-08	NC	1.81E-06
2,4,6-Trichlorophenol	NC	NC	5.23E-08	NC	5.23E-08	1.60E-08	1.78E-10	5.39E-10	NC	1.68E-08
2,4-Dichlorophenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
3/4-Methylphenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
4-Nitroaniline	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Antimony	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Arsenic	NC	NC	NC	NC	NC	NC	NC	2.09E-08	NC	2.09E-08
Benzene	1.71E-09	9.37E-12	7.77E-09	5.60E-08	6.55E-08	2.32E-09	1.27E-11	3.24E-08	2.33E-07	2.68E-07
Benzo(a)anthracene	NC	NC	NC	NC	NC	2.57E-07	3.14E-09	NC	NC	2.60E-07
Benzo(a)pyrene	NC	NC	NC	NC	NC	1.85E-06	2.26E-08	NC	NC	1.87E-06
Benzo(b)fluoranthene	NC	NC	NC	NC	NC	1.44E-07	1.76E-09	NC	NC	1.46E-07
Cadmium	NC	NC	NC	NC	NC	NC	4.97E-08	NC	NC	4.97E-08
Chlorobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Chloroform	1.69E-10	1.66E-11	NC	NC	1.85E-10	NC	NC	NC	NC	NC
Dibenzo(a,h)anthracene	NC	NC	NC	NC	NC	2.16E-07	2.64E-09	NC	NC	2.18E-07
gamma-BHC	NC	NC	1.58E-09	NC	1.58E-09	NC	NC	NC	NC	NC
Lead	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nickel	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nitrobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Pentachlorophenol	1.36E-06	NC	1.61E-06	NC	2.97E-06	NC	NC	6.57E-07	NC	6.57E-07
Tetrachloroethene	4.08E-09	1.77E-12	6.25E-09	2.80E-09	1.31E-08	NC	NC	1.59E-09	7.12E-10	2.30E-09
Toluene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Total PCBs	2.15E-05	2.38E-07	NC	NC	2.17E-05	8.73E-05	9.66E-07	NC	NC	8.82E-05
Trichloroethene	NC	NC	2.84E-10	2.77E-08	2.80E-08	NC	NC	NC	NC	NC
1,2,4-Trichlorobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
1,2-Dichlorobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-D	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-Dinitrotoluene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Barium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Beryllium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Hexachlorobenzene	1.58E-07	1.93E-09	NC	NC	1.60E-07	NC	NC	1.25E-07	NC	1.25E-07
Manganese	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Methylene Chloride	NC	NC	NC	NC	NC	1.03E-09	2.45E-12	NC	NC	1.03E-09
Phosphorous	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Pyridine	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Selenium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Toxaphene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Total Risk	2.30E-05	2.40E-07	1.67E-06	8.65E-08	2.50E-05	9.15E-05	1.06E-06	8.83E-07	2.34E-07	9.37E-05

Notes:
ing/derm - Ingestion/Dermal.
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.
RME - Reasonable Maximum Exposure.

TABLE T-26
TOTAL POTENTIAL CARCINOGENIC RISK
CONSTRUCTION WORKER - RME
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Site I					Site L				
	Subsurface Soil		Groundwater		Total	Subsurface Soil		Groundwater		Total
Constituent	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	Risk	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	Risk
1,4-Dichlorobenzene	1.05E-07	1.08E-09	3.70E-08	NC	1.43E-07	NC	NC	2.48E-08	NC	2.48E-08
2,4,6-Trichlorophenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-Dichlorophenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
3/4-Methylphenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
4-Nitroaniline	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Antimony	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Arsenic	NC	NC	NC	NC	NC	1.77E-07	6.92E-08	3.67E-08	NC	2.83E-07
Benzene	9.12E-10	4.99E-12	6.60E-09	4.76E-08	5.51E-08	2.15E-10	1.18E-12	NC	NC	2.17E-10
Benzo(a)anthracene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(a)pyrene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(b)fluoranthene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Cadmium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Chlorobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Chloroform	NC	NC	3.43E-09	1.89E-06	1.89E-06	2.94E-10	2.89E-11	NC	NC	3.23E-10
Dibenzo(a,h)anthracene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
gamma-BHC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Lead	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nickel	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nitrobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Pentachlorophenol	NC	NC	5.55E-06	NC	5.55E-06	NC	NC	2.19E-07	NC	2.19E-07
Tetrachloroethene	NC	NC	1.39E-08	6.25E-09	2.02E-08	NC	NC	3.46E-09	1.55E-09	5.01E-09
Toluene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Total PCBs	1.66E-06	1.84E-08	NC	NC	1.68E-06	2.42E-06	2.68E-08	NC	NC	2.45E-06
Trichloroethene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
1,2,4-Trichlorobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
1,2-Dichlorobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-D	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-Dinitrotoluene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Barium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Beryllium	NC	3.45E-07	NC	NC	3.45E-07	NC	NC	NC	NC	NC
Hexachlorobenzene	4.93E-06	6.04E-08	NC	NC	4.99E-06	1.86E-08	2.28E-10	NC	NC	1.88E-08
Manganese	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Methylene Chloride	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Phosphorous	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Pyridine	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Selenium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Toxaphene	1.29E-06	1.48E-08	NC	NC	1.30E-06	NC	NC	NC	NC	NC
Total Risk	7.98E-06	4.40E-07	5.61E-06	1.94E-06	1.60E-05	2.62E-06	9.63E-08	2.84E-07	1.55E-09	3.00E-06

Notes:
ing/derm - Ingestion/Dermal.
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.
RME - Reasonable Maximum Exposure.

TABLE T-27
TOTAL POTENTIAL NONCARCINOGENIC RISK
CONSTRUCTION WORKER - RME
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Site G					Site H				
	Subsurface Soil		Groundwater		Total	Subsurface Soil		Groundwater		Total
Constituent	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ
1,4-Dichlorobenzene	NC	NC	NC	NC	NC	1.70E-01	2.51E-04	4.43E-03	NC	1.75E-01
2,4,6-Trichlorophenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-Dichlorophenol	NC	NC	NC	NC	NC	4.12E-02	NC	NC	NC	4.12E-02
3/4-Methylphenol	NC	NC	NC	NC	NC	NC	NC	1.44E-04	NC	1.44E-04
4-Nitroaniline	NC	NC	NC	NC	NC	NC	6.03E-02	NC	NC	6.03E-02
Antimony	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Arsenic	NC	NC	NC	NC	NC	NC	NC	3.25E-03	NC	3.25E-03
Benzene	2.67E-03	5.01E-05	1.21E-02	2.99E-01	3.14E-01	3.60E-03	6.77E-05	5.03E-02	1.25E+00	1.30E+00
Benzo(a)anthracene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(a)pyrene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(b)fluoranthene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Cadmium	NC	NC	1.30E-02	NC	1.30E-02	1.15E-01	NC	2.39E+00	NC	2.50E+00
Chlorobenzene	4.48E-03	1.77E-04	7.50E-03	3.70E-01	3.82E-01	3.76E-03	1.49E-04	7.50E-03	3.70E-01	3.81E-01
Chloroform	1.94E-04	2.54E-04	NC	NC	4.48E-04	NC	NC	NC	NC	NC
Dibenzo(a,h)anthracene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
gamma-BHC	NC	NC	2.84E-04	NC	2.84E-04	NC	NC	NC	NC	NC
Lead	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nickel	NC	NC	NC	NC	NC	1.78E-01	NC	NC	NC	1.78E-01
Nitrobenzene	NC	NC	1.62E-03	NC	1.62E-03	NC	NC	NC	NC	NC
Pentachlorophenol	2.65E-02	NC	3.12E-02	NC	5.77E-02	NC	NC	1.28E-02	NC	1.28E-02
Tetrachloroethene	5.49E-04	5.43E-07	8.41E-04	8.61E-04	2.25E-03	NC	NC	2.13E-04	2.18E-04	4.32E-04
Toluene	9.79E-05	1.94E-06	NC	NC	9.99E-05	6.36E-05	1.26E-06	NC	NC	6.49E-05
Total PCBs	3.76E+01	NC	NC	NC	3.76E+01	1.53E+02	NC	NC	NC	1.53E+02
Trichloroethene	NC	NC	3.01E-04	NC	3.01E-04	NC	NC	NC	NC	NC
1,2,4-Trichlorobenzene	NC	NC	NC	NC	NC	1.26E-01	2.49E-04	NC	NC	1.26E-01
1,2-Dichlorobenzene	NC	NC	NC	NC	NC	3.58E-02	NC	NC	NC	3.58E-02
2,4-D	NC	NC	6.50E-02	NC	6.50E-02	NC	NC	5.46E-04	NC	5.46E-04
2,4-Dinitrotoluene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Barium	9.40E-02	5.49E-01	1.64E-04	NC	6.43E-01	NC	NC	NC	NC	NC
Beryllium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Hexachlorobenzene	8.62E-03	NC	NC	NC	8.62E-03	NC	NC	6.84E-03	NC	6.84E-03
Manganese	NC	NC	NC	NC	NC	1.30E-01	4.81E+00	NC	NC	4.94E+00
Methylene Chloride	NC	NC	NC	NC	NC	1.60E-04	1.21E-07	NC	NC	1.60E-04
Phosphorous	7.07E+00	NC	NC	NC	7.07E+00	NC	NC	NC	NC	NC
Pyridine	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Selenium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Toxaphene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Total HI	4.48E+01	5.50E-01	1.32E-01	6.70E-01	4.61E+01	1.54E+02	4.87E+00	2.47E+00	1.62E+00	1.62E+02

Notes:
ing/derm - Ingestion/Dermal.
HI - Hazard Index.
HQ - Hazard Quotient.
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.
RME - Reasonable Maximum Exposure.

TABLE T-27
TOTAL POTENTIAL NONCARCINOGENIC RIS
CONSTRUCTION WORKER - RME
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Site I					Site L				
	Subsurface Soil		Groundwater		Total	Subsurface Soil		Groundwater		Total
Constituent	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ
1,4-Dichlorobenzene	1.02E-02	1.51E-05	3.60E-03	NC	1.38E-02	NC	NC	2.41E-03	NC	2.41E-03
2,4,6-Trichlorophenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-Dichlorophenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
3/4-Methylphenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
4-Nitroaniline	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Antimony	2.72E+00	NC	NC	NC	2.72E+00	NC	NC	NC	NC	NC
Arsenic	NC	NC	NC	NC	NC	2.75E-02	NC	5.70E-03	NC	3.32E-02
Benzene	1.42E-03	2.67E-05	1.03E-02	2.54E-01	2.66E-01	3.35E-04	6.30E-06	NC	NC	3.41E-04
Benzo(a)anthracene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(a)pyrene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(b)fluoranthene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Cadmium	NC	NC	8.51E-02	NC	8.51E-02	NC	NC	2.93E-02	NC	2.93E-02
Chlorobenzene	1.06E-03	4.18E-05	2.47E-02	1.22E+00	1.24E+00	4.41E-05	1.74E-06	NC	NC	4.59E-05
Chloroform	NC	NC	3.94E-03	2.89E+01	2.89E+01	3.37E-04	4.42E-04	NC	NC	7.80E-04
Dibenzo(a,h)anthracene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
gamma-BHC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Lead	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nickel	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nitrobenzene	NC	NC	2.87E-04	NC	2.87E-04	NC	NC	NC	NC	NC
Pentachlorophenol	NC	NC	1.08E-01	NC	1.08E-01	NC	NC	4.26E-03	NC	4.26E-03
Tetrachloroethene	NC	NC	1.88E-03	1.92E-03	3.80E-03	NC	NC	4.66E-04	4.77E-04	9.42E-04
Toluene	6.49E-05	1.28E-06	NC	NC	6.61E-05	3.33E-04	6.59E-06	NC	NC	3.40E-04
Total PCBs	2.91E+00	NC	NC	NC	2.91E+00	4.24E+00	NC	NC	NC	4.24E+00
Trichloroethene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
1,2,4-Trichlorobenzene	1.37E-01	2.71E-04	NC	NC	1.38E-01	NC	NC	NC	NC	NC
1,2-Dichlorobenzene	5.99E-04	NC	NC	NC	5.99E-04	NC	NC	NC	NC	NC
2,4-D	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-Dinitrotoluene	NC	NC	1.32E-04	NC	1.32E-04	NC	NC	NC	NC	NC
Barium	NC	NC	1.81E-03	NC	1.81E-03	NC	NC	NC	NC	NC
Beryllium	1.96E-01	5.03E-01	NC	NC	6.99E-01	NC	NC	NC	NC	NC
Hexachlorobenzene	2.69E-01	NC	NC	NC	2.69E-01	1.02E-03	NC	NC	NC	1.02E-03
Manganese	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Methylene Chloride	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Phosphorous	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Pyridine	NC	NC	NC	NC	NC	NC	NC	1.69E-03	NC	1.69E-03
Selenium	4.16E-02	NC	NC	NC	4.16E-02	NC	NC	NC	NC	NC
Toxaphene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Total HI	6.29E+00	5.03E-01	2.40E-01	3.04E+01	3.74E+01	4.27E+00	4.57E-04	4.38E-02	4.77E-04	4.32E+00

Notes:
ing/derm - Ingestion/Dermal.
HI - Hazard Index.
HQ - Hazard Quotient.
NC - Not Calculated. no dose-response value or not a constituent of potential concern in this area/medium.
RME - Reasonable Maximum Exposure

TABLE T-28
TOTAL POTENTIAL CARCINOGENIC RISK
CONSTRUCTION WORKER - MLE
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Site G					Site H				
	Subsurface Soil		Groundwater		Total	Subsurface Soil		Groundwater		Total
Constituent	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	Risk	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	Risk
1,4-Dichlorobenzene	NC	NC	NC	NC	NC	1.19E-07	1.12E-09	5.05E-09	NC	1.26E-07
2,4,6-Trichlorophenol	NC	NC	6.72E-09	NC	6.72E-09	2.65E-09	2.68E-11	1.60E-10	NC	2.84E-09
2,4-Dichlorophenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
3/4-Methylphenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
4-Nitroaniline	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Antimony	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Arsenic	NC	NC	NC	NC	NC	NC	NC	3.95E-09	NC	3.95E-09
Benzene	1.97E-10	9.51E-13	1.32E-09	5.70E-09	7.22E-09	1.96E-10	9.43E-13	3.39E-09	1.46E-08	1.82E-08
Benzo(a)anthracene	NC	NC	NC	NC	NC	3.22E-08	3.15E-10	NC	NC	3.26E-08
Benzo(a)pyrene	NC	NC	NC	NC	NC	3.48E-07	3.40E-09	NC	NC	3.51E-07
Benzo(b)fluoranthene	NC	NC	NC	NC	NC	1.81E-08	1.77E-10	NC	NC	1.83E-08
Cadmium	NC	NC	NC	NC	NC	NC	9.54E-09	NC	NC	9.54E-09
Chlorobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Chloroform	5.58E-11	4.97E-12	NC	NC	6.08E-11	NC	NC	NC	NC	NC
Dibenzo(a,h)anthracene	NC	NC	NC	NC	NC	8.09E-08	7.91E-10	NC	NC	8.17E-08
gamma-BHC	NC	NC	3.76E-10	NC	3.76E-10	NC	NC	NC	NC	NC
Lead	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nickel	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nitrobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Pentachlorophenol	1.24E-07	NC	3.38E-07	NC	4.62E-07	NC	NC	1.27E-07	NC	1.27E-07
Tetrachloroethene	7.69E-10	3.03E-13	1.05E-09	2.84E-10	2.11E-09	NC	NC	3.96E-10	1.07E-10	5.03E-10
Toluene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Total PCBs	1.59E-06	1.46E-08	NC	NC	1.61E-06	4.80E-06	4.40E-08	NC	NC	4.84E-06
Trichloroethene	NC	NC	4.40E-11	2.58E-09	2.62E-09	NC	NC	NC	NC	NC
1,2,4-Trichlorobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
1,2-Dichlorobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-D	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-Dinitrotoluene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Barium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Beryllium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Hexachlorobenzene	4.82E-08	4.89E-10	NC	NC	4.86E-08	NC	NC	6.25E-08	NC	6.25E-08
Manganese	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Methylene Chloride	NC	NC	NC	NC	NC	3.94E-11	8.39E-14	NC	NC	3.95E-11
Phosphorous	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Pyridine	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Selenium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Toxaphene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Total Risk	1.77E-06	1.51E-08	3.47E-07	8.57E-09	2.14E-06	5.40E-06	5.94E-08	2.03E-07	1.48E-08	5.68E-06

Notes:
ing/derm - Ingestion/Dermal.
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.
RME - Reasonable Maximum Exposure.

TABLE T-28
TOTAL POTENTIAL CARCINOGENIC RISK
CONSTRUCTION WORKER - MLE
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Site I					Site L				
	Subsurface Soil		Groundwater		Total	Subsurface Soil		Groundwater		Total
Constituent	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	Risk	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	Risk
1,4-Dichlorobenzene	4.81E-09	4.51E-11	8.52E-09	NC	1.34E-08	NC	NC	3.59E-09	NC	3.59E-09
2,4,6-Trichlorophenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-Dichlorophenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
3/4-Methylphenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
4-Nitroaniline	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Antimony	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Arsenic	NC	NC	NC	NC	NC	1.78E-08	6.48E-09	6.32E-09	NC	3.06E-08
Benzene	4.90E-11	2.36E-13	1.18E-09	5.09E-09	6.32E-09	2.58E-11	1.24E-13	NC	NC	2.59E-11
Benzo(a)anthracene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(a)pyrene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(b)fluoranthene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Cadmium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Chlorobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Chloroform	NC	NC	4.34E-10	1.43E-07	1.44E-07	3.26E-11	2.91E-12	NC	NC	3.55E-11
Dibenzo(a,h)anthracene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
gamma-BHC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Lead	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nickel	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nitrobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Pentachlorophenol	NC	NC	9.43E-07	NC	9.43E-07	NC	NC	9.58E-08	NC	9.58E-08
Tetrachloroethene	NC	NC	1.92E-09	5.17E-10	2.44E-09	NC	NC	8.36E-10	2.25E-10	1.06E-09
Toluene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Total PCBs	3.17E-07	2.91E-09	NC	NC	3.20E-07	4.53E-07	4.15E-09	NC	NC	4.57E-07
Trichloroethene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
1,2,4-Trichlorobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
1,2-Dichlorobenzene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-D	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-Dinitrotoluene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Barium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Beryllium	NC	1.03E-07	NC	NC	1.03E-07	NC	NC	NC	NC	NC
Hexachlorobenzene	3.63E-07	3.68E-09	NC	NC	3.66E-07	6.74E-09	6.84E-11	NC	NC	6.81E-09
Manganese	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Methylene Chloride	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Phosphorous	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Pyridine	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Selenium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Toxaphene	4.26E-07	4.44E-09	NC	NC	4.31E-07	NC	NC	NC	NC	NC
Total Risk	1.11E-06	1.15E-07	9.55E-07	1.49E-07	2.33E-06	4.78E-07	1.07E-08	1.07E-07	2.25E-10	5.95E-07

Notes:
ing/derm - Ingestion/Dermal
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.
RME - Reasonable Maximum Exposure.

TABLE T-29
TOTAL POTENTIAL NONCARCINOGENIC RISK
CONSTRUCTION WORKER - MLE
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Site G					Site H				
	Subsurface Soil		Groundwater		Total	Subsurface Soil		Groundwater		Total
Constituent	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ
1,4-Dichlorobenzene	NC	NC	NC	NC	NC	1.16E-02	1.56E-05	4.91E-04	NC	1.21E-02
2,4,6-Trichlorophenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-Dichlorophenol	NC	NC	NC	NC	NC	2.76E-03	NC	NC	NC	2.76E-03
3/4-Methylphenol	NC	NC	NC	NC	NC	NC	NC	1.68E-05	NC	1.68E-05
4-Nitroaniline	NC	NC	NC	NC	NC	NC	1.81E-02	NC	NC	1.81E-02
Antimony	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Arsenic	NC	NC	NC	NC	NC	NC	NC	6.14E-04	NC	6.14E-04
Benzene	3.07E-04	5.09E-06	2.05E-03	3.05E-02	3.29E-02	3.05E-04	5.05E-06	5.27E-03	7.83E-02	8.39E-02
Benzo(a)anthracene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(a)pyrene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(b)fluoranthene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Cadmium	NC	NC	3.66E-03	NC	3.65E-02	2.63E-02	NC	2.45E-01	NC	2.72E-01
Chlorobenzene	2.99E-04	1.07E-05	1.14E-03	3.38E-02	7.18E-02	2.69E-04	9.63E-06	1.17E-03	3.47E-02	3.62E-02
Chloroform	6.40E-05	7.62E-05	NC	NC	7.20E-02	NC	NC	NC	NC	NC
Dibenzo(a,h)anthracene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
gamma-BHC	NC	NC	6.75E-05	NC	7.20E-02	NC	NC	NC	NC	NC
Lead	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nickel	NC	NC	NC	NC	NC	7.93E-03	NC	NC	NC	7.93E-03
Nitrobenzene	NC	NC	4.38E-04	NC	3.96E-02	NC	NC	NC	NC	NC
Pentachlorophenol	2.42E-03	NC	6.56E-03	NC	4.86E-02	NC	NC	2.47E-03	NC	2.47E-03
Tetrachloroethene	1.04E-04	9.30E-08	1.42E-04	8.72E-05	4.89E-02	NC	NC	5.34E-05	3.28E-05	8.61E-05
Toluene	1.33E-05	2.40E-07	NC	NC	4.89E-02	6.28E-06	1.13E-07	NC	NC	6.39E-06
Total PCBs	2.79E+00	NC	NC	NC	2.83E+00	8.40E+00	NC	NC	NC	8.40E+00
Trichloroethene	NC	NC	4.67E-05	NC	2.80E+00	NC	NC	NC	NC	NC
1,2,4-Trichlorobenzene	NC	NC	NC	NC	NC	7.33E-03	1.31E-05	NC	NC	7.35E-03
1,2-Dichlorobenzene	NC	NC	NC	NC	NC	3.97E-03	NC	NC	NC	3.97E-03
2,4-D	NC	NC	8.56E-03	NC	2.81E+00	NC	NC	6.04E-05	NC	6.04E-05
2,4-Dinitrotoluene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Barium	3.62E-03	1.97E-02	4.54E-05	NC	2.83E+00	NC	NC	NC	NC	NC
Beryllium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Hexachlorobenzene	2.63E-03	NC	NC	NC	2.82E+00	NC	NC	3.42E-03	NC	3.42E-03
Manganese	NC	NC	NC	NC	NC	4.56E-03	1.52E-01	NC	NC	1.57E-01
Methylene Chloride	NC	NC	NC	NC	NC	6.13E-06	4.15E-09	NC	NC	6.13E-06
Phosphorous	1.36E+00	NC	NC	NC	1.39E+00	NC	NC	NC	NC	NC
Pyridine	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Selenium	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Toxaphene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Total HI	4.16E+00	1.98E-02	2.27E-02	6.44E-02	5.65E+00	8.46E+00	1.70E-01	2.59E-01	1.13E-01	9.01E+00

Notes:
ing/derm - Ingestion/Dermal.
HI - Hazard Index.
HQ - Hazard Quotient.
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.
RME - Reasonable Maximum Exposure.

TABLE T-29
TOTAL POTENTIAL NONCARCINOGENIC RIS
CONSTRUCTION WORKER - MLE
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Site I					Site L				
	Subsurface Soil		Groundwater		Total	Subsurface Soil		Groundwater		Total
Constituent	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ
1,4-Dichlorobenzene	4.67E-04	6.26E-07	8.28E-04	NC	1.30E-03	NC	NC	3.49E-04	NC	3.49E-04
2,4,6-Trichlorophenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-Dichlorophenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
3/4-Methylphenol	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
4-Nitroaniline	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Antimony	2.99E-01	NC	NC	NC	2.99E-01	NC	NC	NC	NC	NC
Arsenic	NC	NC	NC	NC	NC	2.78E-03	NC	9.84E-04	NC	3.76E-03
Benzene	7.62E-05	1.26E-06	1.83E-03	2.72E-02	2.91E-02	4.01E-05	6.65E-07	NC	NC	4.08E-05
Benzo(a)anthracene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(a)pyrene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Benzo(b)fluoranthene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Cadmium	NC	NC	1.43E-02	NC	1.43E-02	NC	NC	8.68E-03	NC	8.68E-03
Chlorobenzene	9.54E-05	3.42E-06	3.63E-03	1.07E-01	1.11E-01	3.44E-06	1.23E-07	NC	NC	3.56E-06
Chloroform	NC	NC	4.98E-04	2.19E+00	2.19E+00	3.74E-05	4.46E-05	NC	NC	8.20E-05
Dibenzo(a,h)anthracene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
gamma-BHC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Lead	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nickel	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Nitrobenzene	NC	NC	1.44E-04	NC	1.44E-04	NC	NC	NC	NC	NC
Pentachlorophenol	NC	NC	1.83E-02	NC	1.83E-02	NC	NC	1.86E-03	NC	1.86E-03
Tetrachloroethene	NC	NC	2.59E-04	1.59E-04	4.18E-04	NC	NC	1.13E-04	6.91E-05	1.82E-04
Toluene	3.10E-06	5.57E-08	NC	NC	3.16E-06	1.83E-05	3.29E-07	NC	NC	1.86E-05
Total PCBs	5.55E-01	NC	NC	NC	5.55E-01	7.93E-01	NC	NC	NC	7.93E-01
Trichloroethene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
1,2,4-Trichlorobenzene	7.70E-03	1.38E-05	NC	NC	7.72E-03	NC	NC	NC	NC	NC
1,2-Dichlorobenzene	5.07E-05	NC	NC	NC	5.07E-05	NC	NC	NC	NC	NC
2,4-D	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2,4-Dinitrotoluene	NC	NC	4.90E-05	NC	4.90E-05	NC	NC	NC	NC	NC
Barium	NC	NC	2.32E-04	NC	2.32E-04	NC	NC	NC	NC	NC
Beryllium	7.63E-02	1.51E-01	NC	NC	2.27E-01	NC	NC	NC	NC	NC
Hexachlorobenzene	1.98E-02	NC	NC	NC	1.98E-02	3.69E-04	NC	NC	NC	3.69E-04
Manganese	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Methylene Chloride	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Phosphorous	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Pyridine	NC	NC	NC	NC	NC	NC	NC	3.67E-04	NC	3.67E-04
Selenium	1.34E-02	NC	NC	NC	1.34E-02	NC	NC	NC	NC	NC
Toxaphene	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Total HI	9.71E-01	1.51E-01	4.01E-02	2.33E+00	3.49E+00	7.96E-01	4.57E-05	1.24E-02	6.91E-05	8.08E-01

Notes
ing/derm - Ingestion/Dermal.
HI - Hazard Index.
HQ - Hazard Quotient.
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.
RME - Reasonable Maximum Exposure.

TABLE T-30
EVALUATION OF CONSTRUCTION WORKER EXPOSURE
TO LEAD IN GROUNDWATER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC

	Construction Worker		
	Site G	Site H	Site I
PbB baseline (ug/dL)	2.2	2.2	2.2
BSF (ug/dL per ug/day)	0.4	0.4	0.4
Inhalation - Excavation Air			
Aa (unitless)	0.32	0.32	0.32
Va (m^3/day)	20	20	20
Ca (ug/m^3)	0.01447	0.03462	0.12363
Uptake air (ug/day)	0.0101	0.0243	0.0867
Ingestion - Water			
Aw (unitless)	0.2	0.2	0.2
Iw (L/day)	0.005	0.005	0.005
Cw (ug/L)	6009	8190	2610
Uptake water (ug/day)	0.659	0.898	0.286
Ingestion Soil			
As (unitless)	0.12	0.12	0.12
Is (g/day)	0.1	0.1	0.1
Cs (ug/g)	241.15	577	2060.5
Uptake soil (ug/day)	0.317	0.759	2.710
PbB (ug/dl)	2.59	2.87	3.43

Target Blood Lead Level as Defined by OSHA for Adult Workers:

a) Blood lead level of workers (male and female) intending to have children should remain below 30 ug/dL.
b) OSHA allows 40 ug/dL as a "permissible" blood lead level in lead-exposed workers, below which no further medical monitoring or workplace intervention is required.

The Centers for Disease Control has selected 10 ug/dl as the "level of concern" for young children. Bowers et al. (1994) suggest that while the CDC criteria for children were not developed for adults they may be useful as a screening ctechnique for adults.

TABLE T-31
TOTAL POTENTIAL RISKS - ORIGINAL AND SUPPLEMENTAL
CONSTRUCTION WORKER - RME
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Site			
	G	H	I	L
Total Potential Carcinogenic Risk - Original HHRA	1.01E-05	3.51E-06	8.92E-06	3.69E-07
Total Potential Carcinogenic Risk - Supplemental HHRA	2.50E-05	9.37E-05	1.60E-05	3.00E-06
Total Potential Carcinogenic Risk - Combined	**3.51E-05**	**9.72E-05**	**2.49E-05**	**3.37E-06**
Total Hazard Index - Original HHRA	2.49E+00	4.55E+00	2.04E+00	8.95E-01
Total Hazard Index - Supplemental HHRA	4.61E+01	1.62E+02	3.74E+01	4.32E+00
Total Hazard Index - Combined HHRA	**4.86E+01**	**1.67E+02**	**3.95E+01**	**5.21E+00**

Notes:
HHRA - Human Heath Risk Assessment.
HI - Hazard Index.
RME - Reasonable Maximum Exposure.

TABLE T-32
TOTAL POTENTIAL RISKS - ORIGINAL AND SUPPLEMENTAL
CONSTRUCTION WORKER - MLE
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Site			
	G	H	I	L
Total Potential Carcinogenic Risk - Original HHRA	4.78E-06	1.29E-06	2.84E-06	1.39E-07
Total Potential Carcinogenic Risk - Supplemental HHRA	2.14E-06	5.68E-06	2.33E-06	5.95E-07
Total Potential Carcinogenic Risk - Combined	**6.92E-06**	**6.97E-06**	**5.17E-06**	**7.34E-07**
Total Hazard Index - Original HHRA	7.60E-01	1.38E+00	3.43E-01	2.87E-01
Total Hazard Index - Supplemental HHRA	5.65E+00	9.01E+00	3.49E+00	8.08E-01
Total Hazard Index - Combined HHRA	**6.41E+00**	**1.04E+01**	**3.83E+00**	**1.10E+00**

Notes:
HHRA - Human Heath Risk Assessment.
HI - Hazard Index.
MLE - Most Likely Exposure.

SAUGET AREA 1 - EE/CA AND RI/FS
RME

Receptors Evaluated	
Receptor 3:	RME Construction Worker

ASSUMPTIONS FOR CONSTRUCTION WORKER RME INCIDENTIAL INGESTION AND DERMAL CONTACT SOIL		Assumed Value	Units	Calculated Value
Soil Ingestion Rate	RME Construction Worker	100	(mg soil/day)	
Soil on Skin	RME Construction Worker	0.19	(mg/cm^2)	
Skin Exposed	RME Construction Worker	3339	(cm^2)	
Body Weight	RME Construction Worker	70	(kg)	
Exposure Frequency	RME Construction Worker	40	(days)/365(days) =	1.10E-01
Exposure Duration (cancer)	RME Construction Worker	1	(years)/70(years) =	1.43E-02
Exposure Duration (noncancer)	RME Construction Worker	1	(yrs)/1(yrs) =	1.00E+00
Lifetime		70	(years)	
Unit Conversion Factor		1.00E-06	(kg/mg)	

14-Mar-01

SAUGET AREA 1 - EE/CA AND RI/FS
RME
POTENTIAL CARCINOGENIC RISK
INCIDENTIAL INGESTION AND DERMAL CONTACT
SOIL
CONSTRUCTION WORKER RME

Constituent	Unit Concentration in Soil (mg/kg soil)	Oral - Soil Absorption Adjustment Factor	Dermal - Soil Absorption Adjustment Factor	Oral Cancer Slope Factor (mg/kg-day)$^{-1}$	ADDing RME Construction Worker (mg/kg-day)	Lifetime Average Daily Dose-Ing. (mg/kg-day)	ADDder RME Construction Worker (mg/kg-day)	Lifetime Average Daily Dose-Der. (mg/kg-day)	Excess Lifetime Cancer Risk - Ingestion	Excess Lifetime Cancer Risk - Dermal Contact	Total Excess Lifetime Cancer Risk
1,4-Dichlorobenzene	1.00E+00	1	0.01	2.40E-02	2.24E-09	2.24E-09	1.42E-10	1.42E-10	5.37E-11	3.41E-12	5.71E-11
2,4,6-Trichlorophenol	1.00E+00	1	0.01	1.10E-02	2.24E-09	2.24E-09	1.42E-10	1.42E-10	2.46E-11	1.56E-12	2.62E-11
2,4-Dichlorophenol	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
4-Nitroaniline	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Antimony	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Arsenic	1.00E+00	0.3	0.001	1.50E+00	6.71E-10	6.71E-10	1.42E-11	1.42E-11	1.01E-09	2.13E-11	1.03E-09
Benzene	1.00E+00	1	0.02	1.50E-02	2.24E-09	2.24E-09	2.84E-10	2.84E-10	3.35E-11	4.26E-12	3.78E-11
Benzo(a)anthracene	1.00E+00	0.29	0.02	7.30E-01	6.49E-10	6.49E-10	2.84E-10	2.84E-10	4.73E-10	2.07E-10	6.81E-10
Benzo(a)pyrene	1.00E+00	0.29	0.02	7.30E+00	6.49E-10	6.49E-10	2.84E-10	2.84E-10	4.73E-09	2.07E-09	6.81E-09
Benzo(b)fluoranthene	1.00E+00	0.29	0.02	7.30E-01	6.49E-10	6.49E-10	2.84E-10	2.84E-10	4.73E-10	2.07E-10	6.81E-10
Cadmium	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Chlorobenzene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Chloroform	1.00E+00	1	0.01	6.10E-03	2.24E-09	2.24E-09	1.42E-10	1.42E-10	1.36E-11	8.66E-13	1.45E-11
Dibenzo(a,h)anthracene	1.00E+00	0.29	0.02	7.30E+00	6.49E-10	6.49E-10	2.84E-10	2.84E-10	4.73E-09	2.07E-09	6.81E-09
Lead	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Nickel	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Pentachlorophenol	1.00E+00	1	0.01	1.20E-01	2.24E-09	2.24E-09	1.42E-10	1.42E-10	2.68E-10	1.70E-11	2.85E-10
Tetrachloroethene	1.00E+00	1	0.01	5.20E-02	2.24E-09	2.24E-09	1.42E-10	1.42E-10	1.16E-10	7.38E-12	1.24E-10
Toluene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Total PCBs	1.00E+00	0.83	0.04	2.00E+00	1.86E-09	1.86E-09	5.68E-10	5.68E-10	3.71E-09	1.14E-09	4.85E-09
1,2,4-Trichlorobenzene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
1,2-Dichlorobenzene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Barium	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Beryllium	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Hexachlorobenzene	1.00E+00	0.83	0.04	1.60E+00	1.86E-09	1.86E-09	5.68E-10	5.68E-10	2.97E-09	9.08E-10	3.88E-09
Manganese	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Methylene Chloride	1.00E+00	1	0.016	7.50E-03	2.24E-09	2.24E-09	2.27E-10	2.27E-10	1.68E-11	1.70E-12	1.85E-11
Phosphorous	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Selenium	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Toxaphene	1.00E+00	1	0.01	1.10E+00	2.24E-09	2.24E-09	1.42E-10	1.42E-10	2.46E-09	1.56E-10	2.62E-09

TABLE
POTENTIAL CARCINOGENIC RISK - RME
INCIDENTIAL INGESTION AND DERMAL CONTACT
SOIL
CONSTRUCTION WORKER RME
SAUGET AREA 1 - EE/CA AND RI/FS

	Reference	Site G		Site H		Site I		Site L	
Constituent	Risk (per mg/kg)	EPC (mg/kg)	Risk	EPC (mg/kg)	Risk	EPC (mg/kg)	Risk	EPC (mg/kg)	Risk
1,4-Dichlorobenzene	5.71E-11	--	NC	3.06E+04	1.75E-06	1.84E+03	1.05E-07	--	NC
2,4,6-Trichlorophenol	2.62E-11	--	NC	6.13E+02	1.60E-08	--	NC	--	NC
2,4-Dichlorophenol	NC	--	NC	7.42E+02	NC	--	NC	--	NC
4-Nitroaniline	NC	--	NC	1.83E+03	NC	--	NC	--	NC
Antimony	NC	--	NC	--	NC	6.66E+03	NC	--	NC
Arsenic	1.03E-09	--	NC	--	NC	--	NC	1.72E+02	1.77E-07
Benzene	3.78E-11	4.53E+01	1.71E-09	6.13E+01	2.32E-09	2.41E+01	9.12E-10	5.70E+00	2.15E-10
Benzo(a)anthracene	6.81E-10	--	NC	3.78E+02	2.57E-07	--	NC	--	NC
Benzo(a)pyrene	6.81E-09	--	NC	2.72E+02	1.85E-06	--	NC	--	NC
Benzo(b)fluoranthene	6.81E-10	--	NC	2.11E+02	1.44E-07	--	NC	--	NC
Cadmium	NC	--	NC	2.94E+02	NC	--	NC	--	NC
Chlorobenzene	NC	5.38E+02	NC	4.52E+02	NC	1.27E+02	NC	5.30E+00	NC
Chloroform	1.45E-11	1.16E+01	1.69E-10	--	NC	--	NC	2.03E+01	2.94E-10
Dibenzo(a,h)anthracene	6.81E-09	--	NC	3.17E+01	2.16E-07	--	NC	--	NC
Lead	NC	--	NC	--	NC	2.06E+03	NC	--	NC
Nickel	NC	--	NC	1.51E+04	NC	--	NC	--	NC
Pentachlorophenol	2.85E-10	4.77E+03	1.36E-06	--	NC	--	NC	--	NC
Tetrachloroethene	1.24E-10	3.30E+01	4.08E-09	--	NC	--	NC	--	NC
Toluene	NC	1.18E+02	NC	7.65E+01	NC	7.79E+01	NC	4.00E+02	NC
Total PCBs	4.85E-09	4.43E+03	2.15E-05	1.80E+04	8.73E-05	3.43E+02	1.66E-06	5.00E+02	2.42E-06
1,2,4-Trichlorobenzene	NC	--	NC	7.58E+03	NC	8.26E+03	NC	--	NC
1,2-Dichlorobenzene	NC	--	NC	1.94E+04	NC	3.24E+02	NC	--	NC
Barium	NC	4.18E+04	NC	--	NC	--	NC	--	NC
Beryllium	NC	--	NC	--	NC	1.53E+03	NC	--	NC
Hexachlorobenzene	3.88E-09	4.06E+01	1.58E-07	--	NC	1.27E+03	4.93E-06	4.80E+00	1.86E-08
Manganese	NC	--	NC	3.65E+04	NC	--	NC	--	NC
Methylene Chloride	1.85E-11	--	NC	5.56E+01	1.03E-09	--	NC	--	NC
Phosphorous	NC	8.98E+02	NC	--	NC	--	NC	--	NC
Selenium	NC	--	NC	--	NC	1.32E+03	NC	--	NC
Toxaphene	2.62E-09	--	NC	--	NC	4.93E+02	1.29E-06	--	NC
	Total:		2.30E-05		9.15E-05		7.98E-06		2.62E-06

Notes:
-- Not a constituent of potential concern in this area/medium.
EPC - Exposure Point Concentration.
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.
(a) - Higher of surface soil and subsurface soil EPC used.

SAUGET AREA 1 - EE/CA AND RI/FS
RME
NONCARCINOGENIC HAZARD INDEX
INCIDENTIAL INGESTION AND DERMAL CONTACT
SOIL
CONSTRUCTION WORKER RME

Constituent	Unit Concentration in Soil (mg/kg-soil)	Oral - Soil Absorption Adjustment Factor	Dermal - Soil Absorption Adjustment Factor	Oral Reference Dose RME (mg/kg-day)	ADDing Construction Worker (mg/kg-day)	Chronic Average Daily Dose-Ing. AE (mg/kg-day)	ADDder Construction Worker (mg/kg-day)	Chronic Average Daily Dose-Der. (mg/kg-day)	Hazard Index - Ingestion	Hazard Index - Dermal Contact	Total Hazard Index
1,4-Dichlorobenzene	1.00E+00	1	0.01	3.00E-02	1.57E-07	1.57E-07	9.93E-09	9.93E-09	5.22E-06	3.31E-07	5.55E-06
2,4,6-Trichlorophenol	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
2,4-Dichlorophenol	1.00E+00	1	0.01	3.00E-03	1.57E-07	1.57E-07	9.93E-09	9.93E-09	5.22E-05	3.31E-06	5.55E-05
4-Nitroaniline	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Antimony	1.00E+00	1	0.007	4.00E-04	1.57E-07	1.57E-07	6.95E-09	6.95E-09	3.91E-04	1.74E-05	4.09E-04
Arsenic	1.00E+00	0.3	0.001	3.00E-04	4.70E-08	4.70E-08	9.93E-10	9.93E-10	1.57E-04	3.31E-06	1.60E-04
Benzene	1.00E+00	1	0.02	3.00E-03	1.57E-07	1.57E-07	1.99E-08	1.99E-08	5.22E-05	6.62E-06	5.88E-05
Benzo(a)anthracene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Benzo(a)pyrene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Benzo(b)fluoranthene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Cadmium	1.00E+00	1	0.04	5.00E-04	1.57E-07	1.57E-07	3.97E-08	3.97E-08	3.13E-04	7.95E-05	3.93E-04
Chlorobenzene	1.00E+00	1	0.01	2.00E-02	1.57E-07	1.57E-07	9.93E-09	9.93E-09	7.83E-06	4.97E-07	8.32E-06
Chloroform	1.00E+00	1	0.01	1.00E-02	1.57E-07	1.57E-07	9.93E-09	9.93E-09	1.57E-05	9.93E-07	1.66E-05
Dibenzo(a,h)anthracene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Lead	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Nickel	1.00E+00	1	0.08	2.00E-02	1.57E-07	1.57E-07	7.95E-08	7.95E-08	7.83E-06	3.97E-06	1.18E-05
Pentachlorophenol	1.00E+00	1	0.01	3.00E-02	1.57E-07	1.57E-07	9.93E-09	9.93E-09	5.22E-06	3.31E-07	5.55E-06
Tetrachloroethene	1.00E+00	1	0.01	1.00E-02	1.57E-07	1.57E-07	9.93E-09	9.93E-09	1.57E-05	9.93E-07	1.66E-05
Toluene	1.00E+00	1	0.01	2.00E-01	1.57E-07	1.57E-07	9.93E-09	9.93E-09	7.83E-07	4.97E-08	8.32E-07
Total PCBs	1.00E+00	0.83	0.04	2.00E-05	1.30E-07	1.30E-07	3.97E-08	3.97E-08	6.50E-03	1.99E-03	8.48E-03
1,2,4-Trichlorobenzene	1.00E+00	1	0.01	1.00E-02	1.57E-07	1.57E-07	9.93E-09	9.93E-09	1.57E-05	9.93E-07	1.66E-05
1,2-Dichlorobenzene	1.00E+00	1	0.01	9.00E-02	1.57E-07	1.57E-07	9.93E-09	9.93E-09	1.74E-06	1.10E-07	1.85E-06
Barium	1.00E+00	1	0.001	7.00E-02	1.57E-07	1.57E-07	9.93E-10	9.93E-10	2.24E-06	1.42E-08	2.25E-06
Beryllium	1.00E+00	1	0.1	2.00E-03	1.57E-07	1.57E-07	9.93E-08	9.93E-08	7.83E-05	4.97E-05	1.28E-04
Hexachlorobenzene	1.00E+00	0.83	0.04	8.00E-04	1.30E-07	1.30E-07	3.97E-08	3.97E-08	1.62E-04	4.97E-05	2.12E-04
Manganese	1.00E+00	1	0.01	4.67E-02	1.57E-07	1.57E-07	9.93E-09	9.93E-09	3.35E-06	2.13E-07	3.57E-06
Methylene Chloride	1.00E+00	1	0.016	6.00E-02	1.57E-07	1.57E-07	1.59E-08	1.59E-08	2.61E-06	2.65E-07	2.87E-06
Phosphorous	1.00E+00	1	0.001	2.00E-05	1.57E-07	1.57E-07	9.93E-10	9.93E-10	7.83E-03	4.97E-05	7.88E-03
Selenium	1.00E+00	1	0.001	5.00E-03	1.57E-07	1.57E-07	9.93E-10	9.93E-10	3.13E-05	1.99E-07	3.15E-05
Toxaphene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC

TABLE
POTENTIAL HAZARD INDEX - RME
INCIDENTIAL INGESTION AND DERMAL CONTACT
SOIL
CONSTRUCTION WORKER RME
SAUGET AREA 1 - EE/CA AND RI/FS

	Reference	Site G		Site H		Site I		Site L	
Constituent	HI (per mg/kg)	EPC (mg/kg)	HQ	EPC (mg/kg)	HQ	EPC (mg/kg)	HQ	EPC (mg/kg)	HQ
1,4-Dichlorobenzene	5.55E-06	--	NC	3.06E+04	1.70E-01	1.84E+03	1.02E-02	--	NC
2,4,6-Trichlorophenol	NC	--	NC	6.13E+02	NC	--	NC	--	NC
2,4-Dichlorophenol	5.55E-05	--	NC	7.42E+02	4.12E-02	--	NC	--	NC
4-Nitroaniline	NC	--	NC	1.83E+03	NC	--	NC	--	NC
Antimony	4.09E-04	--	NC	--	NC	6.66E+03	2.72E+00	--	NC
Arsenic	1.60E-04	--	NC	--	NC	--	NC	1.72E+02	2.75E-02
Benzene	5.88E-05	4.53E+01	2.67E-03	6.13E+01	3.60E-03	2.41E+01	1.42E-03	5.70E+00	3.35E-04
Benzo(a)anthracene	NC	--	NC	3.78E+02	NC	--	NC	--	NC
Benzo(a)pyrene	NC	--	NC	2.72E+02	NC	--	NC	--	NC
Benzo(b)fluoranthene	NC	--	NC	2.11E+02	NC	--	NC	--	NC
Cadmium	3.93E-04	--	NC	2.94E+02	1.15E-01	--	NC	--	NC
Chlorobenzene	8.32E-06	5.38E+02	4.48E-03	4.52E+02	3.76E-03	1.27E+02	1.06E-03	5.30E+00	4.41E-05
Chloroform	1.66E-05	1.16E+01	1.94E-04	--	NC	--	NC	2.03E+01	3.37E-04
Dibenzo(a,h)anthracene	NC	--	NC	3.17E+01	NC	--	NC	--	NC
Lead	NC	--	NC	--	NC	2.06E+03	NC	--	NC
Nickel	1.18E-05	--	NC	1.51E+04	1.78E-01	--	NC	--	NC
Pentachlorophenol	5.55E-06	4.77E+03	2.65E-02	--	NC	--	NC	--	NC
Tetrachloroethene	1.66E-05	3.30E+01	5.49E-04	--	NC	--	NC	--	NC
Toluene	8.32E-07	1.18E+02	9.79E-05	7.65E+01	6.36E-05	7.79E+01	6.49E-05	4.00E+02	3.33E-04
Total PCBs	8.48E-03	4.43E+03	3.76E+01	1.80E+04	1.53E+02	3.43E+02	2.91E+00	5.00E+02	4.24E+00
1,2,4-Trichlorobenzene	1.66E-05	--	NC	7.58E+03	1.26E-01	8.26E+03	1.37E-01	--	NC
1,2-Dichlorobenzene	1.85E-06	--	NC	1.94E+04	3.58E-02	3.24E+02	5.99E-04	--	NC
Barium	2.25E-06	4.18E+04	9.40E-02	--	NC	--	NC	--	NC
Beryllium	1.28E-04	--	NC	--	NC	1.53E+03	1.96E-01	--	NC
Hexachlorobenzene	2.12E-04	4.06E+01	8.62E-03	--	NC	1.27E+03	2.69E-01	4.80E+00	1.02E-03
Manganese	3.57E-06	--	NC	3.65E+04	1.30E-01	--	NC	--	NC
Methylene Chloride	2.87E-06	--	NC	5.56E+01	1.60E-04	--	NC	--	NC
Phosphorous	7.88E-03	8.98E+02	7.07E+00	--	NC	--	NC	--	NC
Selenium	3.15E-05	--	NC	--	NC	1.32E+03	4.16E-02	--	NC
Toxaphene	NC	--	NC	--	NC	4.93E+02	NC	--	NC
	Total HI:		4.48E+01		1.54E+02		6.29E+00		4.27E+00

Notes:
-- Not a constituent of concern in this area/medium.
EPC - Exposure Point Concentration.
HI - Hazard Index.
HQ - Hazard Quotient.
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.
(a) - Higher of surface soil and subsurface soil EPC used.

SAUGET AREA 1 - EE/CA AND RI/FS
RME

Receptors Evaluated:	
Receptor 1:	RME Construction Worker

ASSUMPTIONS FOR CONSTRUCTION WORKER - RME INHALATION OF OUTDOOR AIR PARTICULATES		Assumed Value	Units	Calculated Value
Inhalation Rate	RME Construction Worker	2.5	(m^3 air/hour)	
Body Weight	RME Construction Worker	70	(kg)	
Exposure Time	RME Construction Worker	8	(hrs/day) =	8.00E+00
Exposure Frequency	RME Construction Worker	40	(days)/365 (days) =	1.10E-01
Exposure Duration (cancer)	RME Construction Worker	1	(yrs)/70(yrs) =	1.43E-02
Exposure Duration (noncancer)	RME Construction Worker	1	(yrs)/1(yrs) =	1.00E+00
Lifetime		70	(years)	

SAUGET AREA 1 - EE/CA AND RI/FS
CARCINOGENIC ASSESSMENT
INHALATION OF
OUTDOOR AIR PARTICULATES
CONSTRUCTION WORKER - RME

Constituent	Unit Concentration In Air (mg/m^3 air)	Inhalation Absorption Adjustment Factor	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	ADDinh RME Construction Worker (mg/kg-day)	Lifetime Average Daily Dose - Inh. (mg/kg-day)	Excess Lifetime Cancer Risk - Inhalation
1,4-Dichlorobenzene	1.00E+00	1	2.20E-02	4.47E-04	4.47E-04	9.84E-06
2,4,6-Trichlorophenol	1.00E+00	1	1.09E-02	4.47E-04	4.47E-04	4.85E-06
2,4-Dichlorophenol	1.00E+00	1	NA	4.47E-04	4.47E-04	NC
4-Nitroaniline	1.00E+00	NA	NA	NA	NA	NC
Antimony	1.00E+00	NA	NA	NA	NA	NC
Arsenic	1.00E+00	1	1.50E+01	4.47E-04	4.47E-04	6.71E-03
Benzene	1.00E+00	1	7.70E-03	4.47E-04	4.47E-04	3.44E-06
Benzo(a)anthracene	1.00E+00	1	3.10E-01	4.47E-04	4.47E-04	1.39E-04
Benzo(a)pyrene	1.00E+00	1	3.10E+00	4.47E-04	4.47E-04	1.39E-03
Benzo(b)fluoranthene	1.00E+00	1	3.10E-01	4.47E-04	4.47E-04	1.39E-04
Cadmium	1.00E+00	1	6.30E+00	4.47E-04	4.47E-04	2.82E-03
Chlorobenzene	1.00E+00	NA	NA	NA	NA	NC
Chloroform	1.00E+00	0.66	8.05E-02	2.95E-04	2.95E-04	2.38E-05
Dibenzo(a,h)anthracene	1.00E+00	1	3.10E+00	4.47E-04	4.47E-04	1.39E-03
Lead	1.00E+00	NA	NA	NA	NA	NC
Nickel	1.00E+00	NA	NA	NA	NA	NC
Pentachlorophenol	1.00E+00	NA	NA	NA	NA	NC
Tetrachloroethene	1.00E+00	1	2.00E-03	4.47E-04	4.47E-04	8.95E-07
Toluene	1.00E+00	NA	NA	NA	NA	NC
Total PCBs	1.00E+00	1	2.00E+00	4.47E-04	4.47E-04	8.95E-04
1,2,4-Trichlorobenzene	1.00E+00	NA	NA	NA	NA	NC
1,2-Dichlorobenzene	1.00E+00	NA	NA	NA	NA	NC
Barium	1.00E+00	NA	NA	NA	NA	NC
Beryllium	1.00E+00	1	8.40E+00	4.47E-04	4.47E-04	3.76E-03
Hexachlorobenzene	1.00E+00	1.1	1.61E+00	4.92E-04	4.92E-04	7.92E-04
Manganese	1.00E+00	NA	NA	NA	NA	NC
Methylene Chloride	1.00E+00	1	1.65E-03	4.47E-04	4.47E-04	7.36E-07
Phosphorous	1.00E+00	NA	NA	NA	NA	NC
Selenium	1.00E+00	NA	NA	NA	NA	NC
Toxaphene	1.00E+00	1	1.12E+00	4.47E-04	4.47E-04	5.01E-04

TABLE
CARCINOGENIC ASSESSMENT
INHALATION OF
OUTDOOR AIR PARTICULATES
CONSTRUCTION WORKER - RME

Constituent	Reference Risk (per mg/m3)	Site G EPC (mg/m3)	Site G Risk	Site H EPC (mg/m3)	Site H Risk	Site I EPC (mg/m3)	Site I Risk	Site L EPC (mg/m3)	Site L Risk
1,4-Dichlorobenzene	9.84E-06	--	NC	1.84E-03	1.81E-08	1.10E-04	1.08E-09	--	NC
2,4,6-Trichlorophenol	4.85E-06	--	NC	3.68E-05	1.78E-10	--	NC	--	NC
2,4-Dichlorophenol	NC	--	NC	4.45E-05	NC	--	NC	--	NC
4-Nitroaniline	NC	--	NC	1.10E-04	NC	--	NC	--	NC
Antimony	NC	--	NC	--	NC	4.00E-04	NC	--	NC
Arsenic	6.71E-03	--	NC	--	NC	--	NC	1.03E-05	6.92E-08
Benzene	3.44E-06	2.72E-06	9.37E-12	3.68E-06	1.27E-11	1.45E-06	4.99E-12	3.42E-07	1.18E-12
Benzo(a)anthracene	1.39E-04	--	NC	2.27E-05	3.14E-09	--	NC	--	NC
Benzo(a)pyrene	1.39E-03	--	NC	1.63E-05	2.26E-08	--	NC	--	NC
Benzo(b)fluoranthene	1.39E-04	--	NC	1.27E-05	1.76E-09	--	NC	--	NC
Cadmium	2.82E-03	--	NC	1.76E-05	4.97E-08	--	NC	--	NC
Chlorobenzene	NC	3.23E-05	NC	2.71E-05	NC	7.61E-06	NC	3.18E-07	NC
Chloroform	2.38E-05	6.98E-07	1.66E-11	--	NC	--	NC	1.22E-06	2.89E-11
Dibenzo(a,h)anthracene	1.39E-03	--	NC	1.90E-06	2.64E-09	--	NC	--	NC
Lead	NC	--	NC	--	NC	1.24E-04	NC	--	NC
Nickel	NC	--	NC	9.06E-04	NC	--	NC	--	NC
Pentachlorophenol	NC	2.86E-04	NC	--	NC	--	NC	--	NC
Tetrachloroethene	8.95E-07	1.98E-06	1.77E-12	--	NC	--	NC	--	NC
Toluene	NC	7.06E-06	NC	4.59E-06	NC	4.67E-06	NC	2.40E-05	NC
Total PCBs	8.95E-04	2.66E-04	2.38E-07	1.08E-03	9.66E-07	2.06E-05	1.84E-08	3.00E-05	2.68E-08
1,2,4-Trichlorobenzene	NC	--	NC	4.55E-04	NC	4.95E-04	NC	--	NC
1,2-Dichlorobenzene	NC	--	NC	1.16E-03	NC	1.94E-05	NC	--	NC
Barium	NC	2.51E-03	NC	--	NC	--	NC	--	NC
Beryllium	3.76E-03	--	NC	--	NC	9.18E-05	3.45E-07	--	NC
Hexachlorobenzene	7.92E-04	2.44E-06	1.93E-09	--	NC	7.62E-05	6.04E-08	2.88E-07	2.28E-10
Manganese	NC	--	NC	2.19E-03	NC	--	NC	--	NC
Methylene Chloride	7.36E-07	--	NC	3.34E-06	2.45E-12	--	NC	--	NC
Phosphorous	NC	5.39E-05	NC	--	NC	--	NC	--	NC
Selenium	NC	--	NC	--	NC	7.92E-05	NC	--	NC
Toxaphene	5.01E-04	--	NC	--	NC	2.96E-05	1.48E-08	--	NC
	Total:		**2.40E-07**		**1.06E-06**		**4.40E-07**		**9.63E-08**

Notes:
-- Not a constituent of potential concern in this area/medium.
EPC - Exposure Point Concentration.
NC - Not Calculated.
(a) - Higher of the surface soil and subsurface soil EPC used.

SAUGET AREA 1 - EE/CA AND RI/FS
NONCARCINOGENIC ASSESSMENT
INHALATION OF
OUTDOOR AIR PARTICULATES
CONSTRUCTION WORKER - RME

Constituent	Unit Concentration In Air (mg/m^3 air)	Inhalation Absorption Adjustment Factor	Inhalation Reference Dose (mg/kg-day)	ADDinh RME Construction Worker (mg/kg-day)	Chronic Average Daily Dose-inh (mg/kg-day)	Hazard Index - Inhalation
1,4-Dichlorobenzene	1.00E+00	1	2.29E-01	3.13E-02	3.13E-02	1.37E-01
2,4,6-Trichlorophenol	1.00E+00	NA	NA	NA	NA	NC
2,4-Dichlorophenol	1.00E+00	1	NA	3.13E-02	3.13E-02	NC
4-Nitroaniline	1.00E+00	1	5.71E-05	3.13E-02	3.13E-02	5.48E+02
Antimony	1.00E+00	NA	NA	NA	NA	NC
Arsenic	1.00E+00	NA	NA	NA	NA	NC
Benzene	1.00E+00	1	1.70E-03	3.13E-02	3.13E-02	1.84E+01
Benzo(a)anthracene	1.00E+00	NA	NA	NA	NA	NC
Benzo(a)pyrene	1.00E+00	NA	NA	NA	NA	NC
Benzo(b)fluoranthene	1.00E+00	NA	NA	NA	NA	NC
Cadmium	1.00E+00	NA	NA	NA	NA	NC
Chlorobenzene	1.00E+00	1	5.71E-03	3.13E-02	3.13E-02	5.48E+00
Chloroform	1.00E+00	1	8.60E-05	3.13E-02	3.13E-02	3.64E+02
Dibenzo(a,h)anthracene	1.00E+00	NA	NA	NA	NA	NC
Lead	1.00E+00	NA	NA	NA	NA	NC
Nickel	1.00E+00	NA	NA	NA	NA	NC
Pentachlorophenol	1.00E+00	NA	NA	NA	NA	NC
Tetrachloroethene	1.00E+00	1	1.14E-01	3.13E-02	3.13E-02	2.75E-01
Toluene	1.00E+00	1	1.14E-01	3.13E-02	3.13E-02	2.75E-01
Total PCBs	1.00E+00	NA	NA	NA	NA	NC
1,2,4-Trichlorobenzene	1.00E+00	1	5.71E-02	3.13E-02	3.13E-02	5.48E-01
1,2-Dichlorobenzene	1.00E+00	NA	NA	NA	NA	NC
Barium	1.00E+00	1	1.43E-04	3.13E-02	3.13E-02	2.19E+02
Beryllium	1.00E+00	1	5.71E-06	3.13E-02	3.13E-02	5.48E+03
Hexachlorobenzene	1.00E+00	NA	NA	NA	NA	NC
Manganese	1.00E+00	1	1.43E-05	3.13E-02	3.13E-02	2.19E+03
Methylene Chloride	1.00E+00	1	8.60E-01	3.13E-02	3.13E-02	3.64E-02
Phosphorous	1.00E+00	NA	NA	NA	NA	NC
Selenium	1.00E+00	NA	NA	NA	NA	NC
Toxaphene	1.00E+00	NA	NA	NA	NA	NC

TABLE
NONCARCINOGENIC ASSESSMENT
INHALATION OF
OUTDOOR AIR PARTICULATES
CONSTRUCTION WORKER - RME

Constituent	Reference HQ (per mg/m3)	Site G		Site H		Site I		Site L	
		EPC (mg/m3)	HQ	EPC (mg/m3)	HQ	EPC (mg/m3)	HQ	EPC (mg/m3)	HQ
1,4-Dichlorobenzene	1.37E-01	--	NC	1.84E-03	2.51E-04	1.10E-04	1.51E-05	--	NC
2,4,6-Trichlorophenol	NC	--	NC	3.68E-05	NC	--	NC	--	NC
2,4-Dichlorophenol	NC	--	NC	4.45E-05	NC	--	NC	--	NC
4-Nitroaniline	5.48E+02	--	NC	1.10E-04	6.03E-02	--	NC	--	NC
Antimony	NC	--	NC	--	NC	4.00E-04	NC	--	NC
Arsenic	NC	--	NC	--	NC	--	NC	1.03E-05	NC
Benzene	1.84E+01	2.72E-06	5.01E-05	3.68E-06	6.77E-05	1.45E-06	2.67E-05	3.42E-07	6.30E-06
Benzo(a)anthracene	NC	--	NC	2.27E-05	NC	--	NC	--	NC
Benzo(a)pyrene	NC	--	NC	1.63E-05	NC	--	NC	--	NC
Benzo(b)fluoranthene	NC	--	NC	1.27E-05	NC	--	NC	--	NC
Cadmium	NC	--	NC	1.76E-05	NC	--	NC	--	NC
Chlorobenzene	5.48E+00	3.23E-05	1.77E-04	2.71E-05	1.49E-04	7.61E-06	4.18E-05	3.18E-07	1.74E-06
Chloroform	3.64E+02	6.98E-07	2.54E-04	--	NC	--	NC	1.22E-06	4.42E-04
Dibenzo(a,h)anthracene	NC	--	NC	1.90E-06	NC	--	NC	--	NC
Lead	NC	--	NC	--	NC	1.24E-04	NC	--	NC
Nickel	NC	--	NC	9.06E-04	NC	--	NC	--	NC
Pentachlorophenol	NC	2.86E-04	NC	--	NC	--	NC	--	NC
Tetrachloroethene	2.75E-01	1.98E-06	5.43E-07	--	NC	--	NC	--	NC
Toluene	2.75E-01	7.06E-06	1.94E-06	4.59E-06	1.26E-06	4.67E-06	1.28E-06	2.40E-05	6.59E-06
Total PCBs	NC	2.66E-04	NC	1.08E-03	NC	2.06E-05	NC	3.00E-05	NC
1,2,4-Trichlorobenzene	5.48E-01	--	NC	4.55E-04	2.49E-04	4.95E-04	2.71E-04	--	NC
1,2-Dichlorobenzene	NC	--	NC	1.16E-03	NC	1.94E-05	NC	--	NC
Barium	2.19E+02	2.51E-03	5.49E-01	--	NC	--	NC	--	NC
Beryllium	5.48E+03	--	NC	--	NC	9.18E-05	5.03E-01	--	NC
Hexachlorobenzene	NC	2.44E-06	NC	--	NC	7.62E-05	NC	2.88E-07	NC
Manganese	2.19E+03	--	NC	2.19E-03	4.81E+00	--	NC	--	NC
Methylene Chloride	3.64E-02	--	NC	3.34E-06	1.21E-07	--	NC	--	NC
Phosphorous	NC	5.39E-05	NC	--	NC	--	NC	--	NC
Selenium	NC	--	NC	--	NC	7.92E-05	NC	--	NC
Toxaphene	NC	--	NC	--	NC	2.96E-05	NC	--	NC
	Total HI:		5.50E-01		4.87E+00		5.03E-01		4.57E-04

Notes:
-- Not a constituent of potential concern in this area/medium.
HQ - Hazard Quotient.
HI - Hazard Index.
EPC - Exposure Point Concentration.
NC - Not Calculated.
(a) - Higher of the surface soil and subsurface soil EPC used.

SAUGET AREA 1 - EE/CA AND RI/FS
RME

Receptors Evaluated:	
Receptor 3:	RME Construction Worker

ASSUMPTIONS FOR CONSTRUCTION WORKER-RME INCIDENTAL INGESTION AND DERMAL CONTACT GROUNDWATER		Assumed Value	Units	Calculated Value
Water Ingestion Rate	RME Construction Worker	0.005	(l/day)	
Skin Exposed	RME Construction Worker	3339	(cm^2)	
Body Weight	RME Construction Worker	70	(kg)	
Exposure Time (dermal route only)	RME Construction Worker	1	(hr/day)	
Exposure Frequency	RME Construction Worker	10	(days)/365 (days) =	2.74E-02
Exposure Duration (cancer)	RME Construction Worker	1	(yrs)/ 70(yrs) =	1.43E-02
Exposure Duration (noncancer)	RME Construction Worker	1	(yrs)/ 1(yrs) =	1.00E+00
Lifetime		70	(years)	
Unit Conversion Factor (dermal route only)		0.001	(l/cm^3)	

14-Mar-01

SAUGET AREA 1 - EE/CA AND RI/FS
RME
CARCINOGENIC ASSESSMENT
INCIDENTAL INGESTION AND DERMAL CONTACT
GROUNDWATER
CONSTRUCTION WORKER - RME

Constituent	Unit Concentration In Groundwater (mg/l)	Oral - Water Absorption Adjustment Factor	Dermal - Water Absorption Adjustment Factor	Dermal Permeability Constant (cm/hr)	Oral Cancer Slope Factor (mg/kg-day)⁻¹	ADDing Construction Worker (mg/kg-day)	Lifetime Average Daily Dose-Ing (mg/kg-day)	ADDder Construction Worker (mg/kg-day)	Lifetime Average Daily Dose-Der. (mg/kg-day)	Excess Lifetime Cancer Risk - Ingestion	Excess Lifetime Cancer Risk - Dermal Contact	Total Excess Lifetime Cancer Risk
1,4-Dichlorobenzene	1.00E+00	1	1	6.20E-02	2.40E-02	2.80E-08	2.80E-08	1.16E-06	1.16E-06	6.71E-10	2.78E-08	2.85E-08
2,4,6-Trichlorophenol	1.00E+00	1	1	5.00E-02	1.10E-02	2.80E-08	2.80E-08	9.33E-07	9.33E-07	3.08E-10	1.03E-08	1.06E-08
3/4-Methylphenol	1.00E+00	NA	NA	1.00E-02	NA	NA	NA	NA	NA	NA	NA	NC
Arsenic	1.00E+00	1	1	1.60E-04	1.50E+00	2.80E-08	2.80E-08	2.99E-09	2.99E-09	4.19E-08	4.48E-09	4.64E-08
Benzene	1.00E+00	1	2.13	2.10E-02	1.50E-02	2.80E-08	2.80E-08	8.35E-07	8.35E-07	4.19E-10	1.25E-08	1.29E-08
Cadmium	1.00E+00	NA	NA	1.00E-03	NA	NA	NA	NA	NA	NA	NA	NC
Chlorobenzene	1.00E+00	NA	NA	4.10E-02	NA	NA	NA	NA	NA	NA	NA	NC
Chloroform	1.00E+00	1	1	8.90E-03	6.10E-03	2.80E-08	2.80E-08	1.66E-07	1.66E-07	1.71E-10	1.01E-09	1.18E-09
gamma-BHC	1.00E+00	1	1	1.40E-02	1.30E+00	2.80E-08	2.80E-08	2.61E-07	2.61E-07	3.63E-08	3.40E-07	3.76E-07
Lead	1.00E+00	NA	NA	4.00E-06	NA	NA	NA	NA	NA	NA	NA	NC
Nitrobenzene	1.00E+00	NA	NA	6.96E-03	NA	NA	NA	NA	NA	NA	NA	NC
Pentachlorophenol	1.00E+00	1	1	6.50E-01	1.20E-01	2.80E-08	2.80E-08	1.21E-05	1.21E-05	3.35E-09	1.46E-06	1.46E-06
Tetrachloroethene	1.00E+00	1	1	4.80E-02	5.20E-02	2.80E-08	2.80E-08	8.96E-07	8.96E-07	1.45E-09	4.66E-08	4.81E-08
Trichloroethene	1.00E+00	1	1	1.60E-02	1.10E-02	2.80E-08	2.80E-08	2.99E-07	2.99E-07	3.08E-10	3.29E-09	3.59E-09
2,4-D	1.00E+00	NA	NA	8.45E-03	NA	NA	NA	NA	NA	NA	NA	NC
2,4-Dinitrotoluene	1.00E+00	NA	NA	3.80E-03	NA	NA	NA	NA	NA	NA	NA	NC
Barium	1.00E+00	NA	NA	1.60E-04	NA	NA	NA	NA	NA	NA	NA	NC
Hexachlorobenzene	1.00E+00	1	1.1	2.10E-01	1.60E+00	2.80E-08	2.80E-08	4.31E-06	4.31E-06	4.47E-08	6.90E-06	6.94E-06
Pyridine	1.00E+00	NA	NA	1.82E-03	NA	NA	NA	NA	NA	NA	NA	NC

TABLE
POTENTIAL CARCINOGENIC RISK - RME
INCIDENTAL INGESTION AND DERMAL CONTACT
GROUNDWATER
CONSTRUCTION WORKER- RME

Constituent	Reference Risk (per mg/L)	Site G		Site H		Site I		Site L	
		EPC (mg/L)	Risk	EPC (mg/L)	Risk	EPC (mg/L)	Risk	EPC (mg/L)	Risk
1,4-Dichlorobenzene	2.85E-08	--	NC	1.60E+00	4.55E-08	1.30E+00	3.70E-08	8.70E-01	2.48E-08
2,4,6-Trichlorophenol	1.06E-08	4.95E+00	5.23E-08	5.10E-02	5.39E-10	--	NC	--	NC
3/4-Methylphenol	NC	--	NC	4.80E-01	NC	--	NC	--	NC
Arsenic	4.64E-08	--	NC	4.50E-01	2.09E-08	--	NC	7.90E-01	3.67E-08
Benzene	1.29E-08	6.00E-01	7.77E-09	2.50E+00	3.24E-08	5.10E-01	6.60E-09	--	NC
Cadmium	NC	1.20E-01	NC	2.20E+01	NC	7.85E-01	NC	2.70E-01	NC
Chlorobenzene	NC	2.70E+00	NC	2.70E+00	NC	8.90E+00	NC	--	NC
Chloroform	1.18E-09	--	NC	--	NC	2.90E+00	3.43E-09	--	NC
gamma-BHC	3.76E-07	4.20E-03	1.58E-09	--	NC	--	NC	--	NC
Lead	NC	6.09E+00	NC	8.19E+00	NC	2.61E+00	NC	--	NC
Nitrobenzene	NC	7.35E-02	NC	--	NC	1.30E-02	NC	--	NC
Pentachlorophenol	1.46E-06	1.10E+00	1.61E-06	4.50E-01	6.57E-07	3.80E+00	5.55E-06	1.50E-01	2.19E-07
Tetrachloroethene	4.81E-08	1.30E-01	6.25E-09	3.30E-02	1.59E-09	2.90E-01	1.39E-08	7.20E-02	3.46E-09
Trichloroethene	3.59E-09	7.90E-02	2.84E-10	--	NC	--	NC	--	NC
2,4-D	NC	5.00E+01	NC	4.20E-01	NC	--	NC	--	NC
2,4-Dinitrotoluene	NC	--	NC	--	NC	3.80E-02	NC	--	NC
Barium	NC	5.30E+00	NC	--	NC	5.85E+01	NC	--	NC
Hexachlorobenzene	6.94E-06	--	NC	1.80E-02	1.25E-07	--	NC	--	NC
Pyridine	NC	--	NC	--	NC	--	NC	3.90E-01	NC
	Total:		1.67E-06		8.83E-07		5.61E-06		2.84E-07

Notes:

-- Not a constituent of potential concern in this area/medium.
EPC - Exposure Point Concentration.

NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.
(a) - Risks divided by the number of wells in

SAUGET AREA 1 - EE/CA AND RI/FS
RME
NONCARCINOGENIC ASSESSMENT
INCIDENTAL INGESTION AND DERMAL CONTACT
GROUNDWATER
CONSTRUCTION WORKER - RME

Constituent	Unit Concentration In Groundwater (mg/l)	Oral - Water Absorption Adjustment Factor	Dermal - Water Absorption Adjustment Factor	Dermal Permeability Constant (cm/hr)	Oral Reference Dose (mg/kg-day)	ADDing Construction Worker (mg/kg-day)	Chronic Average Daily Dose-Ing. (mg/kg-day)	ADDder Construction Worker (mg/kg-day)	Chronic Average Daily Dose-Der. (mg/kg-day)	Hazard Index - Ingestion	Hazard Index - Dermal Contact	Total Hazard Index
1,4-Dichlorobenzene	1.00E+00	1	1	6.20E-02	3.00E-02	1.96E-06	1.96E-06	8.10E-05	8.10E-05	6.52E-05	2.70E-03	2.77E-03
2,4,6-Trichlorophenol	1.00E+00	NA	NA	5.00E-02	NA	NA	NA	NA	NA	NA	NA	NC
3/4-Methylphenol	1.00E+00	1	1	1.00E-02	5.00E-02	1.96E-06	1.96E-06	1.31E-05	1.31E-05	3.91E-05	2.61E-04	3.01E-04
Arsenic	1.00E+00	1	1	1.60E-04	3.00E-04	1.96E-06	1.96E-06	2.09E-07	2.09E-07	6.52E-03	6.97E-04	7.22E-03
Benzene	1.00E+00	1	2.13	2.10E-02	3.00E-03	1.96E-06	1.96E-06	5.85E-05	5.85E-05	6.52E-04	1.95E-02	2.01E-02
Cadmium	1.00E+00	1	40	1.00E-03	5.00E-04	1.96E-06	1.96E-06	5.23E-05	5.23E-05	3.91E-03	1.05E-01	1.08E-01
Chlorobenzene	1.00E+00	1	1	4.10E-02	2.00E-02	1.96E-06	1.96E-06	5.36E-05	5.36E-05	9.78E-05	2.68E-03	2.78E-03
Chloroform	1.00E+00	1	1	8.90E-03	1.00E-02	1.96E-06	1.96E-06	1.16E-05	1.16E-05	1.96E-04	1.16E-03	1.36E-03
gamma-BHC	1.00E+00	1	1	1.40E-02	3.00E-04	1.96E-06	1.96E-06	1.83E-05	1.83E-05	6.52E-03	6.10E-02	6.75E-02
Lead	1.00E+00	NA	NA	4.00E-06	NA	NA	NA	NA	NA	NA	NA	NC
Nitrobenzene	1.00E+00	1	1	6.96E-03	5.00E-04	1.96E-06	1.96E-06	9.10E-06	9.10E-06	3.91E-03	1.82E-02	2.21E-02
Pentachlorophenol	1.00E+00	1	1	6.50E-01	3.00E-02	1.96E-06	1.96E-06	8.49E-04	8.49E-04	6.52E-05	2.83E-02	2.84E-02
Tetrachloroethene	1.00E+00	1	1	4.80E-02	1.00E-02	1.96E-06	1.96E-06	6.27E-05	6.27E-05	1.96E-04	6.27E-03	6.47E-03
Trichloroethene	1.00E+00	1	1	1.60E-02	6.00E-03	1.96E-06	1.96E-06	2.09E-05	2.09E-05	3.26E-04	3.48E-03	3.81E-03
2,4-D	1.00E+00	1	1	8.45E-03	1.00E-02	1.96E-06	1.96E-06	1.10E-05	1.10E-05	1.96E-04	1.10E-03	1.30E-03
2,4-Dinitrotoluene	1.00E+00	1	1	3.80E-03	2.00E-03	1.96E-06	1.96E-06	4.97E-06	4.97E-06	9.78E-04	2.48E-03	3.46E-03
Barium	1.00E+00	1	1	1.60E-04	7.00E-02	1.96E-06	1.96E-06	2.09E-07	2.09E-07	2.80E-05	2.99E-06	3.09E-05
Hexachlorobenzene	1.00E+00	1	1.1	2.10E-01	8.00E-04	1.96E-06	1.96E-06	3.02E-04	3.02E-04	2.45E-03	3.77E-01	3.80E-01
Pyridine	1.00E+00	1	1	1.82E-03	1.00E-03	1.96E-06	1.96E-06	2.38E-06	2.38E-06	1.96E-03	2.38E-03	4.34E-03

TABLE
POTENTIAL CARCINOGENIC RISK - RME
INCIDENTAL INGESTION AND DERMAL CONTACT
GROUNDWATER
CONSTRUCTION WORKER- RME

Constituent	Reference HQ (per mg/L)	Site G		Site H		Site I		Site L	
		EPC (mg/L)	HQ	EPC (mg/L)	HQ	EPC (mg/L)	HQ	EPC (mg/L)	HQ
1,4-Dichlorobenzene	2.77E-03	--	NC	1.60E+00	4.43E-03	1.30E+00	3.60E-03	8.70E-01	2.41E-03
2,4,6-Trichlorophenol	NC	4.95E+00	NC	5.10E-02	NC	--	NC	--	NC
3/4-Methylphenol	3.01E-04	--	NC	4.80E-01	1.44E-04	--	NC	--	NC
Arsenic	7.22E-03	--	NC	4.50E-01	3.25E-03	--	NC	7.90E-01	5.70E-03
Benzene	2.01E-02	6.00E-01	1.21E-02	2.50E+00	5.03E-02	5.10E-01	1.03E-02	--	NC
Cadmium	1.08E-01	1.20E-01	1.30E-02	2.20E+01	2.39E+00	7.85E-01	8.51E-02	2.70E-01	2.93E-02
Chlorobenzene	2.78E-03	2.70E+00	7.50E-03	2.70E+00	7.50E-03	8.90E+00	2.47E-02	--	NC
Chloroform	1.36E-03	--	NC	--	NC	2.90E+00	3.94E-03	--	NC
gamma-BHC	6.75E-02	4.20E-03	2.84E-04	--	NC	--	NC	--	NC
Lead	NC	6.09E+00	NC	8.19E+00	NC	2.61E+00	NC	--	NC
Nitrobenzene	2.21E-02	7.35E-02	1.62E-03	--	NC	1.30E-02	2.87E-04	--	NC
Pentachlorophenol	2.84E-02	1.10E+00	3.12E-02	4.50E-01	1.28E-02	3.80E+00	1.08E-01	1.50E-01	4.26E-03
Tetrachloroethene	6.47E-03	1.30E-01	8.41E-04	3.30E-02	2.13E-04	2.90E-01	1.88E-03	7.20E-02	4.66E-04
Trichloroethene	3.81E-03	7.90E-02	3.01E-04	--	NC	--	NC	--	NC
2,4-D	1.30E-03	5.00E+01	6.50E-02	4.20E-01	5.46E-04	--	NC	--	NC
2,4-Dinitrotoluene	3.46E-03	--	NC	--	NC	3.80E-02	1.32E-04	--	NC
Barium	3.09E-05	5.30E+00	1.64E-04	--	NC	5.85E+01	1.81E-03	--	NC
Hexachlorobenzene	3.80E-01	--	NC	1.80E-02	6.84E-03	--	NC	--	NC
Pyridine	4.34E-03	--	NC	--	NC	--	NC	3.90E-01	1.69E-03
	Total:		**1.32E-01**		**2.47E+00**		**2.40E-01**		**4.38E-02**

Notes:

-- Not a constituent of potential concern in this area/medium.
HI - Hazard Index.
HQ - Hazard Quotient.
EPC - Exposure Point Concentration.
NC - Not Calculated, no dose-response value

SAUGET AREA 1 - EE/CA AND RI/FS
RME

Receptors Evaluated:	
Receptor:	RME Construction Worker

ASSUMPTIONS FOR CONSTRUCTION WORKER - RME INHALATION OF TRENCH AIR		Assumed Value	Units	Calculated Value
Inhalation Rate	RME Construction Worker	2.5	(m^3 air/hour)	
Body Weight	RME Construction Worker	70	(kg)	
Exposure Time	RME Construction Worker	8	(hrs/day) =	8.00E+00
Exposure Frequency	RME Construction Worker	40	(days)/365 (days) =	1.10E-01
Exposure Duration (cancer)	RME Construction Worker	1	(yrs)/70(yrs) =	1.43E-02
Exposure Duration (noncancer)	RME Construction Worker	1	(yrs)/1(yrs) =	1.00E+00
Lifetime		70	(years)	

SAUGET AREA 1 - EE/CA AND RI/FS
RME

CARCINOGENIC ASSESSMENT
INHALATION OF
TRENCH AIR
CONSTRUCTION WORKER - RME

Constituent	Unit Concentration In Air (mg/m^3 air)	Inhalation Absorption Adjustment Factor	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	ADDinh RME Construction Worker (mg/kg-day)	Lifetime Average Daily Dose - Inh. (mg/kg-day)	Excess Lifetime Cancer Risk - Inhalation
Benzene	1.00E+00	1	7.70E-03	4.47E-04	4.47E-04	3.44E-06
Chlorobenzene	1.00E+00	NA	NA	NA	NA	NC
Chloroform	1.00E+00	0.66	8.05E-02	2.95E-04	2.95E-04	2.38E-05
Tetrachloroethene	1.00E+00	1	2.00E-03	4.47E-04	4.47E-04	8.95E-07
Toluene	1.00E+00	NA	NA	NA	NA	NC
Trichloroethene	1.00E+00	1	6.00E-03	4.47E-04	4.47E-04	2.68E-06

14-Mar-01

TABLE
POTENTIAL CARCINOGENIC RISK
CONSTRUCTION WORKER - RME
TRENCH AIR

Constituent	Reference Risk (per mg/m3)	Site G		Site H		Site I		Site L	
		EPC (mg/m3)	Risk	EPC (mg/m3)	Risk	EPC (mg/m3)	Risk	EPC (mg/m3)	Risk
Benzene	3.44E-06	1.62E-02	5.60E-08	6.77E-02	2.33E-07	1.38E-02	4.76E-08	--	NC
Chlorobenzene	NC	6.74E-02	NC	6.74E-02	NC	2.22E-01	NC	--	NC
Chloroform	2.38E-05	--	NC	--	NC	7.95E-02	1.89E-06	--	NC
Tetrachloroethene	8.95E-07	3.13E-03	2.80E-09	7.95E-04	7.12E-10	6.99E-03	6.25E-09	1.74E-03	1.55E-09
Toluene	NC	--	NC	--	NC	--	NC	--	NC
Trichloroethene	2.68E-06	1.03E-02	2.77E-08	--	NC	--	NC	--	NC
	Total:		**8.65E-08**		**2.34E-07**		**1.94E-06**		**1.55E-09**

Notes:
-- Not a constituent of potential concern in this area/medium.
EPC - Exposure Point Concentration.
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.

SAUGET AREA 1 - EE/CA AND RI/FS
RME
NONCARCINOGENIC ASSESSMENT
INHALATION OF
TRENCH AIR
CONSTRUCTION WORKER - RME

Constituent	Unit Concentration In Air (mg/m^3 air)	Inhalation Absorption Adjustment Factor	Inhalation Reference Dose (mg/kg-day)	ADDinh RME Construction Worker (mg/kg-day)	Chronic Average Daily Dose-inh (mg/kg-day)	Hazard Index - Inhalation
Benzene	1.00E+00	1	1.70E-03	3.13E-02	3.13E-02	1.84E+01
Chlorobenzene	1.00E+00	1	5.71E-03	3.13E-02	3.13E-02	5.48E+00
Chloroform	1.00E+00	1	8.60E-05	3.13E-02	3.13E-02	3.64E+02
Tetrachloroethene	1.00E+00	1	1.14E-01	3.13E-02	3.13E-02	2.75E-01
Toluene	1.00E+00	1	1.14E-01	3.13E-02	3.13E-02	2.75E-01
Trichloroethene	1.00E+00	NA	NA	NA	NA	NC

TABLE
POTENTIAL CARCINOGENIC RISK
CONSTRUCTION WORKER - RME
TRENCH AIR

Constituent	Reference HQ (per mg/m3)	Site G		Site H		Site I		Site L	
		EPC (mg/m3)	HQ	EPC (mg/m3)	HQ	EPC (mg/m3)	HQ	EPC (mg/m3)	HQ
Benzene	1.84E+01	1.62E-02	2.99E-01	6.77E-02	1.25E+00	1.38E-02	2.54E-01	--	NC
Chlorobenzene	5.48E+00	6.74E-02	3.70E-01	6.74E-02	3.70E-01	2.22E-01	1.22E+00	--	NC
Chloroform	3.64E+02	--	NC	--	NC	7.95E-02	2.89E+01	--	NC
Tetrachloroethene	2.75E-01	3.13E-03	8.61E-04	7.95E-04	2.18E-04	6.99E-03	1.92E-03	1.74E-03	4.77E-04
Toluene	2.75E-01	--	NC	--	NC	--	NC	--	NC
Trichloroethene	NC	1.03E-02	NC	--	NC	--	NC	--	NC
	Total:		**6.70E-01**		**1.62E+00**		**3.04E+01**		**4.77E-04**

Notes:
-- Not a constituent of potential concern in this area/medium.
EPC - Exposure Point Concentration.
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.

SAUGET AREA 1 - EE/CA AND RI/FS
MLE

Receptors Evaluated	
Receptor 3:	MLE Construction Worker

ASSUMPTIONS FOR CONSTRUCTION WORKER MLE INCIDENTIAL INGESTION AND DERMAL CONTACT SOIL		Assumed Value	Units	Calculated Value
Soil Ingestion Rate	MLE Construction Worker	64	(mg soil/day)	
Soil on Skin	MLE Construction Worker	0.19	(mg/cm^2)	
Skin Exposed	MLE Construction Worker	3339	(cm^2)	
Body Weight	MLE Construction Worker	70	(kg)	
Exposure Frequency	MLE Construction Worker	20	(days)/365(days) =	5.48E-02
Exposure Duration (cancer)	MLE Construction Worker	1	(years)/70(years) =	1.43E-02
Exposure Duration (noncancer)	MLE Construction Worker	1	(yrs)/1(yrs) =	1.00E+00
Lifetime		70	(years)	
Unit Conversion Factor		1.00E-06	(kg/mg)	

14-Mar-01

SAUGET AREA 1 - EE/CA AND RI/FS
MLE
POTENTIAL CARCINOGENIC RISK
INCIDENTIAL INGESTION AND DERMAL CONTACT
SOIL
CONSTRUCTION WORKER MLE

Constituent	Unit Concentration in Soil (mg/kg soil)	Oral - Soil Absorption Adjustment Factor	Dermal - Soil Absorption Adjustment Factor	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	ADDing MLE Construction Worker (mg/kg-day)	Lifetime Average Daily Dose-Ing. (mg/kg-day)	ADDder MLE Construction Worker (mg/kg-day)	Lifetime Average Daily Dose-Der. (mg/kg-day)	Excess Lifetime Cancer Risk - Ingestion	Excess Lifetime Cancer Risk - Dermal Contact	Total Excess Lifetime Cancer Risk
1,4-Dichlorobenzene	1.00E+00	1	0.01	2.40E-02	7.16E-10	7.16E-10	7.09E-11	7.09E-11	1.72E-11	1.70E-12	1.89E-11
2,4,6-Trichlorophenol	1.00E+00	1	0.01	1.10E-02	7.16E-10	7.16E-10	7.09E-11	7.09E-11	7.87E-12	7.80E-13	8.65E-12
2,4-Dichlorophenol	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
4-Nitroaniline	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Antimony	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Arsenic	1.00E+00	0.3	0.001	1.50E+00	2.15E-10	2.15E-10	7.09E-12	7.09E-12	3.22E-10	1.06E-11	3.33E-10
Benzene	1.00E+00	1	0.02	1.50E-02	7.16E-10	7.16E-10	1.42E-10	1.42E-10	1.07E-11	2.13E-12	1.29E-11
Benzo(a)anthracene	1.00E+00	0.29	0.02	7.30E-01	2.08E-10	2.08E-10	1.42E-10	1.42E-10	1.52E-10	1.04E-10	2.55E-10
Benzo(a)pyrene	1.00E+00	0.29	0.02	7.30E+00	2.08E-10	2.08E-10	1.42E-10	1.42E-10	1.52E-09	1.04E-09	2.55E-09
Benzo(b)fluoranthene	1.00E+00	0.29	0.02	7.30E-01	2.08E-10	2.08E-10	1.42E-10	1.42E-10	1.52E-10	1.04E-10	2.55E-10
Cadmium	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Chlorobenzene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Chloroform	1.00E+00	1	0.01	6.10E-03	7.16E-10	7.16E-10	7.09E-11	7.09E-11	4.37E-12	4.33E-13	4.80E-12
Dibenzo(a,h)anthracene	1.00E+00	0.29	0.02	7.30E+00	2.08E-10	2.08E-10	1.42E-10	1.42E-10	1.52E-09	1.04E-09	2.55E-09
Lead	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Nickel	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Pentachlorophenol	1.00E+00	1	0.01	1.20E-01	7.16E-10	7.16E-10	7.09E-11	7.09E-11	8.59E-11	8.51E-12	9.44E-11
Tetrachloroethene	1.00E+00	1	0.01	5.20E-02	7.16E-10	7.16E-10	7.09E-11	7.09E-11	3.72E-11	3.69E-12	4.09E-11
Toluene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Total PCBs	1.00E+00	0.83	0.04	2.00E+00	5.94E-10	5.94E-10	2.84E-10	2.84E-10	1.19E-09	5.68E-10	1.76E-09
1,2,4-Trichlorobenzene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
1,2-Dichlorobenzene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Barium	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Beryllium	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Hexachlorobenzene	1.00E+00	0.83	0.04	1.60E+00	5.94E-10	5.94E-10	2.84E-10	2.84E-10	9.50E-10	4.54E-10	1.40E-09
Manganese	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Methylene Chloride	1.00E+00	1	0.016	7.50E-03	7.16E-10	7.16E-10	1.14E-10	1.14E-10	5.37E-12	8.51E-13	6.22E-12
Phosphorous	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Selenium	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Toxaphene	1.00E+00	1	0.01	1.10E+00	7.16E-10	7.16E-10	7.09E-11	7.09E-11	7.87E-10	7.80E-11	8.65E-10

TABLE
POTENTIAL CARCINOGENIC RISK - MLE
INCIDENTIAL INGESTION AND DERMAL CONTACT
SOIL
CONSTRUCTION WORKER MLE
SAUGET AREA 1 - EE/CA AND RI/FS

Constituent	Reference Risk (per mg/kg)	Site G		Site H		Site I		Site L	
		EPC (mg/kg)	Risk	EPC (mg/kg)	Risk	EPC (mg/kg)	Risk	EPC (mg/kg)	Risk
1,4-Dichlorobenzene	1.89E-11	--	NC	6.32E+03	1.19E-07	2.55E+02	4.81E-09	--	NC
2,4,6-Trichlorophenol	8.65E-12	--	NC	3.07E+02	2.65E-09	--	NC	--	NC
2,4-Dichlorophenol	NC	--	NC	1.50E+02	NC	--	NC	--	NC
4-Nitroaniline	NC	--	NC	1.83E+03	NC	--	NC	--	NC
Antimony	NC	--	NC	--	NC	2.23E+03	NC	--	NC
Arsenic	3.33E-10	--	NC	--	NC	--	NC	5.36E+01	1.78E-08
Benzene	1.29E-11	1.53E+01	1.97E-10	1.52E+01	1.96E-10	3.81E+00	4.90E-11	2.01E+00	2.58E-11
Benzo(a)anthracene	2.55E-10	--	NC	1.26E+02	3.22E-08	--	NC	--	NC
Benzo(a)pyrene	2.55E-09	--	NC	1.36E+02	3.48E-07	--	NC	--	NC
Benzo(b)fluoranthene	2.55E-10	--	NC	7.10E+01	1.81E-08	--	NC	--	NC
Cadmium	NC	--	NC	1.88E+02	NC	--	NC	--	NC
Chlorobenzene	NC	1.08E+02	NC	9.76E+01	NC	3.47E+01	NC	1.25E+00	NC
Chloroform	4.80E-12	1.16E+01	5.58E-11	--	NC	--	NC	6.80E+00	3.26E-11
Dibenzo(a,h)anthracene	2.55E-09	--	NC	3.17E+01	8.09E-08	--	NC	--	NC
Lead	NC	--	NC	--	NC	2.06E+03	NC	--	NC
Nickel	NC	--	NC	1.77E+03	NC	--	NC	--	NC
Pentachlorophenol	9.44E-11	1.32E+03	1.24E-07	--	NC	--	NC	--	NC
Tetrachloroethene	4.09E-11	1.88E+01	7.69E-10	--	NC	--	NC	--	NC
Toluene	NC	4.85E+01	NC	2.28E+01	NC	1.13E+01	NC	6.65E+01	NC
Total PCBs	1.76E-09	9.08E+02	1.59E-06	2.73E+03	4.80E-06	1.81E+02	3.17E-07	2.58E+02	4.53E-07
1,2,4-Trichlorobenzene	NC	--	NC	1.33E+03	NC	1.40E+03	NC	--	NC
1,2-Dichlorobenzene	NC	--	NC	6.48E+03	NC	8.29E+01	NC	--	NC
Barium	NC	5.00E+03	NC	--	NC	--	NC	--	NC
Beryllium	NC	--	NC	--	NC	1.53E+03	NC	--	NC
Hexachlorobenzene	1.40E-09	3.43E+01	4.82E-08	--	NC	2.58E+02	3.63E-07	4.80E+00	6.74E-09
Manganese	NC	--	NC	3.86E+03	NC	--	NC	--	NC
Methylene Chloride	6.22E-12	--	NC	6.34E+00	3.94E-11	--	NC	--	NC
Phosphorous	NC	5.37E+02	NC	--	NC	--	NC	--	NC
Selenium	NC	--	NC	--	NC	1.32E+03	NC	--	NC
Toxaphene	8.65E-10	--	NC	--	NC	4.93E+02	4.26E-07	--	NC
	Total:		1.77E-06		5.40E-06		1.11E-06		4.78E-07

Notes:
-- Not a constituent of potential concern in this area/medium.
EPC - Exposure Point Concentration.
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.
(a) - Higher of surface soil and subsurface soil EPC used.

SAUGET AREA 1 - EE/CA AND RI/FS
MLE
NONCARCINOGENIC HAZARD INDEX
INCIDENTIAL INGESTION AND DERMAL CONTACT
SOIL
CONSTRUCTION WORKER MLE

Constituent	Unit Concentration in Soil (mg/kg-soil)	Oral - Soil Absorption Adjustment Factor	Dermal - Soil Absorption Adjustment Factor	Oral Reference Dose (mg/kg-day)	ADDing MLE Construction Worker (mg/kg-day)	Chronic Average Daily Dose-Ing. (mg/kg-day)	ADDder LE Construction Worker (mg/kg-day)	Chronic Average Daily Dose-Der. (mg/kg-day)	Hazard Index - Ingestion	Hazard Index - Dermal Contact	Total Hazard Index
1,4-Dichlorobenzene	1.00E+00	1	0.01	3.00E-02	5.01E-08	5.01E-08	4.97E-09	4.97E-09	1.67E-06	1.66E-07	1.84E-06
2,4,6-Trichlorophenol	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
2,4-Dichlorophenol	1.00E+00	1	0.01	3.00E-03	5.01E-08	5.01E-08	4.97E-09	4.97E-09	1.67E-05	1.66E-06	1.84E-05
4-Nitroaniline	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Antimony	1.00E+00	1	0.007	4.00E-04	5.01E-08	5.01E-08	3.48E-09	3.48E-09	1.25E-04	8.69E-06	1.34E-04
Arsenic	1.00E+00	0.3	0.001	3.00E-04	1.50E-08	1.50E-08	4.97E-10	4.97E-10	5.01E-05	1.66E-06	5.18E-05
Benzene	1.00E+00	1	0.02	3.00E-03	5.01E-08	5.01E-08	9.93E-09	9.93E-09	1.67E-05	3.31E-06	2.00E-05
Benzo(a)anthracene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Benzo(a)pyrene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Benzo(b)fluoranthene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Cadmium	1.00E+00	1	0.04	5.00E-04	5.01E-08	5.01E-08	1.99E-08	1.99E-08	1.00E-04	3.97E-05	1.40E-04
Chlorobenzene	1.00E+00	1	0.01	2.00E-02	5.01E-08	5.01E-08	4.97E-09	4.97E-09	2.50E-06	2.48E-07	2.75E-06
Chloroform	1.00E+00	1	0.01	1.00E-02	5.01E-08	5.01E-08	4.97E-09	4.97E-09	5.01E-06	4.97E-07	5.51E-06
Dibenzo(a,h)anthracene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Lead	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC
Nickel	1.00E+00	1	0.08	2.00E-02	5.01E-08	5.01E-08	3.97E-08	3.97E-08	2.50E-06	1.99E-06	4.49E-06
Pentachlorophenol	1.00E+00	1	0.01	3.00E-02	5.01E-08	5.01E-08	4.97E-09	4.97E-09	1.67E-06	1.66E-07	1.84E-06
Tetrachloroethene	1.00E+00	1	0.01	1.00E-02	5.01E-08	5.01E-08	4.97E-09	4.97E-09	5.01E-06	4.97E-07	5.51E-06
Toluene	1.00E+00	1	0.01	2.00E-01	5.01E-08	5.01E-08	4.97E-09	4.97E-09	2.50E-07	2.48E-08	2.75E-07
Total PCBs	1.00E+00	0.83	0.04	2.00E-05	4.16E-08	4.16E-08	1.99E-08	1.99E-08	2.08E-03	9.93E-04	3.07E-03
1,2,4-Trichlorobenzene	1.00E+00	1	0.01	1.00E-02	5.01E-08	5.01E-08	4.97E-09	4.97E-09	5.01E-06	4.97E-07	5.51E-06
1,2-Dichlorobenzene	1.00E+00	1	0.01	9.00E-02	5.01E-08	5.01E-08	4.97E-09	4.97E-09	5.57E-07	5.52E-08	6.12E-07
Barium	1.00E+00	1	0.001	7.00E-02	5.01E-08	5.01E-08	4.97E-10	4.97E-10	7.16E-07	7.09E-09	7.23E-07
Beryllium	1.00E+00	1	0.1	2.00E-03	5.01E-08	5.01E-08	4.97E-08	4.97E-08	2.50E-05	2.48E-05	4.99E-05
Hexachlorobenzene	1.00E+00	0.83	0.04	8.00E-04	4.16E-08	4.16E-08	1.99E-08	1.99E-08	5.20E-05	2.48E-05	7.68E-05
Manganese	1.00E+00	1	0.01	4.67E-02	5.01E-08	5.01E-08	4.97E-09	4.97E-09	1.07E-06	1.06E-07	1.18E-06
Methylene Chloride	1.00E+00	1	0.016	6.00E-02	5.01E-08	5.01E-08	7.95E-09	7.95E-09	8.35E-07	1.32E-07	9.67E-07
Phosphorous	1.00E+00	1	0.001	2.00E-05	5.01E-08	5.01E-08	4.97E-10	4.97E-10	2.50E-03	2.48E-05	2.53E-03
Selenium	1.00E+00	1	0.001	5.00E-03	5.01E-08	5.01E-08	4.97E-10	4.97E-10	1.00E-05	9.93E-08	1.01E-05
Toxaphene	1.00E+00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC

TABLE
POTENTIAL HAZARD INDEX - MLE
INCIDENTIAL INGESTION AND DERMAL CONTACT
SOIL
CONSTRUCTION WORKER MLE
SAUGET AREA 1 - EE/CA AND RI/FS

	Reference	Site G		Site H		Site I		Site L	
Constituent	HI (per mg/kg)	EPC (mg/kg)	HQ	EPC (mg/kg)	HQ	EPC (mg/kg)	HQ	EPC (mg/kg)	HQ
1,4-Dichlorobenzene	1.84E-06	--	NC	6.32E+03	1.16E-02	2.55E+02	4.67E-04	--	NC
2,4,6-Trichlorophenol	NC	--	NC	3.07E+02	NC	--	NC	--	NC
2,4-Dichlorophenol	1.84E-05	--	NC	1.50E+02	2.76E-03	--	NC	--	NC
4-Nitroaniline	NC	--	NC	1.83E+03	NC	--	NC	--	NC
Antimony	1.34E-04	--	NC	--	NC	2.23E+03	2.99E-01	--	NC
Arsenic	5.18E-05	--	NC	--	NC	--	NC	5.36E+01	2.78E-03
Benzene	2.00E-05	1.53E+01	3.07E-04	1.52E+01	3.05E-04	3.81E+00	7.62E-05	2.01E+00	4.01E-05
Benzo(a)anthracene	NC	--	NC	1.26E+02	NC	--	NC	--	NC
Benzo(a)pyrene	NC	--	NC	1.36E+02	NC	--	NC	--	NC
Benzo(b)fluoranthene	NC	--	NC	7.10E+01	NC	--	NC	--	NC
Cadmium	1.40E-04	--	NC	1.88E+02	2.63E-02	--	NC	--	NC
Chlorobenzene	2.75E-06	1.08E+02	2.99E-04	9.76E+01	2.69E-04	3.47E+01	9.54E-05	1.25E+00	3.44E-06
Chloroform	5.51E-06	1.16E+01	6.40E-05	--	NC	--	NC	6.80E+00	3.74E-05
Dibenzo(a,h)anthracene	NC	--	NC	3.17E+01	NC	--	NC	--	NC
Lead	NC	--	NC	--	NC	2.06E+03	NC	--	NC
Nickel	4.49E-06	--	NC	1.77E+03	7.93E-03	--	NC	--	NC
Pentachlorophenol	1.84E-06	1.32E+03	2.42E-03	--	NC	--	NC	--	NC
Tetrachloroethene	5.51E-06	1.88E+01	1.04E-04	--	NC	--	NC	--	NC
Toluene	2.75E-07	4.85E+01	1.33E-05	2.28E+01	6.28E-06	1.13E+01	3.10E-06	6.65E+01	1.83E-05
Total PCBs	3.07E-03	9.08E+02	2.79E+00	2.73E+03	8.40E+00	1.81E+02	5.55E-01	2.58E+02	7.93E-01
1,2,4-Trichlorobenzene	5.51E-06	--	NC	1.33E+03	7.33E-03	1.40E+03	7.70E-03	--	NC
1,2-Dichlorobenzene	6.12E-07	--	NC	6.48E+03	3.97E-03	8.29E+01	5.07E-05	--	NC
Barium	7.23E-07	5.00E+03	3.62E-03	--	NC	--	NC	--	NC
Beryllium	4.99E-05	--	NC	--	NC	1.53E+03	7.63E-02	--	NC
Hexachlorobenzene	7.68E-05	3.43E+01	2.63E-03	--	NC	2.58E+02	1.98E-02	4.80E+00	3.69E-04
Manganese	1.18E-06	--	NC	3.86E+03	4.56E-03	--	NC	--	NC
Methylene Chloride	9.67E-07	--	NC	6.34E+00	6.13E-06	--	NC	--	NC
Phosphorous	2.53E-03	5.37E+02	1.36E+00	--	NC	--	NC	--	NC
Selenium	1.01E-05	--	NC	--	NC	1.32E+03	1.34E-02	--	NC
Toxaphene	NC	--	NC	--	NC	4.93E+02	NC	--	NC
	Total HI:		4.16E+00		8.46E+00		9.71E-01		7.96E-01

Notes:
-- Not a constituent of concern in this area/medium.
EPC - Exposure Point Concentration.
HI - Hazard Index
HQ - Hazard Quotient
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium
(a) - Higher of surface soil and subsurface soil EPC used

SAUGET AREA 1 - EE/CA AND RI/FS
MLE

Receptors Evaluated:	
Receptor 1:	MLE Construction Worker

ASSUMPTIONS FOR CONSTRUCTION WORKER - MLE INHALATION OF OUTDOOR AIR PARTICULATES		Assumed Value	Units	Calculated Value
Inhalation Rate	MLE Construction Worker	1.5	(m^3 air/hour)	
Body Weight	MLE Construction Worker	70	(kg)	
Exposure Time	MLE Construction Worker	8	(hrs/day) =	8.00E+00
Exposure Frequency	MLE Construction Worker	20	(days)/365 (days) =	5.48E-02
Exposure Duration (cancer)	MLE Construction Worker	1	(yrs)/70(yrs) =	1.43E-02
Exposure Duration (noncancer)	MLE Construction Worker	1	(yrs)/1(yrs) =	1.00E+00
Lifetime		70	(years)	

SAUGET AREA 1 - EE/CA AND RI/FS
CARCINOGENIC ASSESSMENT
INHALATION OF
OUTDOOR AIR PARTICULATES
CONSTRUCTION WORKER - MLE

Constituent	Unit Concentration In Air (mg/m^3 air)	Inhalation Absorption Adjustment Factor	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	ADDinh MLE Construction Worker (mg/kg-day)	Lifetime Average Daily Dose - Inh. (mg/kg-day)	Excess Lifetime Cancer Risk - Inhalation
1,4-Dichlorobenzene	1.00E+00	1	2.20E-02	1.34E-04	1.34E-04	2.95E-06
2,4,6-Trichlorophenol	1.00E+00	1	1.09E-02	1.34E-04	1.34E-04	1.46E-06
2,4-Dichlorophenol	1.00E+00	1	NA	1.34E-04	1.34E-04	NC
4-Nitroaniline	1.00E+00	NA	NA	NA	NA	NC
Antimony	1.00E+00	NA	NA	NA	NA	NC
Arsenic	1.00E+00	1	1.50E+01	1.34E-04	1.34E-04	2.01E-03
Benzene	1.00E+00	1	7.70E-03	1.34E-04	1.34E-04	1.03E-06
Benzo(a)anthracene	1.00E+00	1	3.10E-01	1.34E-04	1.34E-04	4.16E-05
Benzo(a)pyrene	1.00E+00	1	3.10E+00	1.34E-04	1.34E-04	4.16E-04
Benzo(b)fluoranthene	1.00E+00	1	3.10E-01	1.34E-04	1.34E-04	4.16E-05
Cadmium	1.00E+00	1	6.30E+00	1.34E-04	1.34E-04	8.45E-04
Chlorobenzene	1.00E+00	NA	NA	NA	NA	NC
Chloroform	1.00E+00	0.66	8.05E-02	8.86E-05	8.86E-05	7.13E-06
Dibenzo(a,h)anthracene	1.00E+00	1	3.10E+00	1.34E-04	1.34E-04	4.16E-04
Lead	1.00E+00	NA	NA	NA	NA	NC
Nickel	1.00E+00	NA	NA	NA	NA	NC
Pentachlorophenol	1.00E+00	NA	NA	NA	NA	NC
Tetrachloroethene	1.00E+00	1	2.00E-03	1.34E-04	1.34E-04	2.68E-07
Toluene	1.00E+00	NA	NA	NA	NA	NC
Total PCBs	1.00E+00	1	2.00E+00	1.34E-04	1.34E-04	2.68E-04
1,2,4-Trichlorobenzene	1.00E+00	NA	NA	NA	NA	NC
1,2-Dichlorobenzene	1.00E+00	NA	NA	NA	NA	NC
Barium	1.00E+00	NA	NA	NA	NA	NC
Beryllium	1.00E+00	1	8.40E+00	1.34E-04	1.34E-04	1.13E-03
Hexachlorobenzene	1.00E+00	1.1	1.61E+00	1.48E-04	1.48E-04	2.38E-04
Manganese	1.00E+00	NA	NA	NA	NA	NC
Methylene Chloride	1.00E+00	1	1.65E-03	1.34E-04	1.34E-04	2.21E-07
Phosphorous	1.00E+00	NA	NA	NA	NA	NC
Selenium	1.00E+00	NA	NA	NA	NA	NC
Toxaphene	1.00E+00	1	1.12E+00	1.34E-04	1.34E-04	1.50E-04

TABLE
CARCINOGENIC ASSESSMENT
INHALATION OF
OUTDOOR AIR PARTICULATES
CONSTRUCTION WORKER - MLE

Constituent	Reference Risk (per mg/m3)	Site G		Site H		Site I		Site L	
		EPC (mg/m3)	Risk	EPC (mg/m3)	Risk	EPC (mg/m3)	Risk	EPC (mg/m3)	Risk
1,4-Dichlorobenzene	2.95E-06	--	NC	3.79E-04	1.12E-09	1.53E-05	4.51E-11	--	NC
2,4,6-Trichlorophenol	1.46E-06	--	NC	1.84E-05	2.68E-11	--	NC	--	NC
2,4-Dichlorophenol	NC	--	NC	9.01E-06	NC	--	NC	--	NC
4-Nitroaniline	NC	--	NC	1.10E-04	NC	--	NC	--	NC
Antimony	NC	--	NC	--	NC	1.34E-04	NC	--	NC
Arsenic	2.01E-03	--	NC	--	NC	--	NC	3.22E-06	6.48E-09
Benzene	1.03E-06	9.21E-07	9.51E-13	9.13E-07	9.43E-13	2.28E-07	2.36E-13	1.20E-07	1.24E-13
Benzo(a)anthracene	4.16E-05	--	NC	7.58E-06	3.15E-10	--	NC	--	NC
Benzo(a)pyrene	4.16E-04	--	NC	8.18E-06	3.40E-09	--	NC	--	NC
Benzo(b)fluoranthene	4.16E-05	--	NC	4.26E-06	1.77E-10	--	NC	--	NC
Cadmium	8.45E-04	--	NC	1.13E-05	9.54E-09	--	NC	--	NC
Chlorobenzene	NC	6.51E-06	NC	5.86E-06	NC	2.08E-06	NC	7.49E-08	NC
Chloroform	7.13E-06	6.98E-07	4.97E-12	--	NC	--	NC	4.08E-07	2.91E-12
Dibenzo(a,h)anthracene	4.16E-04	--	NC	1.90E-06	7.91E-10	--	NC	--	NC
Lead	NC	--	NC	--	NC	1.24E-04	NC	--	NC
Nickel	NC	--	NC	1.06E-04	NC	--	NC	--	NC
Pentachlorophenol	NC	7.91E-05	NC	--	NC	--	NC	--	NC
Tetrachloroethene	2.68E-07	1.13E-06	3.03E-13	--	NC	--	NC	--	NC
Toluene	NC	2.91E-06	NC	1.37E-06	NC	6.76E-07	NC	3.99E-06	NC
Total PCBs	2.68E-04	5.45E-05	1.46E-08	1.64E-04	4.40E-08	1.08E-05	2.91E-09	1.55E-05	4.15E-09
1,2,4-Trichlorobenzene	NC	--	NC	7.99E-05	NC	8.39E-05	NC	--	NC
1,2-Dichlorobenzene	NC	--	NC	3.89E-04	NC	4.97E-06	NC	--	NC
Barium	NC	3.00E-04	NC	--	NC	--	NC	--	NC
Beryllium	1.13E-03	--	NC	--	NC	9.18E-05	1.03E-07	--	NC
Hexachlorobenzene	2.38E-04	2.06E-06	4.89E-10	--	NC	1.55E-05	3.68E-09	2.88E-07	6.84E-11
Manganese	NC	--	NC	2.32E-04	NC	--	NC	--	NC
Methylene Chloride	2.21E-07	--	NC	3.80E-07	8.39E-14	--	NC	--	NC
Phosphorous	NC	3.22E-05	NC	--	NC	--	NC	--	NC
Selenium	NC	--	NC	--	NC	7.92E-05	NC	--	NC
Toxaphene	1.50E-04	--	NC	--	NC	2.96E-05	4.44E-09	--	NC
	Total:		1.51E-08		5.94E-08		1.15E-07		1.07E-08

Notes:
-- Not a constituent of potential concern in this area/medium.
EPC - Exposure Point Concentration.
NC - Not Calculated.
(a) - Higher of the surface soil and subsurface soil EPC used.

SAUGET AREA 1 - EE/CA AND RI/FS
NONCARCINOGENIC ASSESSMENT
INHALATION OF
OUTDOOR AIR PARTICULATES
CONSTRUCTION WORKER - MLE

Constituent	Unit Concentration In Air (mg/m^3 air)	Inhalation Absorption Adjustment Factor	Inhalation Reference Dose (mg/kg-day)	ADDinh MLE Construction Worker (mg/kg-day)	Chronic Average Daily Dose-inh (mg/kg-day)	Hazard Index - Inhalation
1,4-Dichlorobenzene	1.00E+00	1	2.29E-01	9.39E-03	9.39E-03	4.10E-02
2,4,6-Trichlorophenol	1.00E+00	NA	NA	NA	NA	NC
2,4-Dichlorophenol	1.00E+00	1	NA	9.39E-03	9.39E-03	NC
4-Nitroaniline	1.00E+00	1	5.71E-05	9.39E-03	9.39E-03	1.64E+02
Antimony	1.00E+00	NA	NA	NA	NA	NC
Arsenic	1.00E+00	NA	NA	NA	NA	NC
Benzene	1.00E+00	1	1.70E-03	9.39E-03	9.39E-03	5.53E+00
Benzo(a)anthracene	1.00E+00	NA	NA	NA	NA	NC
Benzo(a)pyrene	1.00E+00	NA	NA	NA	NA	NC
Benzo(b)fluoranthene	1.00E+00	NA	NA	NA	NA	NC
Cadmium	1.00E+00	NA	NA	NA	NA	NC
Chlorobenzene	1.00E+00	1	5.71E-03	9.39E-03	9.39E-03	1.65E+00
Chloroform	1.00E+00	1	8.60E-05	9.39E-03	9.39E-03	1.09E+02
Dibenzo(a,h)anthracene	1.00E+00	NA	NA	NA	NA	NC
Lead	1.00E+00	NA	NA	NA	NA	NC
Nickel	1.00E+00	NA	NA	NA	NA	NC
Pentachlorophenol	1.00E+00	NA	NA	NA	NA	NC
Tetrachloroethene	1.00E+00	1	1.14E-01	9.39E-03	9.39E-03	8.24E-02
Toluene	1.00E+00	1	1.14E-01	9.39E-03	9.39E-03	8.24E-02
Total PCBs	1.00E+00	NA	NA	NA	NA	NC
1,2,4-Trichlorobenzene	1.00E+00	1	5.71E-02	9.39E-03	9.39E-03	1.64E-01
1,2-Dichlorobenzene	1.00E+00	NA	NA	NA	NA	NC
Barium	1.00E+00	1	1.43E-04	9.39E-03	9.39E-03	6.58E+01
Beryllium	1.00E+00	1	5.71E-06	9.39E-03	9.39E-03	1.64E+03
Hexachlorobenzene	1.00E+00	NA	NA	NA	NA	NC
Manganese	1.00E+00	1	1.43E-05	9.39E-03	9.39E-03	6.58E+02
Methylene Chloride	1.00E+00	1	8.60E-01	9.39E-03	9.39E-03	1.09E-02
Phosphorous	1.00E+00	NA	NA	NA	NA	NC
Selenium	1.00E+00	NA	NA	NA	NA	NC
Toxaphene	1.00E+00	NA	NA	NA	NA	NC

TABLE
NONCARCINOGENIC ASSESSMENT
INHALATION OF
OUTDOOR AIR PARTICULATES
CONSTRUCTION WORKER - MLE

	Reference	Site G		Site H		Site I		Site L	
Constituent	HQ (per mg/m3)	EPC (mg/m3)	HQ	EPC (mg/m3)	HQ	EPC (mg/m3)	HQ	EPC (mg/m3)	HQ
1,4-Dichlorobenzene	4.10E-02	--	NC	3.79E-04	1.56E-05	1.53E-05	6.26E-07	--	NC
2,4,6-Trichlorophenol	NC	--	NC	1.84E-05	NC	--	NC	--	NC
2,4-Dichlorophenol	NC	--	NC	9.01E-06	NC	--	NC	--	NC
4-Nitroaniline	1.64E+02	--	NC	1.10E-04	1.81E-02	--	NC	--	NC
Antimony	NC	--	NC	--	NC	1.34E-04	NC	--	NC
Arsenic	NC	--	NC	--	NC	--	NC	3.22E-06	NC
Benzene	5.53E+00	9.21E-07	5.09E-06	9.13E-07	5.05E-06	2.28E-07	1.26E-06	1.20E-07	6.65E-07
Benzo(a)anthracene	NC	--	NC	7.58E-06	NC	--	NC	--	NC
Benzo(a)pyrene	NC	--	NC	8.18E-06	NC	--	NC	--	NC
Benzo(b)fluoranthene	NC	--	NC	4.26E-06	NC	--	NC	--	NC
Cadmium	NC	--	NC	1.13E-05	NC	--	NC	--	NC
Chlorobenzene	1.65E+00	6.51E-06	1.07E-05	5.86E-06	9.63E-06	2.08E-06	3.42E-06	7.49E-08	1.23E-07
Chloroform	1.09E+02	6.98E-07	7.62E-05	--	NC	--	NC	4.08E-07	4.46E-05
Dibenzo(a,h)anthracene	NC	--	NC	1.90E-06	NC	--	NC	--	NC
Lead	NC	--	NC	--	NC	1.24E-04	NC	--	NC
Nickel	NC	--	NC	1.06E-04	NC	--	NC	--	NC
Pentachlorophenol	NC	7.91E-05	NC	--	NC	--	NC	--	NC
Tetrachloroethene	8.24E-02	1.13E-06	9.30E-08	--	NC	--	NC	--	NC
Toluene	8.24E-02	2.91E-06	2.40E-07	1.37E-06	1.13E-07	6.76E-07	5.57E-08	3.99E-06	3.29E-07
Total PCBs	NC	5.45E-05	NC	1.64E-04	NC	1.08E-05	NC	1.55E-05	NC
1,2,4-Trichlorobenzene	1.64E-01	--	NC	7.99E-05	1.31E-05	8.39E-05	1.38E-05	--	NC
1,2-Dichlorobenzene	NC	--	NC	3.89E-04	NC	4.97E-06	NC	--	NC
Barium	6.58E+01	3.00E-04	1.97E-02	--	NC	--	NC	--	NC
Beryllium	1.64E+03	--	NC	--	NC	9.18E-05	1.51E-01	--	NC
Hexachlorobenzene	NC	2.06E-06	NC	--	NC	1.55E-05	NC	2.88E-07	NC
Manganese	6.58E+02	--	NC	2.32E-04	1.52E-01	--	NC	--	NC
Methylene Chloride	1.09E-02	--	NC	3.80E-07	4.15E-09	--	NC	--	NC
Phosphorous	NC	3.22E-05	NC	--	NC	--	NC	--	NC
Selenium	NC	--	NC	--	NC	7.92E-05	NC	--	NC
Toxaphene	NC	--	NC	--	NC	2.96E-05	NC	--	NC
	Total HI:		1.98E-02		1.70E-01		1.51E-01		4.57E-05

Notes:
-- Not a constituent of potential concern in this area/medium.
HQ - Hazard Quotient.
HI - Hazard Index.
EPC - Exposure Point Concentration.
NC - Not Calculated.
(a) - Higher of the surface soil and subsurface soil EPC used.

SAUGET AREA 1 - EE/CA AND RI/FS
MLE

Receptors Evaluated:	
Receptor 3:	MLE Construction Worker

ASSUMPTIONS FOR CONSTRUCTION WORKER-MLE INCIDENTAL INGESTION AND DERMAL CONTACT GROUNDWATER		Assumed Value	Units	Calculated Value
Water Ingestion Rate	MLE Construction Worker	0.005	(l/day)	
Skin Exposed	MLE Construction Worker	3339	(cm^2)	
Body Weight	MLE Construction Worker	70	(kg)	
Exposure Time (dermal route only)	MLE Construction Worker	1	(hr/day)	
Exposure Frequency	MLE Construction Worker	5	(days)/365 (days) =	1.37E-02
Exposure Duration (cancer)	MLE Construction Worker	1	(yrs)/ 70(yrs) =	1.43E-02
Exposure Duration (noncancer)	MLE Construction Worker	1	(yrs)/ 1(yrs) =	1.00E+00
Lifetime		70	(years)	
Unit Conversion Factor (dermal route only)		0.001	(l/cm^3)	

14-Mar-01

SAUGET AREA 1 - EE/CA AND RI/FS
MLE
CARCINOGENIC ASSESSMENT
INCIDENTAL INGESTION AND DERMAL CONTACT
GROUNDWATER
CONSTRUCTION WORKER - MLE

Constituent	Unit Concentration In Groundwater (mg/l)	Oral - Water Absorption Adjustment Factor	Dermal - Water Absorption Adjustment Factor	Dermal PeMLEability Constant (cm/hr)	Oral Cancer Slope Factor (mg/kg-day)⁻¹	ADDing Construction Worker (mg/kg-day)	Lifetime Average Daily Dose-Ing. (mg/kg-day)	ADDder Construction Worker (mg/kg-day)	Lifetime Average Daily Dose-Der. (mg/kg-day)	Excess Lifetime Cancer Risk - Ingestion	Excess Lifetime Cancer Risk - Dermal Contact	Total Excess Lifetime Cancer Risk
1,4-Dichlorobenzene	1.00E+00	1	1	6.20E-02	2.40E-02	1.40E-08	1.40E-08	5.79E-07	5.79E-07	3.35E-10	1.39E-08	1.42E-08
2,4,6-Trichlorophenol	1.00E+00	1	1	5.00E-02	1.10E-02	1.40E-08	1.40E-08	4.67E-07	4.67E-07	1.54E-10	5.13E-09	5.29E-09
3/4-Methylphenol	1.00E+00	NA	NA	1.00E-02	NA	NA	NA	NA	NA	NA	NA	NC
Arsenic	1.00E+00	1	1	1.60E-04	1.50E+00	1.40E-08	1.40E-08	1.49E-09	1.49E-09	2.10E-08	2.24E-09	2.32E-08
Benzene	1.00E+00	1	2.13	2.10E-02	1.50E-02	1.40E-08	1.40E-08	4.18E-07	4.18E-07	2.10E-10	6.26E-09	6.47E-09
Cadmium	1.00E+00	NA	NA	1.00E-03	NA	NA	NA	NA	NA	NA	NA	NC
Chlorobenzene	1.00E+00	NA	NA	4.10E-02	NA	NA	NA	NA	NA	NA	NA	NC
Chloroform	1.00E+00	1	1	8.90E-03	6.10E-03	1.40E-08	1.40E-08	8.31E-08	8.31E-08	8.53E-11	5.07E-10	5.92E-10
gamma-BHC	1.00E+00	1	1	1.40E-02	1.30E+00	1.40E-08	1.40E-08	1.31E-07	1.31E-07	1.82E-08	1.70E-07	1.88E-07
Lead	1.00E+00	NA	NA	4.00E-06	NA	NA	NA	NA	NA	NA	NA	NC
Nitrobenzene	1.00E+00	NA	NA	6.96E-03	NA	NA	NA	NA	NA	NA	NA	NC
Pentachlorophenol	1.00E+00	1	1	6.50E-01	1.20E-01	1.40E-08	1.40E-08	6.07E-06	6.07E-06	1.68E-09	7.28E-07	7.30E-07
Tetrachloroethene	1.00E+00	1	1	4.80E-02	5.20E-02	1.40E-08	1.40E-08	4.48E-07	4.48E-07	7.27E-10	2.33E-08	2.40E-08
Trichloroethene	1.00E+00	1	1	1.60E-02	1.10E-02	1.40E-08	1.40E-08	1.49E-07	1.49E-07	1.54E-10	1.64E-09	1.80E-09
2,4-D	1.00E+00	NA	NA	8.45E-03	NA	NA	NA	NA	NA	NA	NA	NC
2,4-Dinitrotoluene	1.00E+00	NA	NA	3.80E-03	NA	NA	NA	NA	NA	NA	NA	NC
Barium	1.00E+00	NA	NA	1.60E-04	NA	NA	NA	NA	NA	NA	NA	NC
Hexachlorobenzene	1.00E+00	1	1.1	2.10E-01	1.60E+00	1.40E-08	1.40E-08	2.16E-06	2.16E-06	2.24E-08	3.45E-06	3.47E-06
Pyridine	1.00E+00	NA	NA	1.82E-03	NA	NA	NA	NA	NA	NA	NA	NC

TABLE
POTENTIAL CARCINOGENIC RISK - MLE
INCIDENTAL INGESTION AND DERMAL CONTACT
GROUNDWATER
CONSTRUCTION WORKER- MLE

Constituent	Reference Risk (per mg/L)	Site G		Site H		Site I		Site L	
		EPC (mg/L)	Risk	EPC (mg/L)	Risk	EPC (mg/L)	Risk	EPC (mg/L)	Risk
1,4-Dichlorobenzene	1.42E-08	--	NC	3.55E-01	5.05E-09	5.99E-01	8.52E-09	2.53E-01	3.59E-09
2,4,6-Trichlorophenol	5.29E-09	1.27E+00	6.72E-09	3.02E-02	1.60E-10	--	NC	--	NC
3/4-Methylphenol	NC	--	NC	1.12E-01	NC	--	NC	--	NC
Arsenic	2.32E-08	--	NC	1.70E-01	3.95E-09	--	NC	2.73E-01	6.32E-09
Benzene	6.47E-09	2.04E-01	1.32E-09	5.23E-01	3.39E-09	1.82E-01	1.18E-09	--	NC
Cadmium	NC	6.75E-02	NC	4.52E+00	NC	2.64E-01	NC	1.60E-01	NC
Chlorobenzene	NC	8.24E-01	NC	8.46E-01	NC	2.62E+00	NC	--	NC
Chloroform	5.92E-10	--	NC	--	NC	7.33E-01	4.34E-10	--	NC
gamma-BHC	1.88E-07	2.00E-03	3.76E-10	--	NC	--	NC	--	NC
Lead	NC	6.09E+00	NC	8.19E+00	NC	2.61E+00	NC	--	NC
Nitrobenzene	NC	3.96E-02	NC	--	NC	1.30E-02	NC	--	NC
Pentachlorophenol	7.30E-07	4.63E-01	3.38E-07	1.74E-01	1.27E-07	1.29E+00	9.43E-07	1.31E-01	9.58E-08
Tetrachloroethene	2.40E-08	4.39E-02	1.05E-09	1.65E-02	3.96E-10	8.00E-02	1.92E-09	3.48E-02	8.36E-10
Trichloroethene	1.80E-09	2.45E-02	4.40E-11	--	NC	--	NC	--	NC
2,4-D	NC	1.32E+01	NC	9.29E-02	NC	--	NC	--	NC
2,4-Dinitrotoluene	NC	--	NC	--	NC	2.83E-02	NC	--	NC
Barium	NC	2.94E+00	NC	--	NC	1.50E+01	NC	--	NC
Hexachlorobenzene	3.47E-06	--	NC	1.80E-02	6.25E-08	--	NC	--	NC
Pyridine	NC	--	NC	--	NC	--	NC	1.69E-01	NC
	Total:		3.47E-07		2.03E-07		9.55E-07		1.07E-07

Notes:

-- Not a constituent of potential concern in this area/medium.
EPC - Exposure Point Concentration.

NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.
(a) - Risks divided by the number of wells in

SAUGET AREA 1 - EE/CA AND RI/FS
MLE
NONCARCINOGENIC ASSESSMENT
INCIDENTAL INGESTION AND DERMAL CONTACT
GROUNDWATER
CONSTRUCTION WORKER - MLE

Constituent	Unit Concentration In Groundwater (mg/l)	Oral - Water Absorption Adjustment Factor	Dermal - Water Absorption Adjustment Factor	Dermal PeMLEability Constant (cm/hr)	Oral Reference Dose (mg/kg-day)	ADDing Construction Worker (mg/kg-day)	Chronic Average Daily Dose-Ing. (mg/kg-day)	ADDder Construction Worker (mg/kg-day)	Chronic Average Daily Dose-Der. (mg/kg-day)	Hazard Index - Ingestion	Hazard Index - Dermal Contact	Total Hazard Index
1,4-Dichlorobenzene	1.00E+00	1	1	6.20E-02	3.00E-02	9.78E-07	9.78E-07	4.05E-05	4.05E-05	3.26E-05	1.35E-03	1.38E-03
2,4,6-Trichlorophenol	1.00E+00	NA	NA	5.00E-02	NA	NA	NA	NA	NA	NA	NA	NC
3/4-Methylphenol	1.00E+00	1	1	1.00E-02	5.00E-02	9.78E-07	9.78E-07	6.53E-06	6.53E-06	1.96E-05	1.31E-04	1.50E-04
Arsenic	1.00E+00	1	1	1.60E-04	3.00E-04	9.78E-07	9.78E-07	1.05E-07	1.05E-07	3.26E-03	3.48E-04	3.61E-03
Benzene	1.00E+00	1	2.13	2.10E-02	3.00E-03	9.78E-07	9.78E-07	2.92E-05	2.92E-05	3.26E-04	9.74E-03	1.01E-02
Cadmium	1.00E+00	1	40	1.00E-03	5.00E-04	9.78E-07	9.78E-07	2.61E-05	2.61E-05	1.96E-03	5.23E-02	5.42E-02
Chlorobenzene	1.00E+00	1	1	4.10E-02	2.00E-02	9.78E-07	9.78E-07	2.68E-05	2.68E-05	4.89E-05	1.34E-03	1.39E-03
Chloroform	1.00E+00	1	1	8.90E-03	1.00E-02	9.78E-07	9.78E-07	5.82E-06	5.82E-06	9.78E-05	5.82E-04	6.79E-04
gamma-BHC	1.00E+00	1	1	1.40E-02	3.00E-04	9.78E-07	9.78E-07	9.15E-06	9.15E-06	3.26E-03	3.05E-02	3.38E-02
Lead	1.00E+00	NA	NA	4.00E-06	NA	NA	NA	NA	NA	NA	NA	NC
Nitrobenzene	1.00E+00	1	1	6.96E-03	5.00E-04	9.78E-07	9.78E-07	4.55E-06	4.55E-06	1.96E-03	9.10E-03	1.11E-02
Pentachlorophenol	1.00E+00	1	1	6.50E-01	3.00E-02	9.78E-07	9.78E-07	4.25E-04	4.25E-04	3.26E-05	1.42E-02	1.42E-02
Tetrachloroethene	1.00E+00	1	1	4.80E-02	1.00E-02	9.78E-07	9.78E-07	3.14E-05	3.14E-05	9.78E-05	3.14E-03	3.23E-03
Trichloroethene	1.00E+00	1	1	1.60E-02	6.00E-03	9.78E-07	9.78E-07	1.05E-05	1.05E-05	1.63E-04	1.74E-03	1.91E-03
2,4-D	1.00E+00	1	1	8.45E-03	1.00E-02	9.78E-07	9.78E-07	5.52E-06	5.52E-06	9.78E-05	5.52E-04	6.50E-04
2,4-Dinitrotoluene	1.00E+00	1	1	3.80E-03	2.00E-03	9.78E-07	9.78E-07	2.48E-06	2.48E-06	4.89E-04	1.24E-03	1.73E-03
Barium	1.00E+00	1	1	1.60E-04	7.00E-02	9.78E-07	9.78E-07	1.05E-07	1.05E-07	1.40E-05	1.49E-06	1.55E-05
Hexachlorobenzene	1.00E+00	1	1.1	2.10E-01	8.00E-04	9.78E-07	9.78E-07	1.51E-04	1.51E-04	1.22E-03	1.89E-01	1.90E-01
Pyridine	1.00E+00	1	1	1.82E-03	1.00E-03	9.78E-07	9.78E-07	1.19E-06	1.19E-06	9.78E-04	1.19E-03	2.17E-03

TABLE
POTENTIAL CARCINOGENIC RISK - MLE
INCIDENTAL INGESTION AND DERMAL CONTACT
GROUNDWATER
CONSTRUCTION WORKER- MLE

Constituent	Reference HQ (per mg/L)	Site G		Site H		Site I		Site L	
		EPC (mg/L)	HQ	EPC (mg/L)	HQ	EPC (mg/L)	HQ	EPC (mg/L)	HQ
1,4-Dichlorobenzene	1.38E-03	--	NC	3.55E-01	4.91E-04	5.99E-01	8.28E-04	2.53E-01	3.49E-04
2,4,6-Trichlorophenol	NC	1.27E+00	NC	3.02E-02	NC	--	NC	--	NC
3/4-Methylphenol	1.50E-04	--	NC	1.12E-01	1.68E-05	--	NC	--	NC
Arsenic	3.61E-03	--	NC	1.70E-01	6.14E-04	--	NC	2.73E-01	9.84E-04
Benzene	1.01E-02	2.04E-01	2.05E-03	5.23E-01	5.27E-03	1.82E-01	1.83E-03	--	NC
Cadmium	5.42E-02	6.75E-02	3.66E-03	4.52E+00	2.45E-01	2.64E-01	1.43E-02	1.60E-01	8.68E-03
Chlorobenzene	1.39E-03	8.24E-01	1.14E-03	8.46E-01	1.17E-03	2.62E+00	3.63E-03	--	NC
Chloroform	6.79E-04	--	NC	--	NC	7.33E-01	4.98E-04	--	NC
gamma-BHC	3.38E-02	2.00E-03	6.75E-05	--	NC	--	NC	--	NC
Lead	NC	6.09E+00	NC	8.19E+00	NC	2.61E+00	NC	--	NC
Nitrobenzene	1.11E-02	3.96E-02	4.38E-04	--	NC	1.30E-02	1.44E-04	--	NC
Pentachlorophenol	1.42E-02	4.63E-01	6.56E-03	1.74E-01	2.47E-03	1.29E+00	1.83E-02	1.31E-01	1.86E-03
Tetrachloroethene	3.23E-03	4.39E-02	1.42E-04	1.65E-02	5.34E-05	8.00E-02	2.59E-04	3.48E-02	1.13E-04
Trichloroethene	1.91E-03	2.45E-02	4.67E-05	--	NC	--	NC	--	NC
2,4-D	6.50E-04	1.32E+01	8.56E-03	9.29E-02	6.04E-05	--	NC	--	NC
2,4-Dinitrotoluene	1.73E-03	--	NC	--	NC	2.83E-02	4.90E-05	--	NC
Barium	1.55E-05	2.94E+00	4.54E-05	--	NC	1.50E+01	2.32E-04	--	NC
Hexachlorobenzene	1.90E-01	--	NC	1.80E-02	3.42E-03	--	NC	--	NC
Pyridine	2.17E-03	--	NC	--	NC	--	NC	1.69E-01	3.67E-04
	Total:		**2.27E-02**		**2.59E-01**		**4.01E-02**		**1.24E-02**

Notes:

-- Not a constituent of potential concern in this area/medium.
HI - Hazard Index.
HQ - Hazard Quotient.
EPC - Exposure Point Concentration.
NC - Not Calculated, no dose-response value

SAUGET AREA 1 - EE/CA AND RI/FS
MLE

Receptors Evaluated:	
Receptor:	MLE Construction Worker

ASSUMPTIONS FOR CONSTRUCTION WORKER - MLE INHALATION OF TRENCH AIR		Assumed Value	Units	Calculated Value
Inhalation Rate	MLE Construction Worker	1.5	(m^3 air/hour)	
Body Weight	MLE Construction Worker	70	(kg)	
Exposure Time	MLE Construction Worker	8	(hrs/day) =	8.00E+00
Exposure Frequency	MLE Construction Worker	20	(days)/365 (days) =	5.48E-02
Exposure Duration (cancer)	MLE Construction Worker	1	(yrs)/70(yrs) =	1.43E-02
Exposure Duration (noncancer)	MLE Construction Worker	1	(yrs)/1(yrs) =	1.00E+00
Lifetime		70	(years)	

SAUGET AREA 1 - EE/CA AND RI/FS
MLE

CARCINOGENIC ASSESSMENT
INHALATION OF
TRENCH AIR
CONSTRUCTION WORKER - MLE

Constituent	Unit Concentration In Air (mg/m^3 air)	Inhalation Absorption Adjustment Factor	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	ADDinh MLE Construction Worker (mg/kg-day)	Lifetime Average Daily Dose - Inh. (mg/kg-day)	Excess Lifetime Cancer Risk - Inhalation
Benzene	1.00E+00	1	7.70E-03	1.34E-04	1.34E-04	1.03E-06
Chlorobenzene	1.00E+00	NA	NA	NA	NA	NC
Chloroform	1.00E+00	0.66	8.05E-02	8.86E-05	8.86E-05	7.13E-06
Tetrachloroethene	1.00E+00	1	2.00E-03	1.34E-04	1.34E-04	2.68E-07
Toluene	1.00E+00	NA	NA	NA	NA	NC
Trichloroethene	1.00E+00	1	6.00E-03	1.34E-04	1.34E-04	8.05E-07

14-Mar-01

TABLE
POTENTIAL CARCINOGENIC RISK
CONSTRUCTION WORKER - MLE
TRENCH AIR

Constituent	Reference Risk (per mg/m3)	Site G		Site H		Site I		Site L	
		EPC (mg/m3)	Risk	EPC (mg/m3)	Risk	EPC (mg/m3)	Risk	EPC (mg/m3)	Risk
Benzene	1.03E-06	5.52E-03	5.70E-09	1.42E-02	1.46E-08	4.93E-03	5.09E-09	--	NC
Chlorobenzene	NC	2.06E-02	NC	2.11E-02	NC	6.53E-02	NC	--	NC
Chloroform	7.13E-06	--	NC	--	NC	2.01E-02	1.43E-07	--	NC
Tetrachloroethene	2.68E-07	1.06E-03	2.84E-10	3.98E-04	1.07E-10	1.93E-03	5.17E-10	8.39E-04	2.25E-10
Toluene	NC	--	NC	--	NC	--	NC	--	NC
Trichloroethene	8.05E-07	3.21E-03	2.58E-09	--	NC	--	NC	--	NC
	Total:		**8.57E-09**		**1.48E-08**		**1.49E-07**		**2.25E-10**

Notes:
-- Not a constituent of potential concern in this area/medium.
EPC - Exposure Point Concentration.
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.

SAUGET AREA 1 - EE/CA AND RI/FS
MLE
NONCARCINOGENIC ASSESSMENT
INHALATION OF
TRENCH AIR
CONSTRUCTION WORKER - MLE

Constituent	Unit Concentration In Air (mg/m^3 air)	Inhalation Absorption Adjustment Factor	Inhalation Reference Dose (mg/kg-day)	ADDinh MLE Construction Worker (mg/kg-day)	Chronic Average Daily Dose-inh (mg/kg-day)	Hazard Index - Inhalation
Benzene	1.00E+00	1	1.70E-03	9.39E-03	9.39E-03	5.53E+00
Chlorobenzene	1.00E+00	1	5.71E-03	9.39E-03	9.39E-03	1.65E+00
Chloroform	1.00E+00	1	8.60E-05	9.39E-03	9.39E-03	1.09E+02
Tetrachloroethene	1.00E+00	1	1.14E-01	9.39E-03	9.39E-03	8.24E-02
Toluene	1.00E+00	1	1.14E-01	9.39E-03	9.39E-03	8.24E-02
Trichloroethene	1.00E+00	NA	NA	NA	NA	NC

TABLE
POTENTIAL CARCINOGENIC RISK
CONSTRUCTION WORKER - MLE
TRENCH AIR

Constituent	Reference HQ (per mg/m3)	Site G		Site H		Site I		Site L	
		EPC (mg/m3)	HQ	EPC (mg/m3)	HQ	EPC (mg/m3)	HQ	EPC (mg/m3)	HQ
Benzene	5.53E+00	5.52E-03	3.05E-02	1.42E-02	7.83E-02	4.93E-03	2.72E-02	--	NC
Chlorobenzene	1.65E+00	2.06E-02	3.38E-02	2.11E-02	3.47E-02	6.53E-02	1.07E-01	--	NC
Chloroform	1.09E+02	--	NC	--	NC	2.01E-02	2.19E+00	--	NC
Tetrachloroethene	8.24E-02	1.06E-03	8.72E-05	3.98E-04	3.28E-05	1.93E-03	1.59E-04	8.39E-04	6.91E-05
Toluene	8.24E-02	--	NC	--	NC	--	NC	--	NC
Trichloroethene	NC	3.21E-03	NC	--	NC	--	NC	--	NC
	Total:		**6.44E-02**		**1.13E-01**		**2.33E+00**		**6.91E-05**

Notes:
-- Not a constituent of potential concern in this area/medium.
EPC - Exposure Point Concentration.
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.

ATTACHMENT 2

TABLE SUMMARIZING WORKPLAN DEVIATIONS

Table 1-1
Modifications from Workplan
Sauget Area 1 EE/CA and RI/FS
Human Health Risk Assessment

Modification	Rationale
No comparison to Minimal Risk Levels (MRLs) was performed in the Short Term Risk Assessment.	No Short Term Constituents of Potential Concern (STCOPCs) were identified in soil.
No acute risk calculations were performed for the Short Term Risk Assessment.	The only STOPCs identified did not exhibit excess risks or hazards in the chronic risk assessment. Therefore, they would not exhibit excess risks or hazards in the short term risk assessment.
Site subsurface waste data were not collected.	Although the workplan indicated that this data would be collected, it was not stipulated in the Site Sampling Plan (SSP). An evaluation using historical data is presented in Appendix T.
Industry-Specific Analytes: copper, zinc, fluorides and phosphorous data were not validated.	Although the workplan indicated that this data would be validated, it was not stipulated in the SSP.
The Class II groundwater criteria were not adjusted for cumulative effects.	The TACO guidance does not require this adjustment for Class II standards.
Site M, CS-B, CS-C, CS-D, CS-E, the reference area and portions of CS-F were not included in the risk assessment.	Under an UAO, a sediment removal action is planned, thereby eliminating these areas as exposure areas.
Transects 1 and 2 (all media) were not included in the quantitative evaluation for any receptor.	No Constituents of Potential Concern (COPCs) were identified in these areas.
Site G surface soil was not included in the quantitative evaluation for any receptor.	No COPCs were identified in soil for Site G.
Site N surface soil was only included in the quantitative evaluation for residential receptors.	No COPCs were identified for the industrial scenario for soils in Site N.
The quantitative evaluation of the Indoor Industrial Worker, the Outdoor Industrial Worker, the Construction Worker, and the Resident did not include inhalation of constituents volatilized from Site subsurface waste or Transect subsurface soil. The quantitative evaluation of the Trespassing Teenager did not include inhalation of constituents volatilized from Site subsurface waste.	Site subsurface waste data were not collected, as collection of this data was not stipulated by the SSP. No volatile organic compounds (VOCs) were identified as COPCs in Transect subsurface soil.
The quantitative evaluation of the Recreation Teenager and the Recreational Fisher did not include ingestion of and dermal contact with surface water.	No COPCs were identified in surface water.
The quantitative evaluation of the Resident did not include inhalation of constituents volatilized from groundwater.	The only COPC identified in residential wells was lead, which is not volatile.
The produce ingestion rates for the adult and child resident changed (see Table 5-7 of the workplan and Table 5-6 of the risk assessment).	The produce ingestion rates were adjusted for cooking loss and dry weight.

ATTACHMENT 3

REVISED APPENDIX J – EVALUATION OF AMBIENT AIR MONITORING DATA

APPENDIX J

EVALUATION OF AMBIENT AIR MONITORING DATA

APPENDIX J
EVALUATION OF AMBIENT AIR MONITORING DATA

This appendix presents the upwind and downwind ambient air monitoring data collected at Sites G, H, I and L to determine the tendency of site constituents to enter the atmosphere and local wind patterns. At Site G, air samples were collected at two upwind and two downwind locations. At Sites H, I, and L, air samples were collected at one upwind and two downwind locations. Figure 3-7 of the main text identifies the ambient air sampling locations. Air samples were analyzed for VOCs, SVOCs, PCBs, dioxins, and metals. Table J-22 presents the volume of air collected for each sample. The results are discussed by analyte group below.

VOCs

Table J-1 presents the upwind or background air concentrations for VOCs for each site. Tables J-2 through J-5 present the comparison of each downwind sample concentration to upwind concentrations and to the PRGs for ambient air (USEPA, 1999a) for Sites G, H, I, and L, respectively. Comparisons are made on a sample-by-sample basis. As discussed in Section 3.3.6 of the report, 4-methyl-2-pentanone, acetone and methylene chloride are all common laboratory contaminants, however, review of the field blank data did not clearly indicate a problem with sample collection or analysis. Methylene chloride was identified as a COPC in all four sites. However, the numerical results are sporadic (see Table 3-7 and this appendix). For example, in each downwind sample pair, methylene chloride was detected at a high concentration in one sample, and not detected or detected at a much lower concentration in the second downwind sample. As samples were collected from all areas on the same day, such spikes would not be expected. Moreover, methylene chloride was not identified as a COPC in site soils or groundwater. Therefore, although it is not indicated by the sample blank evaluations, laboratory contamination seems to be the most likely source of methylene chloride in these samples.

SVOCs

Table J-6 presents the upwind or background air concentrations for SVOCs for each site. Tables J-7 through J-10 present the comparison of each downwind sample concentration to upwind concentrations and to the PRGs for ambient air (USEPA, 1999a) for Sites G, H, I, and L, respectively. Comparisons are made on a sample-by-sample basis. No COPCs were identified.

PCBs

PCBs were not detected in the air samples.

Dioxins

Table J-11 presents the upwind or background air concentrations for dioxins for each site. Table J-12 presents the comparison of each downwind sample concentration to upwind concentrations and to the PRGs for ambient air (USEPA, 1999a) for Sites G, H, I, and L. Comparisons are made on a sample-by-sample basis. None of the site downwind sample concentrations of dioxins exceed the PRG. Therefore, dioxin is not identified as a COPC in air based on this evaluation.

Metals

Table J-13 presents the upwind or background air concentrations for metals for each site. Tables J-14 through J-17 present the comparison of each downwind sample concentration to upwind concentrations and to the PRGs for ambient air (USEPA, 1999a) for Sites G, H, I, and L, respectively. Comparisons are made on a sample-by-sample basis. Cadmium in Site I is the only constituent identified as a COPC in this evaluation. Cadmium was not detected at the Site I downwind #1 location, and was detected above the PRG at the downwind #2 location. The PRG is a concentration in ambient air that is considered to be safe for daily, 24-hour per day exposures. It is calculated using an age-adjusted inhalation factor that accounts for exposure for 6 years as a child and 24 years as an adult. As noted in the main text of the report, the sites are industrial areas that are expected to remain industrial in the future. Therefore, the PRG for cadmium in ambient air of 0.001 ug/m^3 (which is based on a 1 x 10^{-6} target risk level) can be adjusted to account for an 8-hour workday and a 250 day work year by an adult. The resulting value is 0.0069 ug/m^3 at a 1 x 10^{-6} target risk level, and 0.069 ug/m^3 at a target risk level of 1 x 10^{-5}. The cadmium concentration detected at Site I is well below this latter value.

Short-Term Exposure Evaluation

Tables J-18 through J-21 present the short-term exposure evaluation for the ambient air monitoring data for VOCs, SVOCs, dioxins, and metals, respectively. As discussed in Section 7.0 of the main text of the report, the short-term evaluation consists of comparing the average concentration of each constituent to a concentration equal to 100 times the appropriate PRG or air standard. Methylene chloride in Sites G, I, and L is the only COPC identified in the short-term exposure evaluation. This result is discussed in more detail in Section 7.2.6 of the main text of the report.

TABLE J-1
UPWIND (BACKGROUND) AIR CONCENTRATIONS - VOLATILE ORGANIC COMPOUNDS
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Site	G			H	I	L
Location	UP#1	UP#2		UP#1	UP#1	UP#1
Sample (a)	AIR-V-9	AIR-V-10	Maximum	AIR-V-6	AIR-V-3	AIR-V-13
Constituent	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	32.5733	ND	ND
2-Butanone	ND	ND	ND	ND	24.0175	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND
Acetone	ND	ND	ND	ND	283.8428	ND
Ethylbenzene	2.7926	1.7878	2.7926	ND	ND	1.3086
Isopropylbenzene	ND	1.6687	1.6687	ND	1.4192	ND
m&p-Xylene	4.2553	2.503	4.2553	ND	1.4192	1.3086
Methylene chloride	152.9255	ND	152.9255	ND	300.2183	ND
n-Butylbenzene	ND	ND	ND	ND	ND	ND
o-Xylene	3.4575	2.1454	3.4575	ND	ND	1.3086
p-Isopropyltoluene	ND	ND	ND	ND	ND	ND
s-Butylbenzene	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND
t-Butylbenzene	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	4.8035	ND

Notes:
(a) - Sum of tube 1 and tube 2. One-half the detection limit was used for constituents reported as "Not Detected" if constituent was detected in one tube and not the other. If one-half the detection limit was greater than the detected concentration for a constituent, that detection limit was not used, in accordance with Risk Assessment Guidance for Superfund. (USEPA, 1989).

TABLE J-2
SITE G DOWNWIND AIR CONCENTRATIONS - VOLATILE ORGANIC COMPOUNDS
COMPARISON TO BACKGROUND AND SCREENING CRITERIA
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Comparison Values		Downwind Location #1 (DW#1) Screen				Downwind Location #2 (DW#2) Screen				
Location Sample (a) Constituent	Maximum Upwind ug/m3	PRG (b) ug/m3	DW#1 AIR-V-7 ug/m3	Is DW #1 Conc> Upwind?	Is DW #1 Conc> PRG?	DW #1 COPC?	DW#2 AIR-V-8 ug/m3	Is DW #2 Conc> Upwind?	Is DW #2 Conc> PRG?	DW #2 COPC?	Site G COPC?
2-Butanone	ND	1000	16.81	ND	No	No, <PRG	ND	ND	ND	No, ND	No
4-Methyl-2-pentanone	ND	83	106.19	ND	Yes	Yes, >PRG/BK	ND	ND	ND	No, ND	Yes
Acetone	ND	370	761.06	ND	Yes	Yes, >PRG/BK	ND	ND	ND	No, ND	Yes
Ethylbenzene	2.79	1100	17.70	Yes	No	No, <PRG	1.45	No	No	No, <PRG/BK	No
Isopropylbenzene	1.67	400	22.12	Yes	No	No, <PRG	ND	ND	ND	No, ND	No
m&p-Xylene	4.26	730	19.47	Yes	No	No, <PRG	3.02	No	No	No, <PRG/BK	No
Methylene chloride	152.93	4.1	72.57	No	Yes	No, <BK	2424.43	Yes	Yes	Yes, >PRG/BK	Yes
n-Butylbenzene	ND	36.5	ND	ND	ND	No, ND	1.45	ND	No	No, <PRG	No
o-Xylene	3.46	730	17.70	Yes	No	No, <PRG	2.90	No	No	No, <PRG/BK	No
p-Isopropyltoluene	ND	730	8.85	ND	No	No, <PRG	ND	ND	ND	No, ND	No
Styrene	ND	1100	20.35	ND	No	No, <PRG	ND	ND	ND	No, ND	No
t-Butylbenzene	ND	36.5	9.38	ND	No	No, <PRG	ND	ND	ND	No, ND	No
Tetrachloroethene	ND	3.3	2.92	ND	No	No, <PRG	ND	ND	ND	No, ND	No
Toluene	ND	400	166.81	ND	No	No, <PRG	ND	ND	ND	No, ND	No

Notes:
COPC - Constituent of Potential Concern.
ND - Not Detected.
PRG - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
(a) - Sum of tube 1 and tube 2. One-half the detection limit was used for constituents reported as "Not Detected" if constituent was detected in one tube and not the other. If one-half the detection limit was greater than the detected concentration for a constituent, that detection limit was not used, in accordance with Risk Assessment Guidance for Superfund. (USEPA, 1989).
(b) - See Appendix C Table C-5 for references.

TABLE J-3
SITE H DOWNWIND AIR CONCENTRATIONS - VOLATILE ORGANIC COMPOUNDS
COMPARISON TO BACKGROUND AND SCREENING CRITERIA
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Comparison Values		Downwind Location #1 (DW#1) Screen				Downwind Location #2 (DW#2) Screen				
Location Sample (a) Constituent	Maximum Upwind ug/m3	PRG (b) ug/m3	DW#1 AIR-V-5 ug/m3	Is DW #1 Conc> Upwind?	Is DW #1 Conc> PRG?	DW #1 COPC?	DW#2 AIR-V-4 ug/m3	Is DW #2 Conc> Upwind?	Is DW #2 Conc> PRG?	DW #2 COPC?	Site H COPC?
1,1,1-Trichloroethane	ND	1000	11.87	ND	No	No, <PRG	ND	ND	ND	No, ND	No
1,1-Dichloroethene	32.57	0.038	27.47	No	Yes	Yes, >PRG, <BK	ND	ND	ND	No, ND	No
2-Butanone	ND	1000	ND	ND	ND	No, ND	24.68	ND	No	No, <PRG	No
Acetone	ND	370	ND	ND	ND	No, ND	24.03	ND	No	No, <PRG	No
Ethylbenzene	ND	1100	ND	ND	ND	No, ND	1.82	ND	No	No, <PRG	No
Isopropylbenzene	ND	400	ND	ND	ND	No, ND	2.34	ND	No	No, <PRG	No
m&p-Xylene	ND	730	ND	ND	ND	No, ND	2.21	ND	No	No, <PRG	No
Methylene chloride	ND	4.1	ND	ND	ND	No, ND	14.29	ND	Yes	Yes, >PRG/BK	Yes
o-Xylene	ND	730	ND	ND	ND	No, ND	2.73	ND	No	No, <PRG	No
s-Butylbenzene	ND	36.5	ND	ND	ND	No, ND	2.21	ND	No	No, <PRG	No
t-Butylbenzene	ND	36.5	ND	ND	ND	No, ND	0.71	ND	No	No, <PRG	No
Tetrachloroethene	ND	3.3	ND	ND	ND	No, ND	0.91	ND	No	No, <PRG	No
Trichloroethene	ND	1.1	ND	ND	ND	No, ND	6.69	ND	Yes	Yes, >PRG/BK	Yes

Notes:
COPC - Constituent of Potential Concern.
ND - Not Detected.
PRG - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
(a) - Sum of tube 1 and tube 2. One-half the detection limit was used for constituents reported as "Not Detected" if constituent was detected in one tube and not the other. If one-half the detection limit was greater than the detected concentration for a constituent, that detection limit was not used, in accordance with Risk Assessment Guidance for Superfund. (USEPA, 1989).
(b) - See Appendix C Table C-5 for references.

TABLE J-4
SITE I DOWNWIND AIR CONCENTRATIONS - VOLATILE ORGANIC COMPOUNDS
COMPARISON TO BACKGROUND AND SCREENING CRITERIA
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Comparison Values		Downwind Location #1 (DW#1) Screen				Downwind Location #2 (DW#2) Screen				
Location Sample (a) Constituent	Maximum Upwind ug/m3	PRG (b) ug/m3	DW#1 AIR-V-2 ug/m3	Is DW #1 Conc> Upwind?	Is DW #1 Conc> PRG?	DW #1 COPC?	DW#2 AIR-V-1 ug/m3	Is DW #2 Conc> Upwind?	Is DW #2 Conc> PRG?	DW #2 COPC?	Site I COPC?
Ethylbenzene	ND	1100	ND	ND	ND	No, ND	1.69	ND	No	No, <PRG	No
Methylene chloride	300.22	4.1	2100.15	Yes	Yes	Yes, >PRG/BK	18.87	No	Yes	No, <BK	Yes

Notes:
COPC - Constituent of Potential Concern.
ND - Not Detected.
PRG - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
(a) - Sum of tube 1 and tube 2. One-half the detection limit was used for constituents reported as "Not Detected" if constituent was detected in one tube and not the other. If one-half the detection limit was greater than the detected concentration for a constituent, that detection limit was not used, in accordance with Risk Assessment Guidance for Superfund. (USEPA, 1989).
(b) - See Appendix C Table C-5 for references.

TABLE J-5
SITE L DOWNWIND AIR CONCENTRATIONS - VOLATILE ORGANIC COMPOUNDS
COMPARISON TO BACKGROUND AND SCREENING CRITERIA
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Comparison Values		Downwind Location #1 (DW#1) Screen				Downwind Location #2 (DW#2) Screen				
Location Sample (a) Constituent	Maximum Upwind ug/m3	PRG (b) ug/m3	DW#1 AIR-V-11 ug/m3	Is DW #1 Conc> Upwind?	Is DW #1 Conc> PRG?	DW #1 COPC?	DW#2 AIR-V-12 ug/m3	Is DW #2 Conc> Upwind?	Is DW #2 Conc> PRG?	DW #2 COPC?	Site L COPC?
2-Butanone	ND	1000	ND	ND	ND	No, ND	30.53	ND	No	No, <PRG	No
m&p-Xylene	1.31	730	0.58	No	No	No, <PRG/BK	ND	ND	ND	No, ND	No
Methylene chloride	ND	4.1	893.84	ND	Yes	Yes, >PRG	ND	ND	ND	No, ND	Yes
o-Xylene	1.31	730	ND	ND	ND	No, ND	1.83	Yes	No	No, <PRG	No

Notes:
COPC - Constituent of Potential Concern.
ND - Not Detected.
PRG - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
(a) - Sum of tube 1 and tube 2. One-half the detection limit was used for constituents reported as "Not Detected" if constituent was detected in one tube and not the other. If one-half the detection limit was greater than the detected concentration for a constituent, that detection limit was not used, in accordance with Risk Assessment Guidance for Superfund. (USEPA, 1989).
(b) - See Appendix C Table C-5 for references.

TABLE J-6
UPWIND (BACKGROUND) AIR CONCENTRATIONS - SEMIVOLATILE ORGANIC COMPOUNDS
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Site	G			H	I	L
Location	UP#1	UP#2		UP#1	UP#1	UP#1
Sample	AIR-S-9	AIR-S-10	Maximum	AIR-S-6	AIR-S-3	AIR-S-13
Constituent	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)
1,4-Dichlorobenzene	0.016	ND	0.016	0.049	0.085	ND
2-Methylnaphthalene	0.104	0.120	0.120	0.090	0.136	0.154
Acenaphthene	ND	0.020	0.020	0.021	ND	0.034
Benzyl alcohol	0.032	ND	0.032	ND	ND	ND
bis(2-Ethylhexyl)phthalate	ND	0.070	0.070	0.052	ND	0.074
Dibenzofuran	0.020	0.022	0.022	0.021	ND	0.037
Diethylphthalate	0.049	ND	0.049	0.023	ND	0.024
Dimethylphthalate	0.049	0.053	0.053	0.043	0.039	0.031
Fluorene	0.017	ND	0.017	0.019	ND	0.029
Phenanthrene	0.018	0.027	0.027	0.040	0.033	ND
Phenol	ND	ND	ND	ND	ND	0.060

Notes:

TABLE J-7
SITE G DOWNWIND AIR CONCENTRATIONS - SEMIVOLATILE ORGANIC COMPOUNDS
COMPARISON TO BACKGROUND AND SCREENING CRITERIA
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Comparison Values		Downwind Location #1 (DW#1) Screen				Downwind Location #2 (DW#2) Screen				
Location / Sample / Constituent	Maximum Upwind (ug/m3)	PRG (a) (ug/m3)	DW#1 AIR-S-7 (ug/m3)	Is DW #1 Conc> Upwind?	Is DW #1 Conc> PRG?	DW #1 COPC?	DW#2 AIR-S-8 (ug/m3)	Is DW #2 Conc> Upwind?	Is DW #2 Conc> PRG?	DW #2 COPC?	Site G COPC?
2-Methylnaphthalene	0.120	3.1	0.113	No	No	No, <PRG/BK	0.144	Yes	No	No, <PRG	No
Acenaphthene	0.020	220	0.018	No	No	No, <PRG/BK	0.024	Yes	No	No, <PRG	No
bis(2-Ethylhexyl)phthalate	0.070	0.48	0.063	No	No	No, <PRG/BK	0.082	Yes	No	No, <PRG	No
Dibenzofuran	0.022	15	0.019	No	No	No, <PRG/BK	0.025	Yes	No	No, <PRG	No
Diethylphthalate	0.049	2900	ND	ND	ND	No, ND	0.025	No	No	No, <PRG/BK	No
Dimethylphthalate	0.053	37000	0.046	No	No	No, <PRG/BK	0.032	No	No	No, <PRG/BK	No
Fluorene	0.01721	150	0.01722	Yes	No	No, <PRG	0.024	Yes	No	No, <PRG	No
Phenanthrene	0.0270	1100	0.0275	Yes	No	No, <PRG	0.032	Yes	No	No, <PRG	No

Notes:
COPC - Constituent of Potential Concern.
ND - Not Detected.
PRG - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
(a) - The value for anthacene is used to evaluate phenanthrene, and the value for naphthalene is used for 2-methylnaphthalene.

TABLE J-8
SITE H DOWNWIND AIR CONCENTRATIONS - SEMIVOLATILE ORGANIC COMPOUNDS
COMPARISON TO BACKGROUND AND SCREENING CRITERIA
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Comparison Values		Downwind Location #1 (DW#1) Screen				Downwind Location #2 (DW#2) Screen				
Location / Sample / Constituent	Maximum Upwind (ug/m3)	PRG (a) (ug/m3)	DW#1 AIR-S-5 (ug/m3)	Is DW #1 Conc> Upwind?	Is DW #1 Conc> PRG?	DW #1 COPC?	DW#2 AIR-S-4 (ug/m3)	Is DW #2 Conc> Upwind?	Is DW #2 Conc> PRG?	DW #2 COPC?	Site H COPC?
1,4-Dichlorobenzene	0.049	0.31	0.041	No	No	No, <PRG/BK	0.064	Yes	No	No, <PRG	No
2-Methylnaphthalene	0.090	3.1	0.086	No	No	No, <PRG/BK	0.112	Yes	No	No, <PRG	No
Acenaphthene	0.021	220	0.018	No	No	No, <PRG/BK	0.022	Yes	No	No, <PRG	No
Dibenzofuran	0.0207	15	0.017	No	No	No, <PRG/BK	0.0213	Yes	No	No, <PRG	No
Dimethylphthalate	0.043	37000	0.033	No	No	No, <PRG/BK	0.073	Yes	No	No, <PRG	No
Fluorene	0.019	150	0.015	No	No	No, <PRG/BK	0.020	Yes	No	No, <PRG	No
Phenanthrene	0.040	1100	0.027	No	No	No, <PRG/BK	0.030	No	No	No, <PRG/BK	No

Notes:
COPC - Constituent of Potential Concern.
ND - Not Detected.
PRG - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
(a) - The value for anthacene is used to evaluate phenanthrene, and the value for naphthalene is used for 2-methylnaphthalene.

TABLE J-9
SITE I DOWNWIND AIR CONCENTRATIONS - SEMIVOLATILE ORGANIC COMPOUNDS
COMPARISON TO BACKGROUND AND SCREENING CRITERIA
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Comparison Values		Downwind Location #1 (DW#1) Screen				Downwind Location #2 (DW#2) Screen				
Location / Sample / Constituent	Maximum Upwind (ug/m3)	PRG (b) (ug/m3)	DW#1 AIR-S-2 (ug/m3)	Is DW #1 Conc> Upwind?	Is DW #1 Conc> PRG?	DW #1 COPC?	DW#2 AIR-S-1 (ug/m3)	Is DW #2 Conc> Upwind?	Is DW #2 Conc> PRG?	DW #2 COPC?	Site I COPC?
1,2-Dichlorobenzene	ND	210	0.259	ND	No	No, <PRG	0.083	ND	No	No, <PRG	No
1,4-Dichlorobenzene	0.085	0.31	0.420	Yes	Yes	No (b)	0.286	Yes	No	No, <PRG	No
2-Methylnaphthalene	0.136	3.1	0.122	No	No	No, <PRG/BK	0.102	No	No	No, <PRG/BK	No
2-Nitroaniline	ND	0.21	0.029	ND	No	No, <PRG	ND	ND	ND	No, ND	No
Acenaphthene	ND	220	0.038	ND	No	No, <PRG	0.031	ND	No	No, <PRG	No
bis(2-Ethylhexyl)phthalate	ND	0.48	0.070	ND	No	No, <PRG	0.074	ND	No	No, <PRG	No
Dibenzofuran	ND	15	0.038	ND	No	No, <PRG	0.034	ND	No	No, <PRG	No
Dimethylphthalate	0.039	37000	0.033	No	No	No, <PRG/BK	0.058	Yes	No	No, <PRG	No
Fluorene	ND	150	0.033	ND	No	No, <PRG	0.026	ND	No	No, <PRG	No
Phenanthrene	0.033	1100	0.059	Yes	No	No, <PRG	0.043	Yes	No	No, <PRG	No

Notes:
COPC - Constituent of Potential Concern.
ND - Not Detected.
PRG - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
(a) - The value for anthacene is used to evaluate phenanthrene, and the value for naphthalene is used for 2-methylnaphthalene.
(b) - The USEPA Integrated Risk Information System (IRIS) file for 1,4-dichlorobenzene provides an inhalation reference concentration (RfC) of 800 ug/m3. The DW#1 AIR-S-2 concentration is below this value. The PRG value is based on withdrawn values that are no longer considered appropriate for 1,4-dichlorobenzene based on its mechanism of toxicity. Moreover, the measured concentration is less than the PRG adjusted to account for an industrial rather than a residential exposure scenario of 2.13 ug/m3.

TABLE J-10
SITE L DOWNWIND AIR CONCENTRATIONS - SEMIVOLATILE ORGANIC COMPOUNDS
COMPARISON TO BACKGROUND AND SCREENING CRITERIA
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Comparison Values		Downwind Location #1 (DW#1) Screen				Downwind Location #2 (DW#2) Screen				
Location / Sample / Constituent	Maximum Upwind (ug/m3)	PRG (a) (ug/m3)	DW#1 AIR-S-11 (ug/m3)	Is DW #1 Conc> Upwind?	Is DW #1 Conc> PRG?	DW #1 COPC?	DW#2 AIR-S-12 (ug/m3)	Is DW #2 Conc> Upwind?	Is DW #2 Conc> PRG?	DW #2 COPC?	Site L COPC?
1,4-Dichlorobenzene	ND	0.31	0.017	ND	No	No, <PRG	0.024	ND	No	No, <PRG	No
2-Methylnaphthalene	0.154	3.1	0.123	No	No	No, <PRG/BK	0.149	No	No	No, <PRG/BK	No
Acenaphthene	0.034	220	0.023	No	No	No, <PRG/BK	0.033	No	No	No, <PRG/BK	No
bis(2-Ethylhexyl)phthalate	0.074	0.48	ND	ND	ND	No, ND	0.078	Yes	No	No, <PRG	No
Dibenzofuran	0.0369	15	0.028	No	No	No, <PRG/BK	0.0372	Yes	No	No, <PRG	No
Diethylphthalate	0.024	2900	ND	ND	ND	No, ND	0.032	Yes	No	No, <PRG	No
Dimethylphthalate	0.031	37000	0.028	No	No	No, <PRG/BK	0.041	Yes	No	No, <PRG	No
Fluorene	0.029	150	0.023	No	No	No, <PRG/BK	0.030	Yes	No	No, <PRG	No
Phenanthrene	ND	1100	0.037	ND	No	No, <PRG	ND	ND	ND	No, ND	No

Notes:
COPC - Constituent of Potential Concern.
ND - Not Detected.
PRG - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
(a) - The value for anthacene is used to evaluate phenanthrene, and the value for naphthalene is used for 2-methylnaphthalene.

TABLE J-11
UPWIND (BACKGROUND) AIR CONCENTRATIONS - DIOXINS
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Site	G			H	I	L
Location	UP#1	UP#2		UP#1	UP#1	UP#1
Sample (a)	AIR-D-9	AIR-S-10	Maximum	AIR-D-6	AIR-D-3	AIR-D-13
Constituent	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)
Total TCDD-TEQ	1.43E-08	5.74E-09	1.43E-08	8.66E-10	3.30E-08	1.40E-08

Notes:
TCDD-TEQ - 2,3,7,8-Tetrachloro-dibenzo-p-dioxin Toxic Equivalent.

TABLE J-12
SITE DOWNWIND AIR CONCENTRATIONS - DIOXINS
COMPARISON TO BACKGROUND AND SCREENING CRITERIA
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Site	Location	Sample	Maximum Upwind (ug/m3)	PRG (ug/m3)	Sample TCDD-TEQ Concentration (ug/m3)	Is Concentration >Upwind?	Is Concentration >PRG?	COPC?
G	DW#1	AIR-D-7	1.43E-08	4.50E-08	5.05E-10	No	No	No
G	DW#2	AIR-D-8	1.43E-08	4.50E-08	1.75E-08	Yes	No	No
H	DW#1	AIR-D-5	8.66E-10	4.50E-08	4.96E-09	Yes	No	No
H	DW#2	AIR-D-4	8.66E-10	4.50E-08	1.34E-08	Yes	No	No
I	DW#1	AIR-D-2	3.30E-08	4.50E-08	5.46E-09	No	No	No
I	DW#2	AIR-D-1	3.30E-08	4.50E-08	1.63E-08	No	No	No
L	DW#1	AIR-D-11	1.40E-08	4.50E-08	3.52E-08	Yes	No	No
L	DW#2	AIR-D-12	1.40E-08	4.50E-08	3.90E-08	Yes	No	No

Notes:
COPC - Constituent of Potential Concern.
ND - Not Detected.
PRG - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
TCDD-TEQ - 2,3,7,8-Tetrachloro-dibenzo-p-dioxin Toxic Equivalent.

TABLE J-13
UPWIND (BACKGROUND) AIR CONCENTRATIONS - METALS
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Site	G			H	I	L
Location	UP#1	UP#2		UP#1	UP#1	UP#1
Sample	AIR-M-9	AIR-M-10	Maximum	AIR-M-6	AIR-M-3	AIR-M-13
Constituent	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)
Aluminum	ND	0.980	0.980	ND	ND	ND
Cadmium	0.022	0.032	0.032	ND	ND	0.029
Calcium	0.561	0.511	0.561	ND	0.625	1.292
Copper	0.108	ND	0.108	0.750	0.313	ND
Iron	ND	ND	ND	ND	ND	0.500
Lead	0.233	0.307	0.307	0.023	0.022	0.300
Magnesium	0.056	0.068	0.068	ND	0.058	0.300
Manganese	ND	ND	ND	ND	ND	ND
Nickel	ND	ND	ND	ND	ND	0.006

Notes:
ND - Not Detected.

TABLE J-14
SITE G DOWNWIND AIR CONCENTRATIONS - METALS
COMPARISON TO BACKGROUND AND SCREENING CRITERIA
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Location Sample Constituent	Comparison Values		Downwind Location #1 (DW#1) Screen				Downwind Location #2 (DW#2) Screen				Site G COPC?
	Maximum Upwind (ug/m3)	Air Standard (ug/m3)	DW#1 AIR-M-7 (ug/m3)	Is DW #1 Conc> Upwind?	Is DW #1 Conc> Standard?	DW #1 COPC?	DW#2 AIR-M-8 (ug/m3)	Is DW #2 Conc> Upwind?	Is DW #2 Conc> Standard?	DW #2 COPC?	
Cadmium	0.032	0.001 (a)	0.029	No	Yes	No, <BK	0.027	No	Yes	No, <BK	No
Calcium	0.561	--	0.467	No	--	No, <BK, EN	ND	ND	--	No, ND	No
Copper	0.108	150 (b)	0.102	No	No	No, <BK/RBC	ND	ND	ND	No, ND	No
Lead	0.307	1.5 (c)	0.285	No	No	No, <BK/ NAAQS	0.272	No	No	No, <BK/NAAQS	No
Magnesium	0.068	--	0.047	No	--	No, <BK, EN	0.047	No	--	No, <BK,EN	No

Notes:
-- No air quality standard available.
COPC - Constituent of Potential Concern.
EN - Essential Nutrient.
NAAQS - National Ambient Air Quality Standard.
ND - Not Detected.
PRG -Preliminary Remediation Goal
RBC - Risk-Based Concentration.
(a) - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
(b) - USEPA Region III Risk-Based Concentration Table, October 5, 2000.
(c) - USEPA 1991. Subchapter C - Air Programs. Part 50 - National Primary and Secondary Ambient Air Quality Standards. Code of Federal Regulations 50:693-697.

TABLE J-15
SITE H DOWNWIND AIR CONCENTRATIONS - METALS
COMPARISON TO BACKGROUND AND SCREENING CRITERIA
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Location Sample Constituent	Comparison Values		Downwind Location #1 (DW#1) Screen				Downwind Location #2 (DW#2) Screen				Site H COPC?
	Maximum Upwind (ug/m3)	Air Standard (ug/m3)	DW#1 AIR-M-5 (ug/m3)	Is DW #1 Conc> Upwind?	Is DW #1 Conc> Standard?	DW #1 COPC?	DW#2 AIR-M-4 (ug/m3)	Is DW #2 Conc> Upwind?	Is DW #2 Conc> Standard?	DW #2 COPC?	
Calcium	ND	--	0.542	ND	--	No, EN	0.914	ND	--	No, EN	No
Copper	0.750	150 (b)	0.583	No	No	No, <BK/RBC	0.336	No	No	No, <BK/RBC	No
Lead	0.023	1.5 (c)	0.027	Yes	No	No, <NAAQS	0.024	Yes	No	No, <NAAQS	No
Magnesium	ND	--	0.100	ND	--	No, EN	0.079	ND	--	No, EN	No
Manganese	ND	0.051 (a)	ND	ND	ND	No, ND	0.005	ND	No	No, <PRG	No

Notes:
-- No air quality standard available.
COPC - Constituent of Potential Concern.
EN - Essential Nutrient.
NAAQS - National Ambient Air Quality Standard.
ND - Not Detected.
PRG -Preliminary Remediation Goal
RBC - Risk-Based Concentration.
(a) - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
(b) - USEPA Region III Risk-Based Concentration Table, October 5, 2000.
(c) - USEPA 1991. Subchapter C - Air Programs. Part 50 - National Primary and Secondary Ambient Air Quality Standards. Code of Federal Regulations 50:693-697.

TABLE J-16
SITE I DOWNWIND AIR CONCENTRATIONS - METALS
COMPARISON TO BACKGROUND AND SCREENING CRITERIA
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Location Sample Constituent	Comparison Values		Downwind Location #1 (DW#1) Screen				Downwind Location #2 (DW#2) Screen				Site I COPC?
	Maximum Upwind (ug/m3)	Air Standard (ug/m3)	DW#1 AIR-M-1 (ug/m3)	Is DW #1 Conc> Upwind?	Is DW #1 Conc> Standard?	DW #1 COPC?	DW#2 AIR-M-2 (ug/m3)	Is DW #2 Conc> Upwind?	Is DW #2 Conc> Standard?	DW #2 COPC?	
Cadmium	ND	0.001 (a)	ND	ND	ND	No, ND	0.021	ND	Yes	Yes, >PRG	Yes
Calcium	0.625	--	ND	ND	--	No, ND	0.500	No	--	No,<BK, EN	No
Copper	0.313	150 (b)	0.208	No	No	No, <BK/RBC	0.150	No	No	No,<BK/RBC	No
Lead	0.022	1.5 (c)	0.020	No	No	No, <BK/NAAQS	0.026	Yes	No	No, <NAAQS	No
Magnesium	0.058	--	0.058	No	--	No,=BK, EN	0.067	Yes	--	No, EN	No
Manganese	ND	0.051 (a)	0.006	ND	No	No,<PRG	0.006	ND	No	No,<PRG	No
Sodium	ND	--	0.542	ND	--	No, EN	ND	ND	--	No, ND	No

Notes:
-- No air quality standard available.
COPC - Constituent of Potential Concern.
EN - Essential Nutrient.
NAAQS - National Ambient Air Quality Standard.
ND - Not Detected.
PRG -Preliminary Remediation Goal
RBC - Risk-Based Concentration.
(a) - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
(b) - USEPA Region III Risk-Based Concentration Table, October 5, 2000.
(c) - USEPA 1991. Subchapter C - Air Programs. Part 50 - National Primary and Secondary Ambient Air Quality Standards. Code of Federal Regulations 50:693-697.

TABLE J-17
SITE L DOWNWIND AIR CONCENTRATIONS - METALS
COMPARISON TO BACKGROUND AND SCREENING CRITERIA
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Location Sample Constituent	Comparison Values		Downwind Location #1 (DW#1) Screen				Downwind Location #2 (DW#2) Screen				Site L COPC?
	Maximum Upwind (ug/m3)	Air Standard (ug/m3)	DW#1 AIR-M-11 (ug/m3)	Is DW #1 Conc> Upwind?	Is DW #1 Conc> Standard?	DW #1 COPC?	DW#2 AIR-M-12 (ug/m3)	Is DW #2 Conc> Upwind?	Is DW #2 Conc> Standard?	DW #2 COPC?	
Cadmium	0.029	0.001 (a)	0.027	No	Yes	No, <BK	0.028	No	Yes	No, <BK	No
Lead	0.300	1.5 (b)	0.268	No	No	No, <BK/NAAQS	0.281	No	No	No, <BK/NAAQS	No
Magnesium	0.300	--	0.068	No	--	No, <BK,EN	0.047	No	--	No, <BK, EN	No
Silver	ND	18 (c)	0.036	ND	No	No, <RBC	ND	ND	ND	No, ND	No
Sodium	ND	--	0.510	ND	--	No, EN	0.553	ND	--	No, EN	No

Notes:
-- No air quality standard available.
COPC - Constituent of Potential Concern.
EN - Essential Nutrient.
NAAQS - National Ambient Air Quality Standard.
ND - Not Detected.
PRG -Preliminary Remediation Goal
RBC - Risk-Based Concentration.
(a) - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
(b) - USEPA 1991. Subchapter C - Air Programs. Part 50 - National Primary and Secondary Ambient Air Quality Standards. Code of Federal Regulations 50:693-697.
(c) - USEPA Region III Risk-Based Concentration Table, October 5, 2000.

TABLE J-18
SITE AVERAGE DOWNWIND AIR CONCENTRATIONS - VOLATILE ORGANIC COMPOUNDS
SHORT-TERM EXPOSURE EVALUATION
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Site	G		H		I		L	
Constituent	100 Times PRG (ug/m3)	Avg (ug/m3)	Is Avg>100 PRG?	Avg (ug/m3)	Is Avg>100 PRG?	Avg (ug/m3)	Is Avg>100 PRG?	Avg (ug/m3)	Is Avg>100 PRG?
1,1,1-Trichloroethane	100000	ND	--	5.93	No	ND	--	ND	--
1,1-Dichloroethene	3.8	ND	--	13.74	Yes	ND	--	ND	--
2-Butanone	100000	16.81	No	24.68	No	ND	--	30.53	No
4-Methyl-2-pentanone	8300	53.10	No	ND	--	ND	--	ND	--
Acetone	37000	380.53	No	24.03	No	ND	--	ND	--
Ethylbenzene	110000	6.38	No	1.82	No	1.69	No	ND	--
Isopropylbenzene	40000	11.06	No	2.34	No	ND	--	ND	--
m&p-Xylene	73000	5.62	No	2.21	No	ND	--	0.58	No
Methylene chloride	410	624.25	Yes	7.14	No	529.75	Yes	446.92	Yes
n-Butylbenzene	3650	1.45	No	ND	--	ND	--	ND	--
o-Xylene	73000	5.15	No	2.73	No	ND	--	1.83	No
p-Isopropyltoluene	73000	4.42	No	ND	--	ND	--	ND	--
s-Butylbenzene	3650	ND	--	2.21	No	ND	--	ND	--
Styrene	110000	10.18	No	ND	--	ND	--	ND	--
t-Butylbenzene	3650	4.69	No	0.71	No	ND	--	ND	--
Tetrachloroethene	330	2.92	No	0.91	No	ND	--	ND	--
Toluene	40000	83.41	No	ND	--	ND	--	ND	--
Trichloroethene	110	ND	--	3.34	No	ND	--	ND	--

Notes:
-- Not Applicable.
ND - Not Detected.
PRG - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.

TABLE J-19
SITE AVERAGE DOWNWIND AIR CONCENTRATIONS - SEMIVOLATILE ORGANIC COMPOUNDS
SHORT-TERM EXPOSURE EVALUATION
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

	Site	G		H		I		L	
Constituent	100 Times PRG (a) (ug/m3)	Avg (ug/m3)	Is Avg>100 PRG?	Avg (ug/m3)	Is Avg>100 PRG?	Avg (ug/m3)	Is Avg>100 PRG?	Avg (ug/m3)	Is Avg>100 PRG?
1,2-Dichlorobenzene	21000	ND	ND	ND	ND	1.71E-01	No	ND	ND
1,4-Dichlorobenzene	31	ND	ND	5.26E-02	No	3.53E-01	No	2.07E-02	No
2-Methylnaphthalene	310	1.29E-01	No	9.92E-02	No	1.12E-01	--	1.36E-01	--
2-Nitroaniline	21	ND	ND	ND	ND	2.94E-02	No	ND	ND
Acenaphthene	22000	2.10E-02	No	2.02E-02	--	3.47E-02	No	2.82E-02	No
bis(2-Ethylhexyl)phthalate	48	7.27E-02	No	ND	ND	7.19E-02	No	4.72E-02	--
Dibenzofuran	1500	2.20E-02	No	1.94E-02	--	3.62E-02	No	3.26E-02	--
Diethylphthalate	290000	2.10E-02	--	ND	ND	ND	ND	2.46E-02	No
Dimethylphthalate	3700000	3.90E-02	--	5.27E-02	No	4.57E-02	No	3.43E-02	No
Fluorene	15000	2.05E-02	No	1.76E-02	--	2.94E-02	No	2.64E-02	--
Phenanthrene	110000	2.99E-02	No	2.88E-02	--	5.13E-02	No	2.68E-02	No

Notes:
--Not Applicable.
Avg - Average.
ND - Not Detected.
PRG - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
(a) - The value for naphthalene is used to evaluate 2-methylnaphthalene, and the value for anthracene is used to evaluate phenanthrene.

TABLE J-20
SITE AVERAGE DOWNWIND AIR CONCENTRATIONS - DIOXINS
SHORT-TERM EXPOSURE EVALUATION
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	Site 100 Times PRG (ug/m3)	G Avg (ug/m3)	G Is Avg>100 PRG?	H Avg (ug/m3)	H Is Avg>100 PRG?	I Avg (ug/m3)	I Is Avg>100 PRG?	L Avg (ug/m3)	L Is Avg>100 PRG?
Total TCDD-TEQ	4.50E-06	(a)	--	9.16E-09	No	(a)	--	3.89E-08	No

Notes:
-- Not Applicable.
ND - Not Detected.
PRG - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
TCDD-TEQ - 2,3,7,8-Tetrachloro-dibenzo-p-dioxin toxic equivalent.
(a) - Average concentration is less than background. See Table J-11.

TABLE J-21
SITE AVERAGE DOWNWIND AIR CONCENTRATIONS - METALS
SHORT-TERM EXPOSURE EVALUATION
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	Site 100 Times Standard and Basis (ug/m3)		G Avg (ug/m3)	G Is Avg>100 Standard?	H Avg (ug/m3)	H Is Avg>100 Standard?	I Avg (ug/m3)	I Is Avg>100 Standard?	L Avg (ug/m3)	L Is Avg>100 Standard?
Cadmium	0.1	PRG	(a)	(a)	ND	ND	1.56E-02	No	(a)	(a)
Calcium	--	EN	(a)	(a)	7.00E-01	--	(a)	(a)	ND	ND
Copper	15000	RBC	(a)	(a)	(a)	(a)	(a)	(a)	ND	ND
Lead	150	NAAQS	(a)	(a)	2.52E-02	No	2.33E-02	No	(a)	(a)
Magnesium	--	EN	(a)	(a)	8.50E-02	--	6.25E-02	--	(a)	(a)
Manganese	5.1	PRG	ND	ND	3.90E-03	No	6.00E-03	No	ND	ND
Silver	1800	RBC	ND	ND	ND	ND	ND	ND	2.85E-02	No
Sodium	--	EN	ND	ND	ND	ND	5.00E-01	--	5.32E-01	--

Notes:
-- No standard available.
Avg - Average.
EN - Essential Nutrient.
NAAQS - National Ambient Air Quality Standard. CFR 50:693-697.
ND - Not Detected.
RBC - USEAP Region III Risk-Based Concentration Table, October 5, 2000.
PRG - USEPA Region IX Preliminary Remediation Goal Table, October 1, 1999.
(a) - Average concentration is less than background. See Table J-13.

TABLE J-22
AIR SAMPLE VOLUMES
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Site	Location	Sample	Collection Date	Sample Type	Volume Sampled (m^3)
G	DW#1	AIR-M-7	9/11/99	PM2.5	23.53
G	DW#2	AIR-M-8	9/11/99	PM2.5	23.51
G	UP#1	AIR-M-9	9/11/99	PM2.5	23.19
G	UP#2	AIR-M-10	9/11/99	PM2.5	23.47
G	DW#1	AIR-D-7	9/10/99	PUF	307
G	DW#1	AIR-P-7	9/11/99	PUF	314
G	DW#1	AIR-S-7	9/11/99	PUF	302
G	DW#2	AIR-D-8	9/10/99	PUF	305
G	DW#2	AIR-P-8	9/11/99	PUF	311
G	DW#2	AIR-S-8	9/11/99	PUF	291
G	UP#1	AIR-D-9	9/10/99	PUF	302
G	UP#1	AIR-P-9	9/11/99	PUF	315
G	UP#1	AIR-S-9	9/11/99	PUF	308
G	UP#2	AIR-D-10	9/10/99	PUF	291
G	UP#2	AIR-P-10	9/11/99	PUF	297
G	UP#2	AIR-S-10	9/11/99	PUF	300
G	DW#1	AIR-V-7 TUBE 1	9/10/99	TO-1	0.0113
G	DW#1	AIR-V-7 TUBE 2	9/10/99	TO-1	0.0113
G	DW#2	AIR-V-8 TUBE 1	9/10/99	TO-1	0.00827
G	DW#2	AIR-V-8 TUBE 2	9/10/99	TO-1	0.00827
G	UP#1	AIR-V-9 TUBE 1	9/11/99	TO-1	0.00752
G	UP#1	AIR-V-9 TUBE 2	9/11/99	TO-1	0.00752
G	UP#2	AIR-V-10 TUBE 1	9/11/99	TO-1	0.00839
G	UP#2	AIR-V-10 TUBE 2	9/11/99	TO-1	0.00839
H	DW#1	AIR-M-5	9/10/99	PM2.5	24
H	DW#2	AIR-M-4	9/10/99	PM2.5	24.083
H	UP#1	AIR-M-6	9/10/99	PM2.5	24
H	DW#1	AIR-D-5	9/10/99	PUF	321
H	DW#1	AIR-P-5	9/10/99	PUF	320
H	DW#1	AIR-S-5	9/10/99	PUF	338
H	DW#2	AIR-D-4	9/10/99	PUF	313
H	DW#2	AIR-P-4	9/10/99	PUF	314
H	DW#2	AIR-S-4	9/10/99	PUF	329
H	UP#1	AIR-D-6	9/10/99	PUF	305
H	UP#1	AIR-P-6	9/10/99	PUF	326
H	UP#1	AIR-S-6	9/10/99	PUF	324
H	DW#1	AIR-V-5 TUBE 1	9/10/99	TO-1	0.0091
H	DW#1	AIR-V-5 TUBE 2	9/10/99	TO-1	0.0091
H	DW#2	AIR-V-4 TUBE 1	9/10/99	TO-1	0.0154
H	DW#2	AIR-V-4 TUBE 2	9/10/99	TO-1	0.0154
H	UP#1	AIR-V-6 TUBE 1	9/10/99	TO-1	0.00921
H	UP#1	AIR-V-6 TUBE 2	9/10/99	TO-1	0.00921

TABLE J-22
AIR SAMPLE VOLUMES
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Site	Location	Sample	Collection Date	Sample Type	Volume Sampled (m^3)
I	DW#1	AIR-M-2	9/10/99	PM2.5	24
I	DW#2	AIR-M-1	9/10/99	PM2.5	24
I	UP#1	AIR-M-3	9/10/99	PM2.5	24
I	DW#1	AIR-D-2	9/10/99	PUF	323
I	DW#1	AIR-P-2	9/10/99	PUF	323
I	DW#1	AIR-S-2	9/10/99	PUF	286
I	DW#2	AIR-D-1	9/10/99	PUF	313
I	DW#2	AIR-P-1	9/10/99	PUF	321
I	DW#2	AIR-S-1	9/10/99	PUF	325
I	UP#1	AIR-D-3	9/10/99	PUF	321
I	UP#1	AIR-P-3	9/10/99	PUF	328
I	UP#1	AIR-S-3	9/10/99	PUF	331
I	DW#1	AIR-V-2 TUBE 1	9/10/99	TO-1	0.00669
I	DW#1	AIR-V-2 TUBE 2	9/10/99	TO-1	0.00669
I	DW#2	AIR-V-1 TUBE 1	9/10/99	TO-1	0.00652
I	DW#2	AIR-V-1 TUBE 2	9/10/99	TO-1	0.00652
I	UP#1	AIR-V-3 TUBE 1	9/10/99	TO-1	0.00916
I	UP#1	AIR-V-3 TUBE 2	9/10/99	TO-1	0.00916
L	DW#1	AIR-M-11	9/11/99	PM2.5	23.52
L	DW#2	AIR-M-12	9/11/99	PM2.5	23.51
L	UP#1	AIR-M-13	9/11/99	PM2.5	23.997
L	DW#1	AIR-D-11	9/10/99	PUF	304
L	DW#1	AIR-P-11	9/11/99	PUF	312
L	DW#1	AIR-S-11	9/11/99	PUF	300
L	DW#2	AIR-D-12	9/10/99	PUF	298
L	DW#2	AIR-P-12	9/11/99	PUF	309
L	DW#2	AIR-S-12	9/11/99	PUF	296
L	UP#1	AIR-D-13	9/10/99	PUF	304
L	UP#1	AIR-P-13	9/11/99	PUF	317
L	UP#1	AIR-S-13	9/11/99	PUF	298
L	DW#1	AIR-V-11 TUBE 1	9/11/99	TO-1	0.0146
L	DW#1	AIR-V-11 TUBE 2	9/11/99	TO-1	0.0146
L	DW#2	AIR-V-12 TUBE 1	9/11/99	TO-1	0.00819
L	DW#2	AIR-V-12 TUBE 2	9/11/99	TO-1	0.00819
L	UP#1	AIR-V-13 TUBE 1	9/11/99	TO-1	0.00917
L	UP#1	AIR-V-13 TUBE 2	9/11/99	TO-1	0.00917

ATTACHMENT 4

REVISED SOIL TO SKIN ADHERENCE FACTOR TABLES (5-11 AND 5-12)

TABLE 5-11
SOIL ADHERENCE FACTORS- RESIDENT ADULT
SAUGET AREA 1 EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Body Part	Adult Resident		
	Surface Area 50th percentile (a) (cm^2)	Soil Loading Gardeners (mg/cm^2) (b)	Total Soil Mass (mg)
Hands	904	0.19	171.76
Forearms	1,230	0.052	63.96
Lower legs	2,370	0.047	111.39
Feet	1,225	0.215	263.38
Total	5,729	--	610.49
Area-Weighted Soil Adherence factor (mg/cm2) = Soil mass/Surface area =			0.11

Notes:
(a) - Data from USEPA (1997a). Tables 6-2, 6-3. Average of 50th percentile values for men and women (1/2 arm used as proxy for female forearm).
(b) - Data from USEPA (1997a) Table 6-12. Average of gardeners Nos. 1 and 2.

TABLE 5-12
SOIL ADHERENCE FACTORS- RESIDENT CHILD
SAUGET AREA 1 EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Body Part	Child Resident (0 to 6 years old)		
	Surface Area 50th percentile (a) (cm^2)	Soil Loading Day Care Kids (mg/cm^2) (b)	Total Soil Mass (mg)
Hands	358	0.0923	33.04
Forearms	437	0.0230	10.05
Lower legs	812	0.0195	15.83
Feet	451	0.0646	29.13
Total	2,058	--	88.06
Area-Weighted Soil Adherence factor (mg/cm2) = Soil mass/Surface area =			0.04

Notes:
(a) - Data from USEPA (1997a). Based on average of boys (Table 6-6) and girls (Table 6-7) total body surface area (6,557 cm2), and mean percentages of total surface area for individual body parts Table 6-8).
(b) - Data from USEPA (1997a), Table 6-12, Daycare kids Nos. #1a, #1b ,#2c, #3.

SOIL ADHERENCE FACTORS-EXAMPLE CALCULATION
SAUGET AREA 1 EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Steps:
1. Determine 50th percentile skin surface area (cm2) for applicable body areas using data from USEPA (1997a) Tables 6-2, 6-3, average of 50th percentile values for men and women (1/2 arm used as proxy for female forearm).
2. Determine soil loading (mg/cm2) for applicable body areas for receptor using data from USEPA (1997a) Table 6-12.
3. Calculate total soil mass (mg) for applicable body areas = Surface Area (cm2) x Soil Loading (mg/cm2).
4. Calculate total 50th percentile surface area (cm3) = sum of applicable body areas surface area (cm2).
5. Calculate total soil mass (mg) = sum of individual body areas total mass (mg).
6. Calculate Soil Adherence factor (mg/cm2) = Total soil mass (mg)/Total Skin Surface Area (cm2).

Example: for adult resident:
Hands: 904 cm^2 x 0.19 mg/cm^2 = 171.76 mg
Forearms: 1230 cm^2 x 0.052 mg/cm^2 = 63.96 mg
Lower legs: 2370 cm^2 x 0.047 mg/cm^2 = 111.39 mg
Feet: 1225 cm^2 x 0.215 mg/cm^2 = 263.38 mg
Total Surface Area = 904 cm2 + 1230 cm2 + 2370 cm2 + 1225 cm2 = 5729 cm2.
Total Soil Mass = 171.67 mg + 63.96 mg + 111.39 mg + 263.39 mg = 610.49 mg.
Soil Adherence Factor = Total Soil Mass (610.49 mg) / Total Skin Surface Area (5729 cm2) = 0.11 mg/cm2.

ATTACHMENT 5

REVISED TABLE 6-2

TABLE 6-2
TOTAL POTENTIAL HAZARD INDEX
INDOOR WORKER - RME
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	Site G Groundwater Inhalation HQ	Site H Groundwater Inhalation HQ	Site I Groundwater Inhalation HQ	Site L Groundwater Inhalation HQ
1,1,2,2-Tetrachloroethane	NC	NC	NC	NC
4-Methyl-2-pentanone	2.30E-03	NC	NC	NC
Benzene	1.46E-01	9.06E-02	2.93E-02	1.75E-03
Chlorobenzene	2.96E-02	3.09E-02	5.94E-02	NC
Chloroform	NC	2.75E-01	NC	4.86E-02
Ethylbenzene	NC	4.34E-04	NC	NC
Naphthalene	1.48E-02	1.69E-02	NC	NC
Tetrachloroethene	2.08E-04	NC	NC	NC
Toluene	5.16E-03	NC	NC	NC
Trichloroethene	NC	NC	NC	NC
Vinyl chloride	5.13E-04	NC	1.21E-02	NC
Total HI	1.98E-01	4.14E-01	1.01E-01	5.04E-02

Notes:
HI - Hazard Index.
HQ - Hazard Quotient.
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area/medium.
RME - Reasonable Maximum Exposure.

ATTACHMENT 6

REVISED APPENDIX L TEXT

APPENDIX L
CALCULATION OF EXCAVATION AIR VOC CONCENTRATIONS FROM STANDING WATER - EXCAVATION TRENCH

Excavation trench air concentrations of a COPC resulting from volatilization from groundwater infiltrating an excavation trench can be predicted by use of the method recommended by USEPA (1987) for predicting volatilization from standing water.

Model to Predict Air Concentration

In this model, the air concentration of a COPC is estimated at the downwind boundary of the water. For the purposes of calculating this concentration, a rectangular box with the base corresponding to the water surface is considered. The height of the box, H_b, is the height to which the chemical emissions from the water surface are uniformly mixed with the air. L_b is the dimension of the box parallel to the direction of the wind. W_b is the width of the box perpendicular to the airflow. If U is the wind speed, then, by conservation of mass, the air concentration, C_a, of chemical within the box is given by:

$$C_a = \frac{Q}{H_b W_b U} \tag{1}$$

The diffusion height, H_b, above the water surface is approximately equal to 0.05 L_b (Jackson, 1976). With this substitution, the equation for the air concentration becomes:

$$C_a = \frac{Q}{0.05AU} \tag{2}$$

Where:

Q = chemical emission rate (g/s)

A = water surface area (m^2) (12 m^2; best professional judgement estimate of utility repair/installation trench)

U = wind speed (m/s) (2.25 m/s; default value USEPA, 1991)

The chemical emission rate, Q, can be expressed as follows:

$$Q = KAC_L \tag{3}$$

Where:

Q = chemical emission rate (g/s)

K = overall mass transfer coefficient (m/s)

A = water surface area (m^2) ($12m^2$; best professional judgement estimate of utility repair/installation trench)

C_L= chemical concentration in water (g/m^3)

With the substitution of equation (3) into equation (2), the equation for air concentration becomes:

$$Ca = \frac{KC_L}{0.05u} \tag{4}$$

As wind speed, u, and the chemical concentration in water, C_L, are known or can be measured, the chemical concentration in air is then a function of the overall mass transfer coefficient.

Mass Transfer Coefficient

The overall mass transfer coefficient, K, is given by:

$$\frac{1}{K} = \frac{1}{K_L} + \frac{1}{K_G K_{eq}} \tag{5}$$

Where:

K_L= Liquid phase mass transfer coefficient (m/s)

K_G= Gas phase mass transfer coefficient (m/s)

K_{eq}= Equilibrium mass transfer coefficient (unitless)

The equilibrium mass transfer coefficient is given by the following:

$$K_{eq} = \frac{H}{RT} \tag{6}$$

Where:

H = Henry's Law constant for the chemical (atm m^3/g-mol)

R = Universal Gas Constant (8.21×10^{-5} atm m^3/g-mol/°K)

T = Water Temperature (°K)

The Henry's Law constants are chemical-specific and were obtained from the RBCA Tool Kit for Chemical Releases software (GSI, 1999).

The liquid phase mass transfer coefficient is given by:

$$K_L = 2.78 \times 10^{-6} \left(\frac{D_w}{D_{ether}} \right)^{2/3} \tag{7}$$

Where:

D_w = Diffusivity of the compound in water (cm^2/s)

D_{ether} = Diffusivity of ether in water (8.5×10^{-6} cm^2/s; USEPA, 1987).

The diffusivity of each chemical in water was obtained from the RBCA Tool Kit for Chemical Releases software (GSI, 1999).

The gas phase mass transfer coefficient is given by:

$$K_G = 4.82 \times 10^{-3} U^{0.78} Sc_G^{-0.67} d_e^{-0.11} \tag{8}$$

Where:

U = wind speed (m/s)

Sc_G = Schmidt number = $\mu_G/(\rho_G D_a)$

μ_G = viscosity of air (1.81×10^{-4} g/cm-s)

ρ_G = density of air (1.2×10^{-3} g/cm^3)

D_a = diffusivity of the chemical in air (cm^2/s)

d_e = effective diameter (m) = $(4A/\pi)^{0.5}$

For each of the compounds the molecular diffusivity in air was obtained from the RBCA Tool Kit for Chemical Releases software (GSI, 1999).

Attenuation Factor

For the purpose of calculating the concentration in air from a given concentration in water, it is convenient to define an attenuation factor, α, which is given as the ratio of the ambient air concentration given in equation (4) to the concentration in water:

$$\alpha = \frac{C_a}{C_L} = \frac{K}{0.05U} \tag{9}$$

If the concentration in the water is given per liter and the air concentration is given per cubic meter, then the attenuation factor becomes:

$$\alpha(L/m^3) = \frac{20000K}{U} \tag{10}$$

where the mass transfer coefficient, K, is defined as above.

Model Application and Results

Table L-1 summarizes model inputs and intermediate steps in the modeling process. Tables L-2 and L-3 present the RME and MLE groundwater source concentrations utilized in predicting trench air concentrations. Tables L-4 and L-5 present the predicted RME and MLE trench air concentrations for volatile COPCs.

Uncertainty Analysis

It should be noted that the volatilization model described above does not consider the effect of one chemical in solution upon the volatilization of another. This effect should be minor, however, considering the low concentrations of these chemicals in water. Also, the assumption of a water temperature of 25°C is conservative considering the increase of the Henry's Law parameter with temperature.

References

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USEPA. 1987. Hazardous Waste Treatment, Storage and Disposal Facilities (TDSF) – Air Emission Models. EPA-450/3-87-026. December 1987.

USEPA. 1991. Risk Assessment Guidance for Superfund: Volume I – Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals). Interim. Office of Emergency and Remedial Response. U.S. Environmental Protection Agency.

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ATTACHMENT 7

REVISED SECTION 8

8.4 Risk Characterization Methodology

The potential risk to human health associated with potential exposure to COPCs in environmental media at the site is evaluated in this step of the risk assessment process. Risk characterization is the process in which the dose-response information (Section 4.0) is integrated with quantitative estimates of human exposure derived in the Exposure Assessment (Section 5.0). The result is a quantitative estimate of the likelihood that humans will experience any adverse health effects given the exposure assumptions made. Two general types of health risk are characterized for each potential exposure pathway considered: potential carcinogenic risk and potential noncarcinogenic risk. Carcinogenic risk is evaluated by averaging exposure over a normal human lifetime, which, based on USEPA guidance (1989a), is assumed to be 70 years. Noncarcinogenic risk is evaluated by averaging exposure over the total exposure period.

Characterization of the potential impact of potential carcinogenic and noncarcinogenic constituents is approached in very different ways. The difference in approaches arises from the conservative assumption that substances with possible carcinogenic action proceed by a no-threshold mechanism, whereas other toxic actions may have a threshold, a dose below which few individuals would be expected to respond. Thus, under the no-threshold assumption, it is necessary to calculate a risk, but for constituents with a threshold, it is possible to simply characterize an exposure as above or below the threshold. In risk assessment, that threshold is termed an RfD.

8.4.1 Carcinogenic Risk Characterization

The purpose of carcinogenic risk characterization is to estimate the upper-bound likelihood, over and above the background cancer rate, that a receptor will develop cancer in his or her lifetime as a result of exposure to a constituent in environmental media at the site. This likelihood is a function of the dose of a constituent (described in the Exposure Assessment, Section 5.0) and the CSF (described in the Toxicity Assessment, Section 4.0) for that constituent. The ELCR is the likelihood over and above the background cancer rate, which currently in the U.S. is between 1 in 3 and 1 in 4 (Landis et al., 1998), that an individual will contract cancer in his or her lifetime. The risk value is expressed as a probability (e.g., 10^{-6}, or one in one million). The ELCR is calculated using the following equation:

$$\mathbf{ELCR = LADD\ (mg/kg\text{-}day) \times CSF\ (mg/kg\text{-}day)^{-1}}$$

The potential carcinogenic risk for each exposure pathway is calculated for each receptor. In current regulatory risk assessment, it is assumed that cancer risks are additive or cumulative. Pathway and area-specific risks were summed to estimate the total site potential cancer risk for each receptor. A summary of the total site cancer risks for each receptor group were presented in Section 6.0 and compared to the USEPA's target risk range of 10^{-4} to 10^{-6}. Any COPC that causes an exceedance of

the 10^{-4} risk level for a particular receptor was designated a COC. Both RME and MLE results were considered in the identification of COCs. Remedial goals (RGs) were then calculated for each COC.

The target risk levels used for the identification of COCs are based on USEPA guidance and Illinois TACO guidance. Specifically, USEPA provides the following guidance (USEPA, 1991a):

> "Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4}, and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts." and,
>
> "The upper boundary of the risk range is not a discrete line at 1 x 10^{-4}, although EPA generally uses 1 x 10^{-4} in making risk management decisions. A specific risk estimate around 10^{-4} may be considered acceptable if justified based on site-specific conditions."

IEPA provides the following summary for the evaluation of cumulative risk for carcinogens (IEPA, 1998, Fact Sheet 13: Mixture Rule):

> "The cumulative risk of carcinogenic contaminants attacking the same target must not exceed 1 in 10,000 [10^{-4}]. Therefore, the risk from all on-site similar acting carcinogens must be added together. If this cumulative risk level is greater than 1 in 10,000, corrective action must be taken to reach an acceptable risk level."

8.4.2 Non-Carcinogenic Risk Characterization

The potential for exposure to a constituent to result in adverse noncarcinogenic health effects is estimated for each receptor by comparing the Chronic Average Daily Dose (CADD) for each COPC with the RfD for that COPC. The resulting ratio, which is unitless, is known as the Hazard Quotient (HQ) for that constituent. The HQ is calculated using the following equation:

$$\mathbf{HQ} = \frac{\mathbf{CADD\,(mg/kg\text{-}day)}}{\mathbf{RfD\,(mg/kg\text{-}day)}}$$

The target HQ is defined as an HQ of less than or equal to one (USEPA, 1989a). When the HQ is less than or equal to 1, the RfD has not been exceeded, and no adverse noncarcinogenic effects are expected. If the HQ is greater than 1, there may be a potential for adverse noncarcinogenic health effects to occur; however, the magnitude of the HQ cannot be directly equated to a probability or effect level. HQs for a given pathway are summed to provide a hazard Index (HI). Pathway HIs are summed to provide a total receptor HI. When the HI is less than 1, the target has not been exceeded, and no adverse noncarcinogenic effects are expected. This initial HI summation assumes that all the COPCs

are additive in their toxicity, and is considered only a screening step as additive toxicity may not be correct. If the HI is greater than 1, further evaluation is necessary to determine if the COPCs are additive in toxicity. This evaluation is termed a toxic endpoint analysis, and is discussed in Appendix R. Any COPC that causes an exceedance of a toxic-endpoint specific HI of one was designated a COC.

8.4.3 Calculation of Remedial Goals

For potentially carcinogenic risk results, COCs are identified as those COPCs that cause an exceedance of the target risk level of 10^{-4}. For noncarcinogenic hazard results, COCs are identified as those COPCs that cause an exceedance of the toxic-endpoint specific HI of one. RGs have been calculated for those COPCs identified as COCs.

Where RGs are calculated, the following formula is used:

$$RG = \frac{\text{EPC x Target (Risk or HQ)}}{\text{Calculated (Risk or HQ)}}$$

The EPC is the exposure point concentration used in the risk calculations. Where only one constituent is the risk driver, the target risk level per constituent to be used in the RG calculation is 1×10^{-4} minus the total risk for all other constituents for that receptor. Similarly, the target HQ per constituent is 1 minus the HQ for all other constituents with similar toxic endpoints.

When there is more than one constituent identified as a COC for a given scenario, the target risk level (or HQ for noncarcinogens) is again 1×10^{-4} (or 1 for noncarcinogens) minus the total risk (or HI for noncarcinogens) for all other constituents for that receptor. However, this target risk (or HQ for noncarcinogens) is then apportioned between the identified COCs. This apportioning can be done in any manner, though most commonly it is done equally between all of the COCs.

8.5 Potential Carcinogenic Risk Results

Potential carcinogenic risks are summarized for all receptors and pathways for the transects in Table 8-1, and for the Sites in Table 8-3. Table 8-6 presents the recreational receptors risks.

8.5.1 Transects

As shown in Table 8-1, all potential risks calculated for both the RME and MLE receptor scenarios for the transects are within or below the USEPA target risk range of 10^{-4} to 10^{-6}.

8.5.2 Sites

As shown in Table 8-3, all potential risks calculated for both the RME and MLE receptor scenarios in the sites are within or below the USEPA target risk range of 10^{-4} to 10^{-6}, with the exception of the RME outdoor industrial worker receptor in Site I. The calculated risk for this receptor is 1.66×10^{-4}, which is only slightly above 10^{-4}. The risk calculated for 2,3,7,8-TCDD-TEQ for this receptor is 1.38×10^{-4} due to potential incidental ingestion and dermal contact with soils (see Table 6-3). Therefore, 2,3,7,8-TCDD-TEQ is identified as a COC for Site I soils.

8.5.3 Dead Creek/Borrow Pit Lake

As shown in Table 8-6, both RME and MLE risks are within or below the target risk range of 10^{-4} to 10^{-6} for the recreational teen and the recreational fisher receptors.

8.5.4 Summary of Potentially Carcinogenic Risk Results

As noted above, potential carcinogenic risk results are evaluated based on the 10^{-6} to 10^{-4} risk range. The following scenarios resulted in risks below the target risk range (i.e., risks less than 10^{-6}):

Transect 3 – RME Outdoor Industrial Worker
Transect 3 – MLE Outdoor Industrial Worker
Transect 3 – RME Construction Worker
Transect 3 – MLE Construction Worker
Transect 3 – MLE Resident

Transect 4 – MLE Outdoor Industrial Worker
Transect 4 – RME Construction Worker
Transect 4 – MLE Construction Worker
Transect 4 – MLE Resident

Transect 5 – MLE Resident

Transect 6 – MLE Outdoor Industrial Worker
Transect 6 – RME Construction Worker
Transect 6 – MLE Construction Worker
Transect 6 – MLE Resident

Transect 7 – MLE Outdoor Industrial Worker
Transect 7 – RME Construction Worker
Transect 7 – MLE Construction Worker

Site G – RME Indoor Industrial Worker
Site G – MLE Indoor Industrial Worker
Site G – RME Outdoor Industrial Worker
Site G – MLE Outdoor Industrial Worker
Site G – RME Trespassing Teen
Site G – MLE Trespassing Teen

Site H – RME Indoor Industrial Worker
Site H – MLE Indoor Industrial Worker
Site H – MLE Trespassing Teen

Site I – MLE Indoor Industrial Worker

Site L – RME Indoor Industrial Worker
Site L – MLE Indoor Industrial Worker
Site L – MLE Outdoor Industrial Worker
Site L – RME Construction Worker
Site L – MLE Construction Worker
Site L – RME Trespassing Teen
Site L – MLE Trespassing Teen

Site N – MLE Resident

Dead Creek/Borrow Pit Lake – RME Recreational Teen
Dead Creek/Borrow Pit Lake – MLE Recreational Teen

The following scenarios [and risk-driving constituents – environmental medium] resulted in risks between 10^{-6} and 10^{-5}, which is within the target risk range:

Transect 3 – RME Resident [benzo(a)pyrene – soil]

Transect 4 – RME Outdoor Industrial Worker [benzo(a)pyrene – soil]

Transect 5 – RME Resident [benzo(a)pyrene and dieldrin – soil]

Transect 6 – RME Outdoor Industrial Worker [benzo(a)pyrene – soil]

Transect 7 – RME Outdoor Industrial Worker [benzo(a)pyrene and arsenic – soil]
Transect 7 – MLE Resident [arsenic – produce]

Site G – MLE Construction Worker [2,3,7,8-TCDD-TEQ – soil]

Site H – MLE Outdoor Industrial Worker [2,3,7,8-TCDD-TEQ – soil]
Site H – RME Construction Worker [pentachlorophenol – groundwater]
Site H – MLE Construction Worker [pentachlorophenol – groundwater]
Site H – RME Trespassing Teen [2,3,7,8-TCDD-TEQ – soil]

Site I – RME Indoor Industrial Worker [vinyl chloride – groundwater]
Site I – MLE Outdoor Industrial Worker [2,3,7,8-TCDD-TEQ and PCBs – soil]
Site I – RME Construction Worker [2,3,7,8-TCDD-TEQ – soil and groundwater]
Site I – MLE Construction Worker [2,3,7,8-TCDD-TEQ – groundwater]
Site I – MLE Trespassing Teen [2,3,7,8-TCDD-TEQ – soil]

Site L – RME Outdoor Industrial Worker [benzo(a)pyrene – soil]

Site N - RME Resident [benzo(a)pyrene - soil]

Dead Creek/Borrow Pit Lake – MLE Recreational Fisher [arsenic – fish]

The following scenarios resulted in risks between 10^{-5} and 10^{-4}, which is within the target risk range:

Transect 4 – RME Resident [benzo(a)pyrene – soil]

Transect 6 – RME Resident [benzo(a)pyrene – soil]

Transect 7 – RME Resident [arsenic – produce]

Site G – RME Construction Worker [pentachlorophenol and 2,3,7,8-TCDD-TEQ – groundwater]

Site H – RME Outdoor Industrial Worker [2,3,7,8-TCDD-TEQ – soil]

Site I – RME Trespassing Teen [2,3,7,8-TCDD-TEQ – soil]

Dead Creek/Borrow Pit Lake – RME Recreational Fisher [arsenic – fish]

The following scenario resulted in a risk above 10^{-4}, which is above the target risk range:

Site I RME – Outdoor Industrial Worker [2,3,7,8-TCDD-TEQ – soil]

Based on the exceedance of the 10^{-4} risk level for the RME Outdoor Industrial Worker in Site I, 2,3,7,8-TCDD-TEQ is identified as a COC in Site I soils.

8.6 Potential Noncarcinogenic Hazard Results

Potential noncarcinogenic hazards are summarized for all receptors and pathways for the transects in Table 8-2, and for the Sites in Table 8-4. Table 8-7 presents the recreational receptors risks.

8.6.1 Transects

As shown in Table 8-2, all potential HIs calculated for both the RME and MLE receptor scenarios for the transects are below the target HI of 1.

8.6.2 Sites

As shown in Table 8-4, all potential HIs calculated for both the RME and MLE receptor scenarios for the sites are below the target HI of 1, with the exception of the following:

- The RME construction worker in Site G;
- The RME construction worker in Site H;
- The MLE construction worker in Site H;
- The RME outdoor industrial worker in Site I; and
- The RME construction worker in Site I.

Because these HIs were calculated by summing all HIs for all pathways, a toxic endpoint analysis was conducted for each receptor, as discussed in Section 8.6.4.

8.6.3 Dead Creek/Borrow Pit Lake

As shown in Table 8-7, both RME and MLE risks are below the target HI of 1 for the recreational teen and the recreational fisher receptors.

8.6.4 Toxic Endpoint Analysis

The RME construction worker in Site G. A toxic endpoint analysis was conducted for this receptor, as presented in Appendix R and summarized in Table 8-5. As shown, none of the toxic endpoint specific HIs exceed the target of 1, therefore, no COCs are identified for this receptor in this area.

The RME construction worker in Site H. A toxic endpoint analysis was conducted for this receptor, as presented in Appendix R and summarized in Table 8-5. As shown, all of the toxic endpoint HIs are below 1 with the exception of "nasal effects." This is due to potential inhalation exposures to

chloroform and naphthalene (see Table R-3) volatilized from exposed groundwater in an excavation trench (Table 6-6). Therefore, chloroform and naphthalene are identified as COCs for groundwater in Site H.

The MLE construction worker in Site H. A toxic endpoint analysis was conducted for this receptor, as presented in Appendix R and summarized in Table 8-5. As shown, none of the toxic endpoint specific HIs exceed the target of 1, therefore, no COCs are identified for this receptor in this area.

The RME outdoor industrial worker receptor in Site I. PCBs are the main contributor to the HI of 2.15 for this scenario. The total HQ for PCBs is 1.99, due to potential ingestion and dermal contact with surface soil. A review of Table R-1, which presents toxic endpoints by constituent, indicates that the toxic endpoints for PCBs are immune, skin and eye effects. None of the other COPCs in Site I exhibit these effects, thus, a quantitative toxic endpoint analysis was not conducted, and PCBs are identified as a COC for soil for the outdoor industrial worker scenario in Site I.

The RME construction worker in Site I. PCBs are the main contributor to the HI of 2.04 for this scenario. The total HQ for PCBs is 1.08, with the majority (1.03) due to potential ingestion and dermal contact with surface soil. As noted above, review of Table R-1, which presents toxic endpoints by constituent, indicates that the toxic endpoints for PCBs are immune, skin and eye effects. None of the other COPCs in Site I exhibit these effects; thus, a toxic endpoint analysis was not conducted, and PCBs are identified as a COC for soil for the construction worker scenario in Site I.

8.6.5 Summary of Noncarcinogenic Hazards

Based on the toxic endpoint analyses, the following constituents are identified as COCs:

- Chloroform and naphthalene in groundwater in Site H for the construction worker scenario.
- PCBs in surface soil in Site I for the outdoor industrial worker and construction worker scenarios.

8.7 Remedial Goals

8.7.1 2,3,7,8-TCDD-TEQ in Site I

2,3,7,8-TCDD-TEQ was identified as a COC in Site I soils for the outdoor industrial worker, due to an exceedance of the target risk level of 10^{-4}. The following RG is calculated using the equation in Section 8.4.3. The EPC for 2,3,7,8-TCDD-TEQ in Site I is 0.012 mg/kg. The risk associated with all other COPCs in Site I for the outdoor worker receptor is 3E-05. Therefore, for a total receptor target

risk level of 1E-04, the target risk level for 2,3,7,8-TCDD-TEQ alone is 7E-05. Thus the RG for 2,3,7,8-TCDD-TEQ is 0.0062 mg/kg.

Of the four soil samples collected in Site I, only one sample exceeds this target concentration; this is WASTE-I-B2-0-0.5FT (see Figure 8-1). Therefore, a remedial action may be warranted at this location, however, it should be noted that the target risk range was not exceeded for the MLE scenario for this receptor.

8.7.2 Chloroform and Naphthalene in Site H

Chloroform and naphthalene were identified as COCs in Site H groundwater for the RME construction worker receptor due to an exceedance of the target toxic endpoint HI of 1 (for nasal effects). An RG is calculated using the equation in Section 8.4.5.

First, the EPCs must be identified. Hazards and risks associated with potential exposure to groundwater were calculated on a per groundwater sampling location basis, prorated based on the number of groundwater sampling locations in the evaluation, such that the hazard/risk per location could be summed for a total hazard/risk for the site. VOCs were detected in two of the three groundwater sampling locations in Site H (EE-01 and EE-02). Therefore, these two locations were evaluated in the excavation trench scenario for the construction worker. Naphthalene was detected in both VOC-containing locations. The concentration in well EE-01 is 2.3 mg/L and the concentration in well EE-02 is 0.195 mg/L; the effective risk concentration is the average of these two, which is 1.25 mg/L. Chloroform was detected in one of these two VOC-containing locations; therefore, although the EPC for chloroform in EE-02 is 0.425 mg/L, the effective risk concentration is 0.213 mg/L. [Note that this is a conservative approach, as not all groundwater sampling locations in Site H were used in this averaging.] These "effective risk concentrations" were used to calculate the RGs.

As shown in Appendix R, chloroform and naphthalene are the only two COPCs in Site H that have "nasal effects" identified as a toxic endpoint. The target HI for nasal effects is 1. Therefore, for the calculation of RGs, a target HQ of 0.5 for each COC (chloroform and naphthalene) is used here, although any HQ combination that results in a total HI of one would be appropriate for use in developing these RGs. The RG for chloroform is 0.0483 mg/L based on a target HI of 0.5, and the RG for naphthalene is 0.624 mg/L based on a target HI of 0.5.

8.7.3 PCBs in Site I - Outdoor Industrial Worker Scenario

PCBs were identified as a COC for Site I soils for the outdoor industrial worker scenario due to an exceedance of the target HI of 1. An RG is calculated using the equation in Section 8.4.3. The EPC for PCBs in Site I soils is 121.3 mg/kg. Assuming a target HQ of 1 for this scenario, the RG for PCBs in soil is 61 mg/kg. The only soil sample in Site I that exceeds this target concentration is WASTE-I-

B2-0-0.5FT (Figure 8-1), which is the same sample indicating an exceedance based on the potential carcinogenic risk analysis. Therefore, a remedial action may be warranted at this location, however, it should be noted that the target HI was not exceeded for the MLE scenario for this receptor. It is also noted that the highest of the remaining PCB concentrations is an order of magnitude lower than the RG, at 3.4 mg/kg.

8.7.4 PCBs in Site I - Construction Worker Scenario

PCBs were identified as a COC for Site I soils for the construction worker scenario due to an exceedance of the target HI of 1. An RG is calculated using the equation in Section 8.4.3. The EPC for PCBs in Site I soils is 121.3 mg/kg. Assuming no action is taken for the low level of PCBs detected in groundwater that contributes an HQ of 0.05 to this scenario (Table 6-6), the target HQ for PCBs in soil is 0.95, and the RG for PCBs in soil is 112 mg/kg. The only soil sample in Site I that exceeds this target concentration is WASTE-I-B2-0-0.5FT (Figure 8-1), which is the same sample indicating an exceedance identified above for the outdoor industrial worker, based on both the potential carcinogenic risk and noncarcinogenic hazard analyses. Therefore, a remedial action may be warranted at this location, however, it should be noted that the target HI was not exceeded for the MLE scenario for this receptor. It is also noted that the highest of the remaining PCB concentrations is almost two orders of magnitude lower than this RG, at 3.4 mg/kg.

8.8 Short-Term Risk Assessment

The short-term risk assessment is presented in Section 7.0. The same screening criteria identified in Section 3.1.1.1 were employed for the short-term COPC (STCOPC) selection. As discussed in the HHRA workplan (Appendix A), the screening criteria were multiplied by 100 and compared to the average site concentration for each constituent detected.

No direct contact STCOPCs for either a residential soil or an industrial soil scenario were identified for either the transects or the sites. No STCOPCs were identified in sediment or surface water. Therefore, these media were not evaluated further in the short-term risk assessment.

In groundwater, of the 34 groundwater sampling locations evaluated in the risk assessment, STCOPCs were identified in only 6 locations from Sites G, H, I, and L. No STCOPCs were identified in the residential (non-potable) wells. Five locations have only one or two STCOPCs identified, and one well (EEG-107, Site G) has 7 STCOPCs identified. There appears to be no clear pattern of STCOPCs between wells. A total of 9 STCOPCs were identified in the 6 groundwater sampling locations combined. Of these, 3 are VOCs.

Concentrations of VOCs in groundwater were used to calculate indoor air, excavation air, and outdoor air concentrations for the above scenarios in Appendices K (indoor air), L (excavation air), and M

(outdoor air). These calculated concentrations are compared to 100 times the USEPA Region 9 air PRGs in Table 7-2. As indicated on the table, air concentrations of all constituents are less than 100 times the air PRG with the exception of benzene and chloroform in excavation air. Therefore, concentrations of these constituents are compared to short-term air action levels, as presented in Table 7-3. The short-term action levels were obtained from the ACGIH, NIOSH, and the TNRCC.

The calculated excavation air concentrations of both benzene in Site G and chloroform in Site H are below the TLVs and NIOSH standards (Table 7-3). The concentration of benzene and chloroform exceed the short-term TNRCC ESLs. Although the excavation air concentrations do exceed the TNRCC standards, this does not indicate that a short term risk presently exists. The excavation air scenario is a potential future scenario, in which the air concentrations are modeled rather than measured, and there are no current excavations at the site.

The six non-VOC STCOPCs were evaluated in the chronic risk assessment in a future construction worker scenario. It was assumed that a future construction worker may contact groundwater during excavation for 10 days per year for one year. As indicated on Tables 6-5 and 6-6, none of these six constituents exhibits a potential cancer risk or an HQ that exceeds the target levels. Therefore, neither a chronic nor an acute risk exists for these constituents.

Therefore, it is concluded that concentrations in groundwater are not posing a current short-term risk to receptors at the site. However, future construction activities in Sites G and H should be conducted with air monitoring in the excavation trenches, and the workers using appropriate personal protective equipment.

Arsenic in fish fillet is identified as a STCOPC for the short-term risk assessment. However, as the chronic risk for the fish ingestion pathway does not exceed target risk levels, it is also concluded that a short-term (acute) risk does not exist for exposure to arsenic in fish fillet. Moreover, the form of arsenic present in fish tissue (organic versus inorganic) is likely not to pose acute or chronic health risks (see discussion in Section 7.2.5).

8.9 Summary of Supplemental Construction Worker Risk Assessment

Pursuant to comments received from USEPA on the December 29, 2000 Human Health Risk Assessment for Sauget Area 1 (the HHRA), an additional evaluation has been conducted for the construction worker and is presented in Appendix T. This evaluation was conducted to evaluate potential risks to the construction worker associated with constituents in subsurface soil and in leachate in Sites G, H, I and L, and followed the same methods as the HHRA.

The potential risk for the construction worker for both the RME and MLE scenarios for all Sites is below or within the USEPA risk range of 10^{-4} to 10^{-6}.

The potential HIs for the construction worker (RME) are above the target HI of 1 in each Site. The HI for the construction worker for the MLE scenario is above 1 for all Sites with the exception of Site L.

This construction worker evaluation (for subsurface soil and leachate) was conducted as a supplement to the original construction worker scenario presented in the main body of the report (surface soil and groundwater). Potential carcinogenic risks for this supplemental scenario are within the target risk range for all Sites. To evaluate potential additivity of risks for the two evaluations, risks calculated for the original and the supplemental risk assessments were summed. The results indicate that the combined risks for each Site are still within the target risk range. With the exception of the MLE scenario for Site L, as the HIs for the supplemental risk assessment are all above 1, the combined HIs are also above 1. The combined HI for the MLE scenario for Site L is slightly above 1 (at 1.1).

These results support the original conclusion in the risk assessment that construction/excavation activities should not occur in Sites G, H, I and now L without use of proper personal protective equipment and monitoring for air emissions from standing water.

8.10 Summary of Class I Groundwater Evaluation

Appendix U and Section 6.5.1.1 presents the comparison of groundwater data to TACO Class I groundwater criteria. Comparing the results to the Class II results, additional Class I COPCs were identified in most locations for which Class II COPCs occurred. Class I COPCs were also identified in additional locations: in Site G, between 1 and 3 COPCs were identified in five additional locations; in Site H, one COPC was identified in one additional location; in Site I, two COPCs were identified in one additional location; and in Site L, one and two COPCs were identified in two additional sampling locations, respectively. In residential areas, lead was identified as a COPC in two residential non-potable use wells and one shallow groundwater sample location. Therefore, the Class I screening results were not substantially different from the Class II screening results.

Lead was identified as (the only) COPC in two of the non-potable use residential wells (DW-MCDO and DW-WRIG). No COPCs were identified in the other two non-potable use wells. A drinking water evaluation of lead was conducted and is presented in Appendix V. The results indicate that well DW-WRIG could be used as a source of drinking water; however, use of well DW-MCDO as a source of drinking water would not be appropriate.

8.11 Summary

Based on the results of this baseline risk assessment and short-term risk assessment for Sauget Area 1, it is recommended that remedial action be considered for 2,3,7,8-TCDD-TEQs and PCBs for a single location in Site I. In addition, it is recommended that excavation work in Sites G, H, I, and L, based on both long-term and short-term potential health risks, be monitored for air emissions and that

appropriate personal protective equipment be used during such work. Excavation conducted within the extent of any of the Sites should be controlled by institutional controls that would require, if such excavation was deemed necessary, that the excavation would be monitored for air emissions and that appropriate personal protective equipment would be used during such work.

ATTACHMENT 8

APPENDIX B FOOTNOTES

Definitions and Footnotes for Summary Statistics Tables

UCL - Upper Confidence Limit.

(a) - The results of the Shapiro-Wilke test for normality indicates whether the data set is more likely to be normally distributed or lognormally distributed. The data set is considered to be normally distributed if the test result is higher in the column labeled "NORMAL". The data set is considered to be lognormally distributed if the test result is higher in the column labeled "LOGNORMAL".

(b) - 95% UCL is selected based on whether the data set is normally or lognormally distributed. The UCL based on the t-statistic is chosen for a normal distribution, and the UCL based on the H-statistic is chosen if the data are lognormally distributed. Where there are greater than 50 samples, the distribution is assumed to be lognormal.

(c) - Site Concentration is the lower of the selected 95% UCL and the Maximum Detected Concentration. Where there are fewer than 8 samples, the maximum detected concentration is selected as the site concentration.

ATTACHMENT 9

REVISED TABLE I-3

TABLE I-3
COMPARISON OF FISH FILLET DATA TO REGION III RBCS FOR FISH TISSUE
SAUGET AREA 1 EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Sample Number (e,f)	Constituent	Concentration (mg/kg)	Qualifier	Background (mg/kg)	Is Concentration > Background?	RBC (a) (mg/kg)	Is Concentration > RBC?	COPC?	Reason
WB BP FILLET 2	4,4'-DDE	9.20E-03	J	ND	--	9.28E-03	No	No	<RBC
	Gamma Chlordane	4.70E-03	J	ND	--	9.01E-03 (d)	No	No	<RBC
WC BP COMP 1	Arsenic	4.50E-01	J	ND	--	2.10E-03	Yes	Yes	>RBC
	Copper	2.50E-01	J	5.07E-01	No	5.41E+01	No	No	<BK/RBC
	Di-n-butylphthalate	2.70E-02	J	ND	--	1.35E+02	No	No	<RBC
	Total 2,3,7,8-TCDD TEQ	2.40E-05		1.67E-06	Yes	2.50E-05 (g)	No	No	<RBC
	Zinc	7.90E+00	J	1.30E+01	No	4.06E+02	No	No	<BK/RBC
WC BP COMP 2	bis(2-Ethylhexyl)phthalate	1.30E-01	J	2.10E-01	No	2.25E-01	No	No	<BK/RBC
	Chromium	2.20E-01	J	4.48E-01	No	2.03E+03 (b)	No	No	<BK/RBC
	Copper	5.70E-01	J	5.07E-01	Yes	5.41E+01	No	No	<RBC
	Total 2,3,7,8-TCDD TEQ	9.52E-07		1.67E-06	No	2.50E-05 (g)	No	No	<BK/RBC
	Zinc	7.10E+00	J	1.30E+01	No	4.06E+02	No	No	<BK/RBC
WC BP COMP 3	Total 2,3,7,8-TCDD TEQ	6.93E-07		1.67E-06	No	2.50E-05 (g)	No	No	<BK/RBC
	bis(2-Ethylhexyl)phthalate	1.00E-01	J	2.10E-01	No	2.25E-01	No	No	<BK/RBC
	Mercury	2.70E-02	J	9.10E-02	No	1.35E-01 (c)	No	No	<BK/RBC
	Zinc	9.20E+00	J	1.30E+01	No	4.06E+02	No	No	<BK/RBC

Notes:
COPC - Constituent of Potential Concern.
RBC - Risk-Based Concentration.
WB - White Bass (There was insufficient white crappie sample to submit for all constituent analyses; therefore, white bass fillet samples were submitted for pesticide (8151A) and herbicide (8081A) analyses only.)
WC - White Crappie.
(a) - USEPA Region III Risk-Based Concentration (RBC) Table, October 5, 2000. Value for fish tissue.
(b) - Value for Chromium III.
(c) - Value for Methyl Mercury.
(d) - Value for Chlordane.
(e) - Sample "WB BP Fillet 1" was non-detect for all constituents.
(f) - All samples were collected from Borrow Pit Lake.
(g) - Refer to Table C-6 for sources of screening values.

ATTACHMENT 10

REVISED APPENDIX K TABLES

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
71432	110	Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	540	SIL	10

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EE-05\Benzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
525	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm·m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	5.42E-04	4.03E-05	2.07E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
525	15	1.27E+04	0.10	8.35E-01	5.42E-04	3.84E+02	1.43E+26	4.50E-06	5.74E-02	8.3E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
108907	620	Chlorobenzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	540	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^v (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250
Used to calculate risk-based groundwater concentration.					

EE-05\Chlorobenzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
525	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_t (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,803	1.54E-03	6.65E-02	1.75E-04	4.55E-04	4.66E-05	2.13E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
525	15	4.12E+04	0.10	8.35E-01	4.55E-04	3.84E+02	1.31E+31	4.59E-06	1.89E-01	NA	2.0E-02

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
91203	390	Naphthalene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	540	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250
Used to calculate risk-based groundwater concentration.					

EE-05\Naphthalene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
525	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	12,913	1.52E-04	6.55E-03	1.75E-04	4.70E-04	2.62E-04	4.26E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
525	15	2.56E+03	0.10	8.35E-01	4.70E-04	3.84E+02	1.40E+30	7.01E-06	1.79E-02	NA	1.4E-01

Site-Specific Soil Parameters

Site Name: Sauget Area 1 | Job ID: MIBK
Location: Sauget Illinois | Date: 15-Nov-00
Compl. By: Marcus

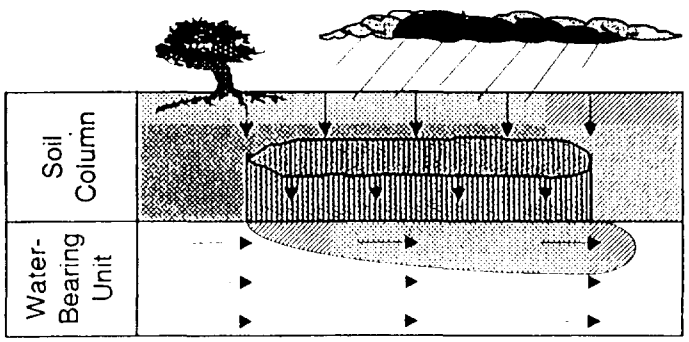
1. Soil Source Zone Characteristics

Hydrogeology

	General Case Construction	
Depth to water-bearing unit	491	(cm)
Capillary zone thickness	11	(cm)
Soil column thickness	480	(cm)

Affected Soil Zone

Depth to top of affected soils		(cm)
Depth to base of affected soils		(cm)
Affected soil area		(cm^2)
Length of affected soil parallel to assumed wind direction		(cm)
Length of affected soil parallel to assumed GW flow direction		(cm)



2. Surface Soil Column

	Vadose Zone	Capillary Fringe	
Predominant USCS Soil Type			ults (?)
or (Calculate)	or		
Total porosity	0.43		(-)
Volumetric water content	0.3	0.387	(-)
Volumetric air content	0.13	0.043	(-)
Dry bulk density	1.5		(kg/L)
Vertical hydraulic conductivity	8.6E-1		(cm/d)
Vapor permeability	1.0E-11		(cm^2)
Capillary zone thickness	1.1E+1		(cm)

Net Rainfall Infiltration

Net infiltration estimate		(in/yr)
or (NA)	or	
Average annual precipitation		(in/yr)

Partitioning Parameters

Fraction organic carbon	0.002	(-)
Soil/water pH	7.57	(-)

3. Commands and Options

Main Screen | Use Default Values | Print Sheet
Set Units | | Help

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: VAPOR INTRUSION INTO ON-SITE BUILDINGS

Exposure Concentration

Constituents of Concern	1) Source Medium Groundwater Conc. (mg/L)	2) NAF Value (m^3/L) Receptor Commercial	3) Exposure Medium Indoor Air POE Conc (mg/m^3) (1) / (2) Commercial	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) Commercial	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) Commercial
Methyl-2-pentanone, 4-	1.3E+0	3.1E+3	4.2E-4	6.8E-1	2.8E-4

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Sauget Area 1
Site Location: Sauget Illinois
Completed By: Marcus

Date Completed: 15-Nov-00
Job ID: MIBK

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
71432	3700	Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	491	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

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_{ra} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
476	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_t (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	5.42E-04	4.03E-05	1.95E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
476	15	4.28E+05	0.10	8.35E-01	5.42E-04	3.84E+02	1.43E+26	4.62E-06	1.98E+00	8.3E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
108907	4300	Chlorobenzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	491	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
476	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_t (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,803	1.64E-03	6.65E-02	1.75E-04	4.55E-04	4.66E-05	2.02E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
476	15	2.86E+05	0.10	8.35E-01	4.55E-04	3.84E+02	1.31E+31	4.73E-06	1.35E+00	NA	2.0E-02

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
91203	2100	Naphthalene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	491	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
476	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	12,913	1.52E-04	6.55E-03	1.75E-04	4.70E-04	2.62E-04	4.22E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
476	15	1.38E+04	0.10	8.35E-01	4.70E-04	3.84E+02	1.40E+30	7.34E-06	1.01E-01	NA	1.4E-01

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
127184	170	Tetrachloroethylene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	491	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
476	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,553	7.83E-03	3.37E-01	1.75E-04	4.39E-04	2.33E-05	1.24E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
476	15	5.73E+04	0.10	8.35E-01	4.39E-04	3.84E+02	1.94E+32	3.30E-06	1.89E-01	5.8E-07	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
108883	8500	Toluene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	491	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
476	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,154	2.92E-03	1.26E-01	1.75E-04	5.34E-04	3.66E-05	1.81E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
476	15	1.07E+06	0.10	8.35E-01	5.34E-04	3.84E+02	3.39E+26	4.39E-06	4.70E+00	NA	4.0E-01

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
79016	200	Trichloroethylene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	491	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
476	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,557	4.79E-03	2.06E-01	1.75E-04	4.83E-04	2.93E-05	1.50E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
476	15	4.13E+04	0.10	8.35E-01	4.83E-04	3.84E+02	2.11E+29	3.84E-06	1.58E-01	1.7E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
75014	41	Vinyl chloride (chloroethene)

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	491	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
476	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	5,000	1.73E-02	7.46E-01	1.75E-04	6.43E-04	2.70E-05	1.50E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
476	15	3.06E+04	0.10	8.35E-01	6.43E-04	3.84E+02	1.11E+22	3.84E-06	1.17E-01	8.4E-05	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
79345	12	1,1,2,2-Tetrachloroethane

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	442	SIL	10

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL	OR		1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EE-01\1,1,2,2-Tetrachloroethane.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
427	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_t (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	10,540	1.34E-04	5.77E-03	1.75E-04	5.65E-04	3.13E-04	5.01E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
427	15	6.92E+01	0.10	8.35E-01	5.65E-04	3.84E+02	1.22E+25	8.37E-06	5.79E-04	5.8E-05	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
71432	1500	Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	442	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EE-01\Benzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
427	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	5.42E-04	4.03E-05	1.82E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
427	15	1.74E+05	0.10	8.35E-01	5.42E-04	3.84E+02	1.43E+26	4.74E-06	8.23E-01	8.3E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
108907	1200	Chlorobenzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	442	SIL	10

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EE-01\Chlorobenzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
427	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,803	1.54E-03	6.65E-02	1.75E-04	4.55E-04	4.66E-05	1.90E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
427	15	7.97E+04	0.10	8.35E-01	4.55E-04	3.84E+02	1.31E+31	4.88E-06	3.89E-01	NA	2.0E-02

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
100414	1800	Ethylbenzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	442	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EE-01\Ethylbenzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
427	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	10,155	3.18E-03	1.37E-01	1.75E-04	4.60E-04	3.11E-05	1.44E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
427	15	2.46E+05	0.10	8.35E-01	4.60E-04	3.84E+02	6.13E+30	4.02E-06	9.90E-01	NA	1.0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
91203	2300	Naphthalene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	442	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EE-01\Naphthalene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
427	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	12,913	1.52E-04	6.55E-03	1.75E-04	4.70E-04	2.62E-04	4.17E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
427	15	1.51E+04	0.10	8.35E-01	4.70E-04	3.84E+02	1.40E+30	7.70E-06	1.16E-01	NA	1.4E-01

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
71432	2250	Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	442	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EE-02\Benzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
427	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	5.42E-04	4.03E-05	1.82E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
427	15	2.60E+05	0.10	8.35E-01	5.42E-04	3.84E+02	1.43E+26	4.74E-06	1.23E+00	8.3E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
108907	4350	Chlorobenzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	442	SIL	10

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EE-02\Chlorobenzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
427	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_t (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,803	1.54E-03	6.65E-02	1.75E-04	4.55E-04	4.66E-05	1.90E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
427	15	2.89E+05	0.10	8.35E-01	4.55E-04	3.84E+02	1.31E+31	4.88E-06	1.41E+00	NA	2.0E-02

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
67663	425	Chloroform

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	442	SIL	10

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EE-02\Chloroform.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
427	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	7,554	1.86E-03	8.02E-02	1.75E-04	6.43E-04	5.30E-05	2.31E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
427	15	3.41E+04	0.10	8.35E-01	6.43E-04	3.84E+02	1.12E+22	5.56E-06	1.89E-01	2.3E-05	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
91203	195	Naphthalene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	442	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EE-02\Naphthalene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
427	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	12,913	1.52E-04	6.55E-03	1.75E-04	4.70E-04	2.62E-04	4.17E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
427	15	1.28E+03	0.10	8.35E-01	4.70E-04	3.84E+02	1.40E+30	7.70E-06	9.83E-03	NA	1.4E-01

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
79016	49.5	Trichloroethylene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	442	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^v (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250
Used to calculate risk-based groundwater concentration.					

EE-02\Trichloroethene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
427	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,557	4.79E-03	2.06E-01	1.75E-04	4.83E-04	2.93E-05	1.39E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
427	15	1.02E+04	0.10	8.35E-01	4.83E-04	3.84E+02	2.11E+29	3.93E-06	4.01E-02	1.7E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
71432	620	Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	506	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

AA-I-S1\Benzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
491	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm·m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	5.42E-04	4.03E-05	1.99E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
491	15	7.18E+04	0.10	8.35E-01	5.42E-04	3.84E+02	1.43E+26	4.58E-06	3.29E-01	8.3E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
108907	8700	Chlorobenzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	506	SIL	10

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

AA-I-S1\Chlorobenzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
491	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,803	1.54E-03	6.65E-02	1.75E-04	4.55E-04	4.66E-05	2.05E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
491	15	5.78E+05	0.10	8.35E-01	4.55E-04	3.84E+02	1.31E+31	4.68E-06	2.71E+00	NA	2.0E-02

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
75014	970	Vinyl chloride (chloroethene)

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	506	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

AA-I-S1\Vinyl Chloride.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
491	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	5,000	1.73E-02	7.46E-01	1.75E-04	6.43E-04	2.70E-05	1.54E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
491	15	7.24E+05	0.10	8.35E-01	6.43E-04	3.84E+02	1.11E+22	3.82E-06	2.76E+00	8.4E-05	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
71432	120	Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	506	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

AA-I-S2\Benzene.xls\DATENTER

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_s (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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
491	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	5.42E-04	4.03E-05	1.99E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
491	15	1.39E+04	0.10	8.35E-01	5.42E-04	3.84E+02	1.43E+26	4.58E-06	6.37E-02	8.3E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
108907	3200	Chlorobenzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	506	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

AA-I-S2\Chlorobenzene.xls\DATENTER

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_1 (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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
491	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,803	1.54E-03	6.65E-02	1.75E-04	4.55E-04	4.66E-05	2.05E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
491	15	2.13E+05	0.10	8.35E-01	4.55E-04	3.84E+02	1.31E+31	4.68E-06	9.96E-01	NA	2.0E-02

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
79016	180	Trichloroethylene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	506	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

AA-i-S2\Trichloroethylene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
491	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,557	4.79E-03	2.06E-01	1.75E-04	4.83E-04	2.93E-05	1.53E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
491	15	3.71E+04	0.10	8.35E-01	4.83E-04	3.84E+02	2.11E+29	3.81E-06	1.41E-01	1.7E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
75014	240	Vinyl chloride (chloroethene)

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	506	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250
Used to calculate risk-based groundwater concentration.					

AA-I-S2\Vinyl Chloride.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
491	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm·m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	5,000	1.73E-02	7.46E-01	1.75E-04	6.43E-04	2.70E-05	1.54E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
491	15	1.79E+05	0.10	8.35E-01	6.43E-04	3.84E+02	1.11E+22	3.82E-06	6.83E-01	8.4E-05	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
71432	680	Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	506	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EE-12\Benzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
491	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm·m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	5.42E-04	4.03E-05	1.99E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
491	15	7.87E+04	0.10	8.35E-01	5.42E-04	3.84E+02	1.43E+26	4.58E-06	3.61E-01	8.3E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
108907	1400	Chlorobenzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	506	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EE-12\Chlorobenzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
491	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,803	1.54E-03	6.65E-02	1.75E-04	4.55E-04	4.66E-05	2.05E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
491	15	9.30E+04	0.10	8.35E-01	4.55E-04	3.84E+02	1.31E+31	4.68E-06	4.36E-01	NA	2.0E-02

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
71432	750	Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	506	SIL	10

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EE-14\Benzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
491	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	5.42E-04	4.03E-05	1.99E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
491	15	8.68E+04	0.10	8.35E-01	5.42E-04	3.84E+02	1.43E+26	4.58E-06	3.98E-01	8.3E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
108907	3800	Chlorobenzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	506	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
491	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_{T} (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,803	1.54E-03	6.65E-02	1.75E-04	4.55E-04	4.66E-05	2.05E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
491	15	2.53E+05	0.10	8.35E-01	4.55E-04	3.84E+02	1.31E+31	4.68E-06	1.18E+00	NA	2.0E-02

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
71432	44	Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	466	SIL	10

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EEG-109\Benzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
451	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	5.42E-04	4.03E-05	1.88E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
451	15	5.09E+03	0.10	8.35E-01	5.42E-04	3.84E+02	1.43E+26	4.68E-06	2.38E-02	8.3E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
67663	76	Chloroform

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	466	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

EEG-109\Chloroform.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
451	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	7,554	1.86E-03	8.02E-02	1.75E-04	6.43E-04	5.30E-05	2.40E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
451	15	6.09E+03	0.10	8.35E-01	6.43E-04	3.84E+02	1.12E+22	5.49E-06	3.34E-02	2.3E-05	NA

Site-Specific Soil Parameters

Site Name: Sauget Area 1 | Job ID: MLE:Area G MIBK
Location: Sauget Illinois | Date: 1-Dec-00
Compl. By: Angela

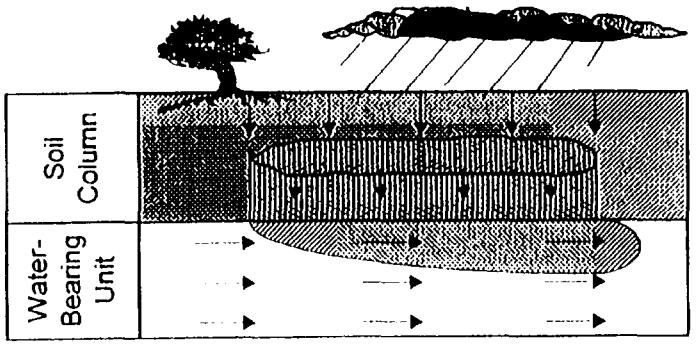
1. Soil Source Zone Characteristics (?)

Hydrogeology

	General Case Construction		
Depth to water-bearing unit	530.8		(cm)
Capillary zone thickness	11		(cm)
Soil column thickness	519.8		(cm)

Affected Soil Zone

Depth to top of affected soils	0		(cm)
Depth to base of affected soils	0		(cm)
Affected soil area	0	0	(cm^2)
Length of affected soil parallel to assumed wind direction	0	0	(cm)
Length of affected soil parallel to assumed GW flow direction	0		(cm)



2. Surface Soil Column

	Vadose Zone	Capillary Fringe	
Predominant USCS Soil Type			ults (?)
or (Calculate)	or		
Total porosity	0.43		(-)
Volumetric water content	0.3	0.387	(-)
Volumetric air content	0.13	0.043	(-)
Dry bulk density	1.5		(kg/L)
Vertical hydraulic conductivity	8.6E-1		(cm/d)
Vapor permeability	1.0E-11		(cm^2)
Capillary zone thickness	1.1E+1		(cm)

Net Rainfall Infiltration

Net infiltration estimate		(in/yr)
or (NA)	or	
Average annual precipitation		(in/yr)

Partitioning Parameters

Fraction organic carbon	0.002	(-)
Soil/water pH	7.57	(-)

3. Commands and Options

Main Screen | Use Default Values | Print Sheet
Set Units | | Help

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: VAPOR INTRUSION INTO ON-SITE BUILDINGS

Exposure Concentration

Constituents of Concern	1) Source Medium Groundwater Conc. (mg/L)	2) NAF Value (m^3/L) Receptor Commercial	3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2) Commercial	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) Commercial	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) Commercial
Methyl-2-pentanone, 4-	1.4E-1	3.3E+3	4.2E-5	6.8E-1	2.9E-5

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Sauget Area 1
Site Location: Sauget Illinois
Completed By: Angela

Date Completed: 1-Dec-00
Job ID: MLE:Area G MIBK

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
71432	347.8	Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	530.8	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250
Used to calculate risk-based groundwater concentration.					

Fill Area G\Benzene.xls\DATENTER

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_i (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 (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
515.8	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	5.42E-04	4.03E-05	2.05E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
515.8	15	4.03E+04	0.10	8.35E-01	5.42E-04	3.84E+02	1.43E+26	4.53E-06	1.82E-01	8.3E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
108907	466.1	Chlorobenzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	530.8	SIL	10

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Fill Area G\Chlorobenzene.xls\DATENTER

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_s (cm)	Vadose zone soil air-filled porosity, θ_a^v (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_e (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
515.8	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,803	1.54E-03	6.65E-02	1.75E-04	4.55E-04	4.66E-05	2.11E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
515.8	15	3.10E+04	0.10	8.35E-01	4.55E-04	3.84E+02	1.31E+31	4.61E-06	1.43E-01	NA	2.0E-02

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
91203	230.5	Naphthalene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	530.8	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Fill Area G\Naphthalene.xls\DATENTER

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_s (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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
515.8	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	12,913	1.52E-04	6.55E-03	1.75E-04	4.70E-04	2.62E-04	4.25E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
515.8	15	1.51E+03	0.10	8.35E-01	4.70E-04	3.84E+02	1.40E+30	7.07E-06	1.07E-02	NA	1.4E-01

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
127184	20.5	Tetrachloroethylene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	530.8	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Fill Area G\Tetrachloroethene.xls\DATENTER

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_s (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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
515.8	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,553	7.83E-03	3.37E-01	1.75E-04	4.39E-04	2.33E-05	1.31E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
515.8	15	6.91E+03	0.10	8.35E-01	4.39E-04	3.84E+02	1.94E+32	3.25E-06	2.24E-02	5.8E-07	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
108883	862.8	Toluene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	530.8	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Fill Area G\toluene.xls\DATENTER

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_s (cm)	Vadose zone soil air-filled porosity, θ_c^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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
515.8	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,s}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{is} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{is} (unitless)	Vapor viscosity at ave. soil temperature, μ_{is} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,154	2.92E-03	1.26E-01	1.75E-04	5.34E-04	3.66E-05	1.91E-04

Diffusion path length, L_d (cm)	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_{tp} (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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
515.8	15	1.09E+05	0.10	8.35E-01	5.34E-04	3.84E+02	3.39E+26	4.30E-06	4.67E-01	NA	4.0E-01

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
79016	20.9	Trichloroethylene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	530.8	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Fill Area G\Trichloroethylene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
515.8	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,557	4.79E-03	2.06E-01	1.75E-04	4.83E-04	2.93E-05	1.59E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
515.8	15	4.31E+03	0.10	8.35E-01	4.83E-04	3.84E+02	2.11E+29	3.76E-06	1.62E-02	1.7E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
75014	8.6	Vinyl chloride (chloroethene)

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	530.8	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250
Used to calculate risk-based groundwater concentration.					

Fill Area G\Vinyl Chloride.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
515.8	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,is}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{is} (atm·m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{is} (unitless)	Vapor viscosity at ave. soil temperature, μ_{is} (g/cm·s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	5,000	1.73E-02	7.46E-01	1.75E-04	6.43E-04	2.70E-05	1.60E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
515.8	15	6.41E+03	0.10	8.35E-01	6.43E-04	3.84E+02	1.11E+22	3.78E-06	2.43E-02	8.4E-05	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
79345	5.7	1,1,2,2-Tetrachloroethane

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	693.6	SIL	10

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Fill Area H\1,1,2,2-Tetrachloroethane.xls\DATENTER

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_s (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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
678.6	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	10,540	1.34E-04	5.77E-03	1.75E-04	5.65E-04	3.13E-04	5.23E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
678.6	15	3.29E+01	0.10	8.35E-01	5.65E-04	3.84E+02	1.22E+25	6.82E-06	2.24E-04	5.8E-05	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
71432	937.8	Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	693.6	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Fill Area H\Benzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
678.6	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	5.42E-04	4.03E-05	2.41E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
678.6	15	1.09E+05	0.10	8.35E-01	5.42E-04	3.84E+02	1.43E+26	4.18E-06	4.54E-01	8.3E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
108907	1391.6	Chlorobenzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	693.6	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Fill Area H\Chlorobenzene.xls\DATENTER

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_e (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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
678.6	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,fs}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{fs} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{fs} (unitless)	Vapor viscosity at ave. soil temperature, μ_{fs} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,803	1.54E-03	6.65E-02	1.75E-04	4.55E-04	4.66E-05	2.42E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
678.6	15	9.25E+04	0.10	8.35E-01	4.55E-04	3.84E+02	1.31E+31	4.19E-06	3.88E-01	NA	2.0E-02

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
67663	120	Chloroform

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	693.6	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Fill Area H\Chloroform.xls\DATENTER

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_i (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 (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
678.6	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	7,554	1.86E-03	8.02E-02	1.75E-04	6.43E-04	5.30E-05	3.03E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
678.6	15	9.62E+03	0.10	8.35E-01	6.43E-04	3.84E+02	1.12E+22	4.90E-06	4.72E-02	2.3E-05	NA

K-92

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
100414	498.1	Ethylbenzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	693.6	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Fill Area H\Ethylbenzene.xls\DATENTER

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_e (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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
678.6	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,is}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{is} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{is} (unitless)	Vapor viscosity at ave. soil temperature, μ_{is} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	10,155	3.18E-03	1.37E-01	1.75E-04	4.60E-04	3.11E-05	1.93E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
678.6	15	6.81E+04	0.10	8.35E-01	4.60E-04	3.84E+02	6.13E+30	3.55E-06	2.42E-01	NA	1.0E+00

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
91203	626.3	Naphthalene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	693.6	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Fill Area H\Naphthalene.xls\DATENTER

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 (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, θ_{acz} (cm^3/cm^3)	Water-filled porosity in capillary zone, θ_{wcz} (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
678.6	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	12,913	1.52E-04	6.55E-03	1.75E-04	4.70E-04	2.62E-04	4.35E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
678.6	15	4.10E+03	0.10	8.35E-01	4.70E-04	3.84E+02	1.40E+30	6.15E-06	2.52E-02	NA	1.4E-01

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
79016	19.8	Trichloroethylene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	693.6	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Fill Area H\Trichloroethene.xls\DATENTER

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_s (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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, θ_{acz} (cm^3/cm^3)	Water-filled porosity in capillary zone, θ_{wcz} (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
678.6	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,557	4.79E-03	2.06E-01	1.75E-04	4.83E-04	2.93E-05	1.89E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
678.6	15	4.08E+03	0.10	8.35E-01	4.83E-04	3.84E+02	2.11E+29	3.49E-06	1.43E-02	1.7E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
71432	278.8	Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	716.5	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Area I\Benzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
701.5	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,s}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{is} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{is} (unitless)	Vapor viscosity at ave. soil temperature, μ_{is} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	5.42E-04	4.03E-05	2.45E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
701.5	15	3.23E+04	0.10	8.35E-01	5.42E-04	3.84E+02	1.43E+26	4.13E-06	1.33E-01	8.3E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
108907	1744.3	Chlorobenzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	716.5	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Area I\Chlorobenzene.xls\DATENTER

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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
701.5	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,is}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{is} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{is} (unitless)	Vapor viscosity at ave. soil temperature, μ_{is} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_t (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	9,803	1.54E-03	6.65E-02	1.75E-04	4.55E-04	4.66E-05	2.46E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
701.5	15	1.16E+05	0.10	8.35E-01	4.55E-04	3.84E+02	1.31E+31	4.14E-06	4.80E-01	NA	2.0E-02

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
79016	31.7	Trichloroethylene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	716.5	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^v (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250
Used to calculate risk-based groundwater concentration.					

Area I\Trichloroethylene.xls\DATENTER

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_1 (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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
701.5	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_3 (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,is}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{is} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{is} (unitless)	Vapor viscosity at ave. soil temperature, μ_{is} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_v (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,557	4.79E-03	2.06E-01	1.75E-04	4.83E-04	2.93E-05	1.93E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
701.5	15	6.54E+03	0.10	8.35E-01	4.83E-04	3.84E+02	2.11E+29	3.46E-06	2.26E-02	1.7E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
75014	157.9	Vinyl chloride (chloroethene)

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	716.5	SIL	10

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Area I\Vinyl Chloride.xls\DATENTER

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_s (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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
701.5	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_{va} (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	5,000	1.73E-02	7.46E-01	1.75E-04	6.43E-04	2.70E-05	2.00E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
701.5	15	1.18E+05	0.10	8.35E-01	6.43E-04	3.84E+02	1.11E+22	3.55E-06	4.18E-01	8.4E-05	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
71432	7.8	Benzene

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	472.6	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Area L\Benzene.xls\DATENTER

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_c^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_g (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
457.6	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	8,122	2.69E-03	1.16E-01	1.75E-04	5.42E-04	4.03E-05	1.90E-04

Diffusion path length, L_d (cm)	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_{sc} (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., $C_{o,ic-g}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
457.6	15	9.03E+02	0.10	8.35E-01	5.42E-04	3.84E+02	1.43E+26	4.66E-06	4.21E-03	8.3E-06	NA

DATA ENTRY SHEET

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (µg/L)	Chemical
67663	14.8	Chloroform

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** SCS soil type directly above water table	**ENTER** Average soil/ groundwater temperature, T_S (°C)
15	472.6	SIL	10

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)	**ENTER** Vadose zone soil dry bulk density, ρ_b^V (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)
SIL			1.5	0.43	0.3

ENTER Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)	**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)
1.0E-06	1	70	25	25	250

Used to calculate risk-based groundwater concentration.

Area L\Chloroform.xls\DATENTER

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_i (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)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
457.6	0.130	0.642	1.67E-09	0.519	8.65E-10	68.18	0.43	0.050	0.380	3,844

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	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. groundwater temperature, $\Delta H_{v,ts}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{ts} (atm-m^3/mol)	Henry's law constant at ave. groundwater 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)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
5.63E+04	9.24E+05	4.16E-04	15	7,554	1.86E-03	8.02E-02	1.75E-04	6.43E-04	5.30E-05	2.42E-04

Diffusion path length, L_d (cm)	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., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
457.6	15	1.19E+03	0.10	8.35E-01	6.43E-04	3.84E+02	1.12E+22	5.47E-06	6.49E-03	2.3E-05	NA

ATTACHMENT 11

APPENDIX M - ADDITIONAL MODEL OUTPUT

Main Screen

RBCA Tool Kit for Chemical Releases
Version 1.2 © 1999

1. Project Information

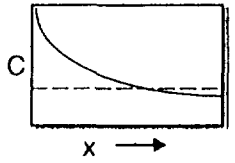
Site Name: Sauget Area 1
Location: Sauget Illinois
Compl. By: Marcus
Date: 15-Nov-00 Job ID: EE-05

2. Which Type of RBCA Analysis? (?)

○ **Tier 1**

Generic Values
On-Site
Exposure

◉ **Tier 2**



Site-Specific Values
On- or Off-Site Exposure

3. Calculation Options (?)

Affects which input data are required

☑ ***Baseline Risks (Forward mode)***

☐ ***RBCA Cleanup Standards (Backward mode)***

4. RBCA Evaluation Process

Prepare Input Data

Data Complete? (■= yes, ■= no)

- ■□ Exposure Pathways
- ■□ Constituents of Concern (COCs)
- ■□ Transport Models
- ■□ Soil Parameters
- ■□ GW Parameters
- ■□ Air Parameters

Review Output

- Exposure Flowchart
- COC Chem. Parameters
- Input Data Summary
- User-Spec. COC Data...
- Transient Domenico Analysis...
- Baseline Risks...
- Cleanup Standards...

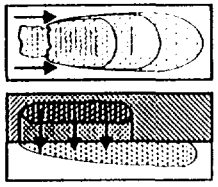
5. Commands and Options

New Site | Load Data... | Save Data As... | Quit
Print Sheet | Set Units | Custom Chem. Data... | *Help*

Exposure Pathway Identification

Site Name: Sauget Area 1
Location: Sauget Illinois
Compl. By: Marcus
Job ID: EE-05 Date: 15-Nov-00

1. Groundwater Exposure



Groundwater Ingestion/ Surface Water Impact

Receptor Type:	None		
	On-site	Off-site1	Off-site2

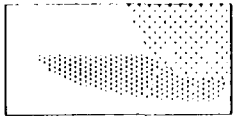
Source Media:

- [ ] Affected Groundwater
- [ ] Affected Soils Leaching to Groundwater

Distance to GW receptors

	On-site	Off-site1	Off-site2	
Affected Groundwater	0	0	0	(cm)
Affected Soils Leaching to Groundwater	0	0	0	(cm)

GW Discharge to Surface Water Exposure

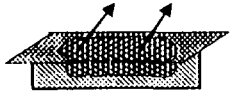


- [ ] Swimming
- [ ] Fish Consumption
- [ ] Aquatic Life Protection

Enter ALP Criteria

2. Surface Soil Exposure

Direct Ingestion and Dermal Contact

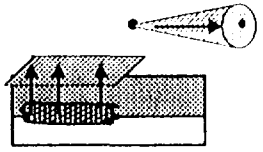


Receptor Type:	None	No off-site receptors
	On-site	

Construction Worker [ ]

3. Air Exposure

Volatilization and Particulates to Outdoor Air Inhalation

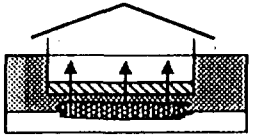


Receptor Type:	Com.			
	On-site	Off-site1	Off-site2	
	0	0	0	(cm)

Construction worker [ ]

- [ ] Affected Soils--Volatilization to Ambient Outdoor Air
- [x] Affected Groundwater--Volatilization to Ambient Outdoor Air
- [ ] Affected Surface Soils--Particulates to Ambient Outdoor Air

Volatilization to Indoor Air Inhalation



Receptor Type:	None	No off-site receptors
	On-site	

- [ ] Affected Soils--Volatilization to Enclosed Space
- [ ] Affected Groundwater--Volatilization to Enclosed Space

4. Commands and Options

Main Screen | Print Sheet | Set Units | Help

Exposure Factors & Target Risks | Exposure Flowchart

Site Name: Sauget Area 1
Location: Sauget Illinois
Compl. By: Marcus

Job ID: EE-05
Date: 15-Nov-00

Commands and Options

Main Screen | Print Sheet | *Help*

Source Media Constituents of Concern (COCs)

Apply Raoult's Law (?)

Selected COCs

COC Select: *Sort List:* (?)

Add/Insert | Top | MoveUp
Delete | Bottom | MoveDown

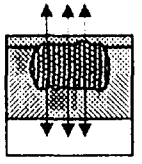
Representative COC Concentration (?)

Selected COCs	Groundwater Source Zone: Calculate (mg/L)	Groundwater Source Zone: Enter Site Data note	Soil Source Zone: Calculate (mg/kg)	Soil Source Zone: Enter Site Data note	Mole Fraction in Source Material (-)
Tetrachloroethane, 1,1,2,2-	0.0E+0				
Methyl-2-pentanone, 4-	0.0E+0				
Benzene	1.1E-1				
Chlorobenzene	6.2E-1				
Chloroform	0.0E+0				
Ethylbenzene	0.0E+0				
Naphthalene	3.9E-1				
Tetrachloroethene	0.0E+0				
Toluene	0.0E+0				
Trichloroethene	0.0E+0				
Vinyl chloride	0.0E+0				

Transport Modeling Options

Site Name: Sauget Area 1 | Job ID: EE-05
Location: Sauget Illinois | Date: 15-Nov-00
Compl. By: Marcus

1. Vertical Transport, Surface Soil Column



Outdoor Air Volatilization Factors (?)

- ○ Surface soil volatilization model only
- ◉ Combination surface soil/Johnson & Ettinger models
  - Thickness of surface soil zone [100] *(cm)*
- ○ User-specified VF from other model (Enter VF Values)

Indoor Air Volatilization Factors (?)

- ○ Johnson & Ettinger model
- ○ User-specified VF from other model (Enter VF Values)

Soil-to-Groundwater Leaching Factor

- ○ ASTM Model (?)
  - ☐ Apply Soil Attenuation Model (SAM)
  - ☐ Allow first-order biodecay (Enter Decay Rates)
- ○ User-specified LF from other model (Enter LF Values)

2. Lateral Air Dispersion Factor

wind (?)

	Off-site 1	Off-site 2	
○ 3-D Gaussian dispersion model			
○ User-Specified ADF	1.00E+0	1.00E+0	*(-)*

3. Groundwater Dilution Attenuation Factor

Calculate DAF using Domenico Model (?)

- ○ Domenico equation with dispersion only (no biodegradation)
- ○ Domenico equation first-order decay (Enter Decay Rates)
- ○ Modified Domenico equation using electron acceptor superposition (Enter Site Data)

(Enter Directly) Biodegradation Capacity [NC] *(mg/L)*

— or —

User-Specified DAF Values

- ○ DAF values from other model or site data (Enter DAF Values)

n o

4. Commands and Options

(Main Screen) (Print Sheet) (*Help*)

Site-Specific Soil Parameters

Site Name: Sauget Area 1 | Job ID: EE-05
Location: Sauget Illinois | Date: 15-Nov-00
Compl. By: Marcus

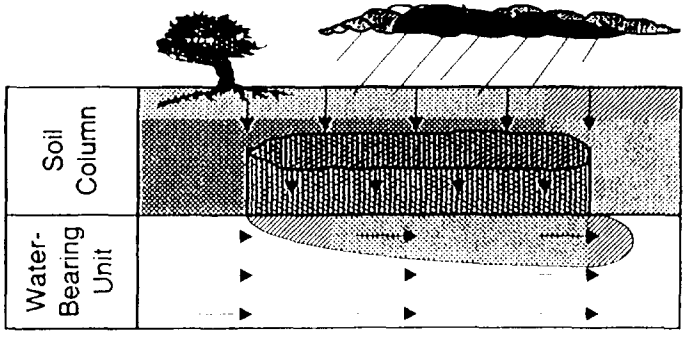
1. Soil Source Zone Characteristics (?)

Hydrogeology

	General Case Construction	
Depth to water-bearing unit	540	(cm)
Capillary zone thickness	11	(cm)
Soil column thickness	529	(cm)

Affected Soil Zone

Depth to top of affected soils		(cm)
Depth to base of affected soils		(cm)
Affected soil area		(cm^2)
Length of affected soil parallel to assumed wind direction		(cm)
Length of affected soil parallel to assumed GW flow direction		(cm)



2. Surface Soil Column

	Vadose Zone	Capillary Fringe	
Predominant USCS Soil Type			ults (?)
or (Calculate)	or		
Total porosity	0.43		(-)
Volumetric water content	0.3	0.387	(-)
Volumetric air content	0.13	0.043	(-)
Dry bulk density	1.5		(kg/L)
Vertical hydraulic conductivity	8.6E-1		(cm/d)
Vapor permeability	1.0E-11		(cm^2)
Capillary zone thickness	1.1E+1		(cm)

Net Rainfall Infiltration

Net infiltration estimate		(in/yr)
or (NA)	or	
Average annual precipitation		(in/yr)

Partitioning Parameters

Fraction organic carbon	0.002	(-)
Soil/water pH	7.57	(-)

3. Commands and Options

Main Screen | Use Default Values | Print Sheet
Set Units | | Help

Site-Specific Groundwater Parameters

Site Name: Sauget Area 1 | Job ID: EE-05
Location: Sauget Illinois | Date: 15-Nov-00
Compl. By: Marcus

1. Water-Bearing Unit

Hydrogeology

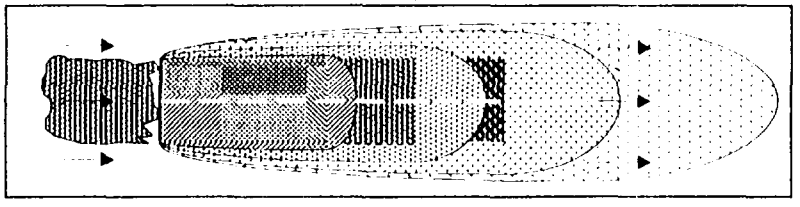
Groundwater Darcy velocity		(cm/d)
Groundwater seepage velocity		(cm/d)
or NA	or	
Hydraulic conductivity		(cm/d)
Hydraulic gradient		(-)
Effective porosity		(-)

Sorption

Fraction organic carbon--saturated zone		(-)
Groundwater pH		(-)

2. Groundwater Source Zone

Groundwater plume width at source	9906	(cm)
Plume (mixing zone) thickness at source		(cm)
or NA	or	
Saturated thickness		(cm)
Length of source zone		(cm)



3. Groundwater Dispersion

Model: GW Ingestion | Soil Leaching to GW

	GW Ingestion Off-site 1	GW Ingestion Off-site 2	Soil Leaching to GW Off-site 1	Soil Leaching to GW Off-site 2	
Distance to GW receptors	0	0	0	0	(cm)
or NA	or		or		
Longitudinal dispersivity					(cm)
Transverse dispersivity					(cm)
Vertical dispersivity					(cm)

4. Groundwater Discharge to Surface Water

	Off-site 2	
Distance to GW/SW disharge point	NA	(cm)
Plume width at GW/SW discharge	0	(cm)
Plume thickness at GW/SW discharge	0	(cm)
Surface water flowrate at GW/SW discharge	0.0E+0	(cm^3/s)

5. Commands and Options

Main Screen | Use Default Values | Print Sheet
Set Units | Help

Site-Specific Air Parameters

Site Name: Sauget Area 1 | Job ID: EE-05
Location: Sauget Illinois | Date: 15-Nov-00
Compl. By: Marcus

1. Outdoor Air Pathway

Dispersion in Air

	Off-site 1	Off-site 2	
Distance to offsite air receptor			(cm)
or (NA)		or	
Horizontal dispersivity			(cm)
Vertical dispersivity			(cm)

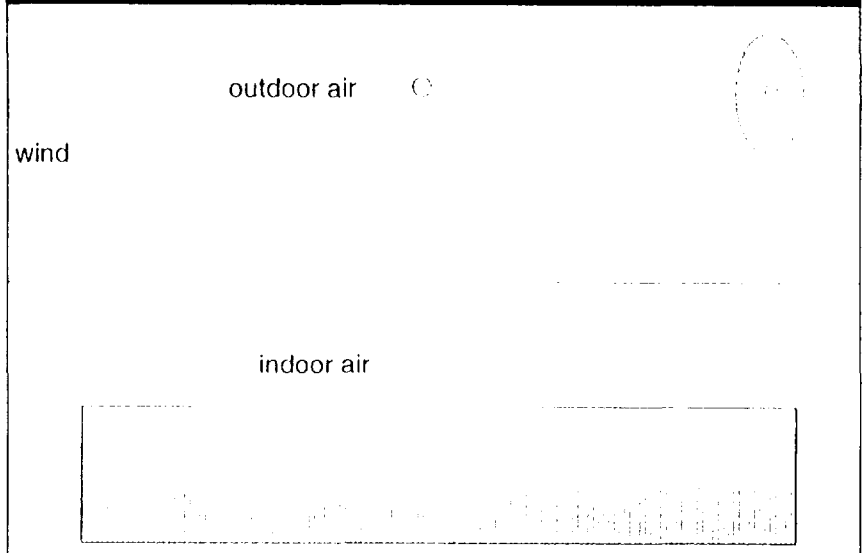
Air Source Zone

Air mixing zone height	200	(cm)
Ambient air velocity in mixing zone	225	(cm/s)
Areal particulate emission flux	6.9E-14	(g/cm^2/s)

2. Indoor Air Pathway

Building Parameters

	Residential	Commercial	
Building volume/area ratio	200	300	(cm)
Foundation area	700000	700000	(cm^2)
Foundation perimeter	3400	3400	(cm)
Building air exchange rate	1.4E-4	2.3E-4	(1/s)
Depth to bottom of foundation slab	15	15	(cm)
Convective air flow through cracks	0.0E+0	0.0E+0	(cm^3/s)
Foundation thickness	15		(cm)
Foundation crack fraction	0.01		(-)
Volumetric water content of cracks	0.12		(-)
Volumetric air content of cracks	0.26		(-)
Indoor/Outdoor differential pressure	0		(g/cm/s^2)



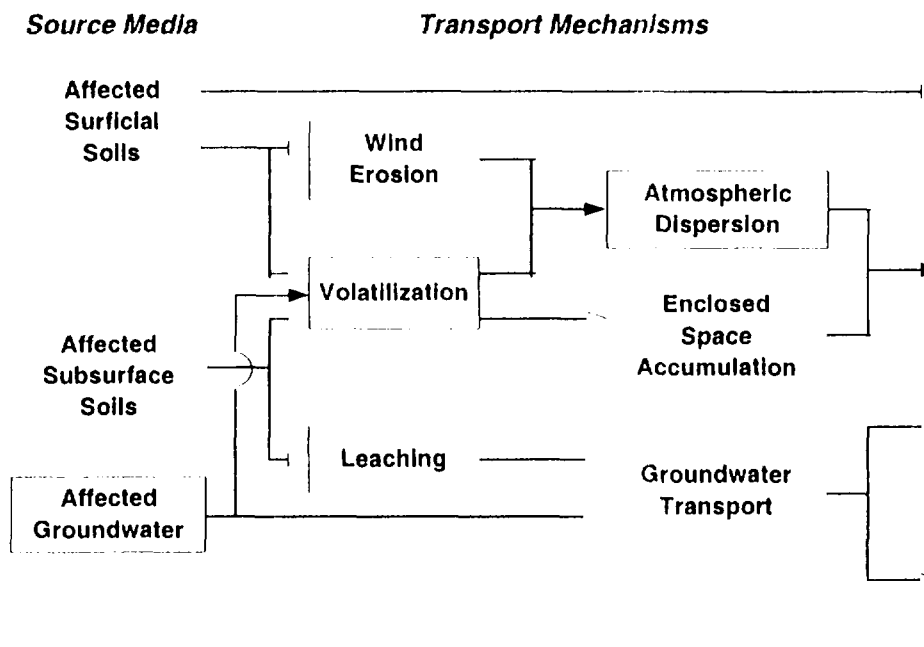
3. Commands and Options

Main Screen | Use Default Values | Print Sheet
Set Units | Help

Exposure Pathway Flowchart

Site Name: Sauget Area 1
Location: Sauget Illinois
Compl. By: Marcus

Job ID: EE-05
Date: 15-Nov-00



Exposure Media	Receptors: On-site	Receptors: Off-site1	Receptors: Off-site2
Soil Dermal Contact and Ingestion	None	NA	NA
Air Inhalation of Vapor and/or Particulates — Outdoor Air: *Commercial*	*#VALUE!*	*#VALUE!*	*#VALUE!*
Air Inhalation of Vapor and/or Particulates — Indoor Air:	None	NA	NA
Groundwater Potable Water Ingestion	None	None	None
Surface Water Swimming, Fish Consumption, Aquatic Life	NA	NA	NA

Commands and Options

Main Screen | Print Sheet | *Help*

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Constituent	CAS Number	type	Molecular Weight (g/mole) MW	rel	Diffusion Coefficients in air (cm2/s) Dair	ref	in water (cm2/s) Dwat	rel	log (Koc) or log(Kd) (@ 20 - 25 C) log(L/kg) partition		ref	Henry's Law Constant (@ 20 - 25 C) (atm-m3) mol	(unitless)	rel	Vapor Pressure (@ 20 - 25 C) (mm Hg)	rel	Solubility (@ 20 - 25 C) (mg/L)	ref	acid pKa	base pKb	rel
Tetrachloroethane, 1,1,2,2-	79-34-5	C	168	4	7.10E-02	4	7.90E-06	4	0.00	Koc	4	2.00E-03	8.25E-02	4	6.50E+00	4	7.18E+02	4	-	-	-
Methyl-2-pentanone, 4-	108-10-1	O	100.2	5	7.35E-02	6	8.68E-05	7	-0.10	Koc	11	4.16E-04	1.72E-02	-	6.00E+00	5	1.90E+04	5	-	-	-
Benzene	71-43-2	A	78.1	PS	8.80E-02	PS	9.80E-06	PS	1.77	Koc	PS	5.55E-03	2.29E-01	PS	9.52E+01	PS	1.75E+03	PS	-	-	-
Chlorobenzene	108-90-7	AC	112.6	PS	7.30E-02	PS	8.70E-06	PS	2.34	Koc	PS	3.70E-03	1.53E-01	PS	1.18E+01	PS	4.72E+02	PS	-	-	-
Chloroform	67-66-3	C	119.4	4	1.04E-01	4	1.00E-05	4	1.93	Koc	4	3.39E-03	1.40E-01	4	2.08E+02	4	9.64E+03	4	-	-	-
Ethylbenzene	100-41-4	A	106.2	PS	7.50E-02	PS	7.80E-06	PS	2.56	Koc	PS	7.88E-03	3.25E-01	PS	1.00E+01	PS	1.69E+02	PS	-	-	-
Naphthalene	91-20-3	PAH	128.2	PS	5.90E-02	PS	7.50E-06	PS	3.30	Koc	PS	4.83E-04	1.99E-02	PS	2.30E-01	PS	3.10E+01	PS	-	-	-
Tetrachloroethene	127-18-4	C	165.83	PS	7.20E-02	PS	8.20E-06	PS	2.19	Koc	PS	1.84E-02	7.59E-01	PS	1.90E+01	PS	2.00E+02	PS	-	-	-
Toluene	108-88-3	A	92.4	5	8.50E-02	A	9.40E-06	A	2.13	Koc	A	6.30E-03	2.60E-01	A	3.00E+01	4	5.15E+02	29	-	-	-
Trichloroethene	79-01-6	C	131.4	23	8.18E-02	6	1.05E-04	7	2.10	Koc	37	1.00E-02	4.14E-01	10	5.80E+01	23	1.00E+03	23	-	-	-
Vinyl chloride	75-01-4	C	62.5	4	1.06E-01	4	1.23E-05	4	1.70	Koc	38	8.60E-02	3.55E+00	4	2.66E+03	4	2.54E+03	4	-	-	-

Site Name: Sauget Area 1
Site Location: Sauget Illinois

Completed By: Marcus
Date Completed: 15-Nov-00

Job ID: EE-05

CHEMICAL DATA FOR SELECTED COCs

Toxicity Data

Constituent	Reference Dose (mg/kg/day) Oral RfD_oral	ref	(mg/kg/day) Dermal RfD_dermal	ref	Reference Conc. (mg/m3) Inhalation RfC_inhal	ref	Slope Factors 1/(mg/kg/day) Oral SF_oral	ref	1/(mg/kg/day) Dermal SF_dermal	ref	Unit Risk Factor 1/(µg/m3) Inhalation URF_inhal	ref	EPA Weight of Evidence	Is Constituent Carcinogenic ?
Tetrachloroethane, 1,1,2,2-	6.00E-02	R	-	-	7.00E-01	31	2.00E-01	R	2.86E-01	TX	5.80E-05	R	C	TRUE
Methyl-2-pentanone, 4-	8.00E-02	R	6.40E-02	TX	7.00E-02	R	-	-	-	-	-	-	-	FALSE
Benzene	3.00E-03	R	-	-	5.95E-03	R	2.90E-02	PS	2.99E-02	TX	8.29E-06	PS	A	TRUE
Chlorobenzene	2.00E-02	PS	6.20E-03	TX	2.00E-02	PS	-	-	-	-	-	-	D	FALSE
Chloroform	1.00E-02	R	-	-	3.00E-04	R	6.10E-03	R	3.05E-02	TX	2.30E-05	R	B2	TRUE
Ethylbenzene	1.00E-01	PS	9.70E-02	TX	1.00E+00	PS	-	-	-	-	-	-	D	FALSE
Naphthalene	4.00E-01	PS	3.56E-01	TX	1.40E+00	PS	-	-	-	-	-	-	D	FALSE
Tetrachloroethene	1.00E-02	PS	-	-	3.50E-02	PS	5.20E-02	PS	5.20E-02	TX	5.80E-07	PS	C-B2	TRUE
Toluene	2.00E-01	A,R	1.60E-01	TX	4.00E-01	A,R	-	-	-	-	-	-	D	FALSE
Trichloroethene	6.00E-03	R	-	-	2.10E-02	31	1.10E-02	R	7.33E-02	TX	1.71E-06	R	B2	TRUE
Vinyl chloride	-	-	-	-	-	-	1.90E+00	R	1.90E+00	TX	8.57E-05	R	A	TRUE

Site Name: Sauget Area 1

Site Location: Sauget Illinois

Miscellaneous Chemical Data

Constituent	Maximum Contaminant Level MCL (mg/L)	Maximum Contaminant Level ref	Time-Weighted Average Workplace Criteria TWA (mg/m3)	Time-Weighted Average Workplace Criteria ref	Aquatic Life Prot. Criteria AQL (mg/L)	Aquatic Life Prot. Criteria ref	Bioconcentration Factor (L-wat/kg-fish)
Tetrachloroethane, 1,1,2,2-	-	-	7.00E+00	NIOSH	-	-	8
Methyl-2-pentanone, 4-	-	-	2.05E+02	NIOSH	-	-	1
Benzene	5.00E-03	52 FR 25690	3.25E+00	PS	-	-	12.6
Chlorobenzene	1.00E-01	56 FR 3526 (30 Jan 91)	3.50E+02	PS	-	-	450
Chloroform	1.00E-01	56 FR 30266 (01 Jul 91)	9.78E+00	NIOSH	-	-	1
Ethylbenzene	7.00E-01	56 FR 3526 (30 Jan 91)	4.35E+02	PS	-	-	1
Naphthalene	-	-	5.00E+01	PS	-	-	430
Tetrachloroethene	5.00E-03	56 FR 3526 (30 Jan 91)	6.80E+02	PS	-	-	49
Toluene	1.00E+00	56 FR 3526 (30 Jan 91)	1.47E+02	ACGIH	-	-	70
Trichloroethene	5.00E-03	52 FR 25690 (08 Jul 87)	2.69E+02	ACGIH	-	-	39
Vinyl chloride	2.00E-03	52 FR 25690 (08 Jul 87)	1.30E+01	ACGIH	-	-	1

Site Name Sauget Area 1

Site Location Sauget Illinois

CHEMICAL DATA FOR SELECTED COCs

Miscellaneous Chemical Data

Constituent	Dermal Relative Absorp. Factor (unitless)	Water Dermal Permeability Data: Dermal Permeability Coeff. (cm/hr)	Lag time for Dermal Exposure (hr)	Critical Exposure Time (hr)	Relative Contr of Derm Perm Coeff (unitless)	Water/Skin Derm Adsorp Factor (cm/event)	ref	Detection Limits: Groundwater (mg/L)	rel	Soil (mg/kg)	ref	Half Life (First-Order Decay) (days): Saturated	Unsaturated	ref
Tetrachloroethane, 1,1,2,2-	0.5	0.009	0.92	2.2	0.025	4.4E-2	D	0.0005	S	0.005	S	45	45	H
Methyl-2-pentanone, 4-	0.5	-	-	-	-	-	-	0.005	S	0.05	S	14	14	H
Benzene	0.5	0.021	0.26	0.63	0.013	7.3E-2	D	0.002	S	0.005	S	720	720	H
Chlorobenzene	0.5	0.041	0.43	1	0.069	1.5E-1	D	0.002	S	0.005	S	300	300	H
Chloroform	0.5	0.0089	0.47	1.1	0.0093	3.5E-2	D	0.0005	S	0.005	S	1800	1800	H
Ethylbenzene	0.5	0.074	0.39	1.3	0.14	2.7E-1	D	0.002	S	0.005	S	228	228	H
Naphthalene	0.05	0.069	0.53	2.2	0.2	2.7E-1	D	0.01	32	0.01	32	258	258	H
Tetrachloroethene	0.5	0.048	0.9	4.3	0.25	2.2E-1	D	0.0005	S	-	-	720	720	H
Toluene	0.5	0.045	0.32	0.77	0.054	1.6E-1	D	0.002	S	0.005	S	28	28	H
Trichloroethene	0.5	0.016	0.55	1.3	0.026	6.5E-2	D	0.001	S	0.005	S	1653	1653	H
Vinyl chloride	0.5	0.0073	0.21	0.51	0.0023	2.5E-2	D	0.002	S	0.01	S	2875	2875	H

Site Name: Sauget Area 1
Site Location: Sauget Illinois

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Sauget Area 1
Site Location: Sauget Illinois

Completed By: Marcus
Date Completed: 15-Nov-00

Job ID: EE 05

Exposure Parameters		Residential			Commercial/Industrial	
		Adult	(1-6yrs)	(1-16 yrs)	Chronic	Construc.
AT_c	Averaging time for carcinogens (yr)	70				
AT_n	Averaging time for non-carcinogens (yr)	30			25	1
BW	Body weight (kg)	70	15	35	70	
ED	Exposure duration (yr)	30	6	16	25	1
τ	Averaging time for vapor flux (yr)	30			25	1
EF	Exposure frequency (days/yr)	350			250	180
EF_D	Exposure frequency for dermal exposure	350			250	
IR_w	Ingestion rate of water (L/day)	2			1	
IR_s	Ingestion rate of soil (mg/day)	100	200		50	100
SA	Skin surface area (dermal) (cm^2)	5800		2023	5800	5800
M	Soil to skin adherence factor	1				
ET_{swm}	Swimming exposure time (hr/event)	3				
EV_{swm}	Swimming event frequency (events/yr)	12	12	12		
IR_{swm}	Water ingestion while swimming (L/hr)	0.05	0.5			
SA_{swm}	Skin surface area for swimming (cm^2)	23000		8100		
IR_{fish}	Ingestion rate of fish (kg/yr)	0.025				
FI_{fish}	Contaminated fish fraction (unitless)	1				

Complete Exposure Pathways and Receptors	On-site	Off-site 1	Off-site 2
Groundwater:			
Groundwater Ingestion	None	None	None
Soil Leaching to Groundwater Ingestion	None	None	None
Applicable Surface Water Exposure Routes			
Swimming			NA
Fish Consumption			NA
Aquatic Life Protection			NA
Soil:			
Direct Ingestion and Dermal Contact	None		
Outdoor Air			
Particulates from Surface Soils	None	None	None
Volatilization from Soils	None	None	None
Volatilization from Groundwater	Commercial	#VALUE!	#VALUE!
Indoor Air			
Volatilization from Subsurface Soils	None	NA	NA
Volatilization from Groundwater	None	NA	NA

Receptor Distance from Source Media	On-site	Off-site 1	Off-site 2	(Units)
Groundwater receptor	NA	NA	NA	(cm)
Soil leaching to groundwater receptor	NA	NA	NA	(cm)
Outdoor air inhalation receptor	0	NA	NA	(cm)

Target Health Risk Values		Individual	Cumulative
TR_{ab}	Target Risk (class A/B carcinogens)	1.0E-6	1.0E-5
TR_c	Target Risk (class C carcinogens)	1.0E-5	
THQ	Target Hazard Quotient (non-carcinogenic risk)	1.0E+0	1.0E+0

Modeling Options	
RBCA tier	Tier 2
Outdoor air volatilization model	Surface & subsurface models
Indoor air volatilization model	NA
Soil leaching model	NA
Use soil attenuation model (SAM) for leachate?	NA
Air dilution factor	NA
Groundwater dilution-attenuation factor	NA

NOTE: NA = Not applicable

Surface Parameters		General	Construction	(Units)
A	Source zone area	0.0E+0	NA	(cm^2)
W	Length of source-zone area parallel to wind	0.0E+0	NA	(cm)
W_{gw}	Length of source-zone area parallel to GW flow	NA		(cm)
U_{air}	Ambient air velocity in mixing zone	2.3E+2		(cm/s)
δ_{air}	Air mixing zone height	2.0E+2		(cm)
P_a	Areal particulate emission rate	NA		(g/cm^2/s)
L_{ss}	Thickness of affected surface soils	NA		(cm)

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	1.1E+1			(cm)
h_v	Vadose zone thickness	5.3E+2			(cm)
ρ_s	Soil bulk density	1.5E+0			(g/cm^3)
f_{oc}	Fraction organic carbon	2.0E-3			(-)
θ_T	Soil total porosity	4.3E-1			(-)
K_{vs}	Vertical hydraulic conductivity	8.6E-1			(cm/d)
k_v	Vapor permeability	1.0E-11			(cm^2)
L_{gw}	Depth to groundwater	5.4E+2			(cm)
L_s	Depth to top of affected soils	NA			(cm)
L_{soil}	Depth to base of affected soils	NA			(cm)
L_{soil}	Thickness of affected soils	NA			(cm)
pH	Soil/groundwater pH	7.6E+0			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	0.387	0.3	0.12	(-)
θ_a	Volumetric air content	0.043	0.13	0.26	(-)

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	NA	NA	(cm)
A_b	Foundation area	NA	NA	(cm^2)
X_{crack}	Foundation perimeter	NA	NA	(cm)
ER	Building air exchange rate	NA	NA	(1/s)
L_{crack}	Foundation thickness	NA	NA	(cm)
Z_{crack}	Depth to bottom of foundation slab	NA	NA	(cm)
η	Foundation crack fraction	NA	NA	(-)
dP	Indoor/outdoor differential pressure	NA	NA	(g/cm/s^2)
Q_s	Convective air flow through slab	NA	NA	(cm^3/s)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	NA	(cm)
I_f	Net groundwater infiltration rate	NA	(m/yr)
U_{gw}	Groundwater Darcy velocity	NA	(cm/d)
V_{gw}	Groundwater seepage velocity	NA	(cm/d)
K_s	Saturated hydraulic conductivity	NA	(cm/d)
i	Groundwater gradient	NA	(-)
S_w	Width of groundwater source zone	NA	(cm)
S_d	Depth of groundwater source zone	NA	(cm)
η_{eff}	Effective porosity in water-bearing unit	NA	(-)
$f_{oc,eff}$	Fraction organic carbon in water-bearing unit	NA	(-)
pH_{eff}	Groundwater pH	NA	(-)
	Biodegradation considered?	NA	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		Groundwater Ingestion		Soil Leaching to GW		
α_x	Longitudinal dispersivity	NA	NA	NA	NA	(cm)
α_y	Transverse dispersivity	NA	NA	NA	NA	(cm)
α_z	Vertical dispersivity	NA	NA	NA	NA	(cm)
Lateral Outdoor Air Transport		Soil to Outdoor Air Inhal.		GW to Outdoor Air Inhal.		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(cm)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(cm)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(cm^3/s)
W_{gw}	Width of GW plume at SW discharge	NA	(cm)
δ_{gw}	Thickness of GW plume at SW discharge	NA	(cm)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ☐ **(CHECKED IF PATHWAY IS ACTIVE)**

SURFACE SOILS (0 - 0 cm):

VAPOR AND DUST INHALATION

	1) Source Medium	2) NAF Value (m^3/kg) Receptor				3) Exposure Medium Outdoor Air POE Conc. (mg/m^3) (1) / (2)			
	Soil Conc. (mg/kg)	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
Constituents of Concern		None	Construction Worker	None	None	None	Construction Worker	None	None
Tetrachloroethane, 1,1,2,2-									
Methyl-2-pentanone, 4-									
Benzene									
Chlorobenzene									
Chloroform									
Ethylbenzene									
Naphthalene									
Tetrachloroethene									
Toluene									
Trichloroethene									
Vinyl chloride									

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Sauget Area 1
Site Location: Sauget Illinois
Completed By: Marcus

Date Completed: 15-Nov-00
Job ID: EE-05

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SURFACE SOILS (0 - 0 cm):

VAPOR AND DUST INHALATION (cont'd)

	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)				5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)			
	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)		Off-site 1 (0 cm)	Off-site 2 (0 cm)
Constituents of Concern	None	Construction Worker	None	None	None	Construction Worker	None	None
Tetrachloroethane, 1,1,2,2-								
Methyl-2-pentanone, 4-								
Benzene								
Chlorobenzene								
Chloroform								
Ethylbenzene								
Naphthalene								
Tetrachloroethene								
Toluene								
Trichloroethene								
Vinyl chloride								

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Sauget Area 1
Site Location: Sauget Illinois
Completed By: Marcus

Date Completed: 15-Nov-00
Job ID: EE-05

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ☐ **(CHECKED IF PATHWAY IS ACTIVE)**

SUBSURFACE SOILS (100 - 0 cm):

VAPOR INHALATION

	1) Source Medium	2) NAF Value (m^3/kg) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
Constituents of Concern	Soil Conc. (mg/kg)	On-site (0 cm) None	Off-site 1 (0 cm) None	Off-site 2 (0 cm) None	On-site (0 cm) None	Off-site 1 (0 cm) None	Off-site 2 (0 cm) None
Tetrachloroethane, 1,1,2,2-							
Methyl-2-pentanone, 4-							
Benzene							
Chlorobenzene							
Chloroform							
Ethylbenzene							
Naphthalene							
Tetrachloroethene							
Toluene							
Trichloroethene							
Vinyl chloride							

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Sauget Area 1
Site Location: Sauget Illinois
Completed By: Marcus

Date Completed: 15-Nov-00
Job ID: EE-05

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SUBSURFACE SOILS (100 - 0 cm):

VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)
	None	None	None	None	None	None
Tetrachloroethane, 1,1,2,2-						
Methyl-2-pentanone, 4-						
Benzene						
Chlorobenzene						
Chloroform						
Ethylbenzene						
Naphthalene						
Tetrachloroethene						
Toluene						
Trichloroethene						
Vinyl chloride						

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Sauget Area 1
Site Location: Sauget Illinois
Completed By: Marcus

Date Completed: 15-Nov-00
Job ID: EE-05

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAY IS ACTIVE)**

GROUNDWATER: VAPOR INHALATION

Exposure Concentration

Constituents of Concern	1) Source Medium	2) NAF Value (m^3/L) Receptor			3) Exposure Medium Outdoor Air. POE Conc. (mg/m^3) (1) / (2)		
	Groundwater Conc (mg/L)	On-site (0 cm) Commercial	Off-site 1 (0 cm) #VALUE!	Off-site 2 (0 cm) #VALUE!	On-site (0 cm) Commercial	Off-site 1 (0 cm) #VALUE!	Off-site 2 (0 cm) #VALUE!
Tetrachloroethane, 1,1,2,2-	0.0E+0	8.5E+4			0.0E+0		
Methyl-2-pentanone, 4-	0.0E+0	1.5E+5			0.0E+0		
Benzene	1.1E-1	2.9E+4			3.8E-6		
Chlorobenzene	6.2E-1	4.9E+4			1.3E-5		
Chloroform	0.0E+0	3.8E+4			0.0E+0		
Ethylbenzene	0.0E+0	2.5E+4			0.0E+0		
Naphthalene	3.9E-1	3.3E+5			1.2E-6		
Tetrachloroethene	0.0E+0	1.2E+4			0.0E+0		
Toluene	0.0E+0	2.7E+4			0.0E+0		
Trichloroethene	0.0E+0	1.3E+4			0.0E+0		
Vinyl chloride	0.0E+0	1.9E+3			0.0E+0		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Sauget Area 1
Site Location: Sauget Illinois
Completed By: Marcus

Date Completed: 15-Nov-00
Job ID: EE-05

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)	On-site (0 cm)	Off-site 1 (0 cm)	Off-site 2 (0 cm)
	Commercial	#VALUE!	#VALUE!	Commercial	#VALUE!	#VALUE!
Tetrachloroethane, 1,1,2,2-	2.4E-1			0.0E+0		
Methyl-2-pentanone, 4-	6.8E-1			0.0E+0		
Benzene	2.4E-1			9.3E-7		
Chlorobenzene	6.8E-1			8.7E-6		
Chloroform	2.4E-1			0.0E+0		
Ethylbenzene	6.8E-1			0.0E+0		
Naphthalene	6.8E-1			8.0E-7		
Tetrachloroethene	2.4E-1			0.0E+0		
Toluene	6.8E-1			0.0E+0		
Trichloroethene	2.4E-1			0.0E+0		
Vinyl chloride	2.4E-1			0.0E+0		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Sauget Area 1
Site Location: Sauget Illinois
Completed By: Marcus

Date Completed: 15-Nov-00
Job ID: EE-05

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m^3)

(Sum average expsosure concentrations from soil and groundwater routes.)

Constituents of Concern	On-site (0 cm) Commercial	On-site (0 cm) Construction Worker	Off-site 1 (0 cm) #VALUE!	Off-site 2 (0 cm) #VALUE!
Tetrachloroethane, 1,1,2,2-				
Methyl-2-pentanone, 4-				
Benzene	9.3E-7			
Chlorobenzene	8.7E-6			
Chloroform				
Ethylbenzene				
Naphthalene	8.0E-7			
Tetrachloroethene				
Toluene				
Trichloroethene				
Vinyl chloride				

Site Name: Sauget Area 1
Site Location: Sauget Illinois
Completed By: Marcus

Date Completed: 15-Nov-00
Job ID: EE-05

ATTACHMENT 12

APPENDIX Q FIGURE AND TABLES

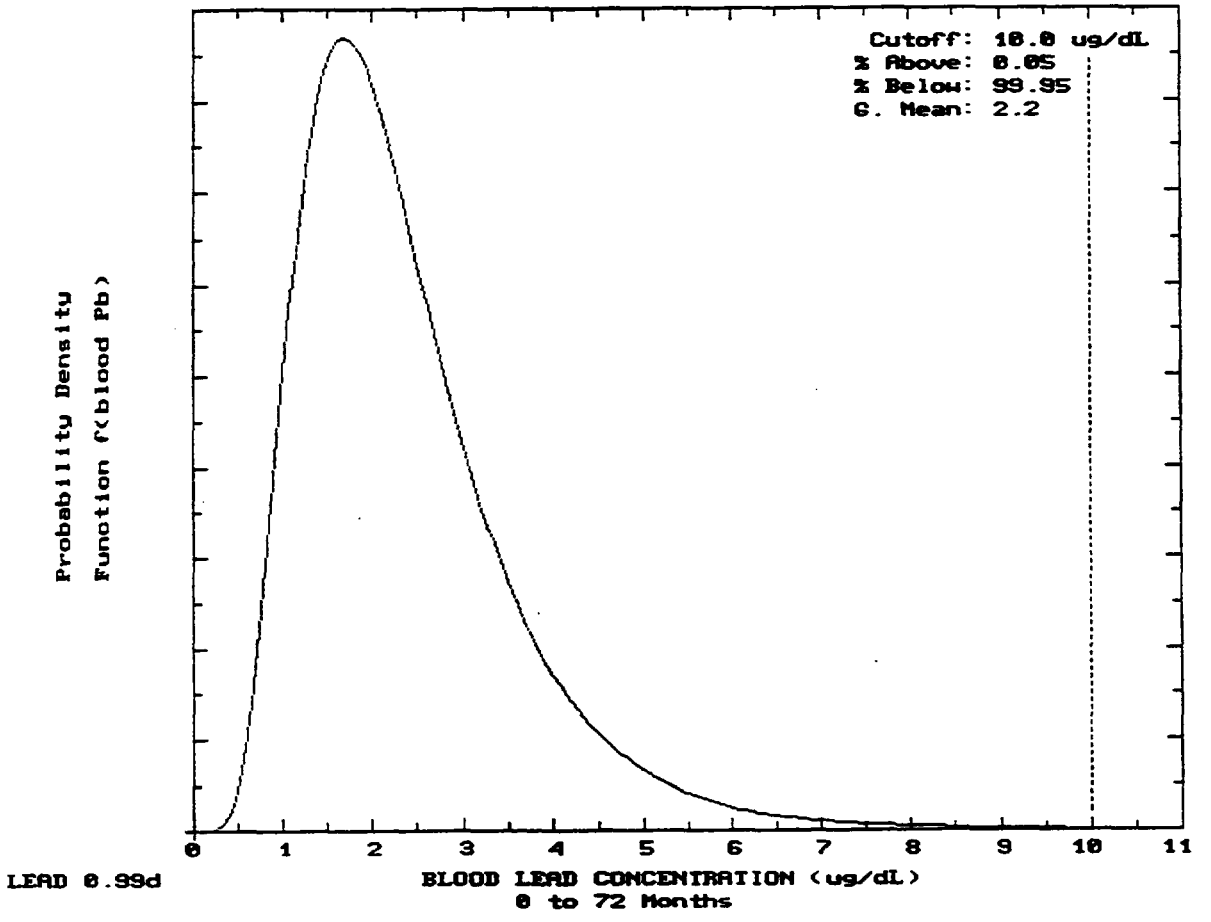


FIGURE Q-1.
IEUBK DISTRIBUTION OF BLOOD LEAD CONCENTRATIONS
SAUGET AREA 1 – EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

TABLE Q-1 (page 1 of 2)
IEUBK MODEL OUTPUT
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

AIR CONCENTRATION: 0.100 ug Pb/m3 DEFAULT
Indoor AIR Pb Conc: 30.0 percent of outdoor.
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 129.00 ug Pb/L
Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	0.005
1-2	0.005
2-3	0.005
3-4	0.005
4-5	0.005
5-6	0.005

SOIL & DUST:
Soil: constant conc.
Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	72.0	72.0
1-2	72.0	72.0
2-3	72.0	72.0
3-4	72.0	72.0
4-5	72.0	72.0
5-6	72.0	72.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	2.4	4.40	1.75
1-2:	2.5	5.86	2.77
2-3:	2.3	6.25	2.79
3-4:	2.2	6.18	2.81
4-5:	1.9	5.40	2.10
5-6:	1.7	5.39	1.89

TABLE Q-1 (page 2 of 2)
IEUBK MODEL OUTPUT
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.63	0.00	0.00	0.02
1-2:	2.75	0.31	0.00	0.03
2-3:	3.10	0.31	0.00	0.06
3-4:	3.00	0.31	0.00	0.07
4-5:	2.92	0.31	0.00	0.07
5-6:	3.09	0.31	0.00	0.09

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TABLE Q-2
EVALUATION OF CONSTRUCTION WORKER EXPOSURE
TO LEAD IN GROUNDWATER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC

	Construction Worker
PbB baseline (ug/dL)	2.2
BSF (ug/dL per ug/day)	0.4
Inhalation - Excavation Air	
Aa (unitless)	0.32
Va (m^3/day)	20
Ca (ug/m^3)	0.00432
Uptake air (ug/day)	0.0030
Ingestion - Water	
Aw (unitless)	0.2
Iw (L/day)	0.005
Cw (ug/L)	129
Uptake water (ug/day)	0.014
Ingestion Soil	
As (unitless)	0.12
Is (g/day)	0.1
Cs (ug/g)	72
Uptake soil (ug/day)	0.095
PbB (ug/dl)	2.24

Target Blood Lead Level as Defined by OSHA for Adult Workers:

a) Blood lead level of workers (male and female) intending to have children should remain below 30 ug/dL.
b) OSHA allows 40 ug/dL as a "permissible" blood lead level in lead-exposed workers, below which no further medical monitoring or workplace intervention is required.

The Centers for Disease Control has selected 10 ug/dl as the "level of concern" for young children. Bowers et al. (1994) suggest that while the CDC criteria for children were not developed for adults they may be useful as a screening ctechnique for adults.

ATTACHMENT 13

APPENDIX U - CLASS I GROUNDWATER SCREEN

APPENDIX U

COMPARISON OF GROUNDWATER DATA TO TACO CLASS I CRITERIA

APPENDIX U

COMPARISON OF GROUNDWATER DATA TO TACO CLASS I CRITERIA

This appendix presents screening tables for groundwater using TACO Class I Criteria.

Groundwater in Sauget Area 1 is classified as Class I by IEPA. Groundwater in Sauget Area 1 is not used as a source of drinking water and there are ordinances in effect in the Villages of Sauget and Cahokia that prohibit the use of groundwater as drinking water. The risk assessment evaluated potential incidental exposure to constituents in groundwater via volatilization of constituents from groundwater to indoor and outdoor air, and via direct contact with groundwater during excavation activities. Therefore, the IEPA Class II groundwater criteria were used for the selection of COPCs in groundwater for these scenarios.

In response to a request by IEPA, this appendix presents a sampling location-by-location comparison of constituent concentrations in groundwater to the TACO Class I groundwater criteria presented in the first table of this appendix entitled "Groundwater and Surface Water Standards". The screening tables present:

- The frequency of detection and the arithmetic mean and maximum detected concentrations;
- An identification of essential nutrient status and comparison to background, as presented in Appendix D;
- Comparison to the TACO Tier 1 Class I groundwater screening values; and
- An identification of whether or not a constituent is selected as a COPC and the reason why or why not.

The screening tables are presented in the following order (location screening interval or sample identification, which includes a sample depth designator, is provided where more than one sample was included in the analysis):

<u>Fill Area G</u>

AA-GHL-S1	(AA-GHL-S1-12-16FT, AA-GHL-S1-22-26FT)
AA-GHL-S2	(AA-GHL-S2-12-16FT, AA-GHL-S2-22-26FT)
AA-GHL-S3	(AA-GHL-S3-20-24FT)
AA-SW-S1	(AA-SW-S1-14-16FT. AA-SW-S1-24-26FT)
EEG-101	(18-23FT)
EEG-102	(16.5-21.5FT)
EEG-104	(19-24FT)

EEG-106	(18-23 FT)
EEG-107	(23-28 FT)
EEG-112	(12-26FT)
EE-05	(18-23 FT)

Fill Area H

EEG-110	(18-23FT)
EE-01	(28-33 FT)
EE-02	(18-23 FT)
EE-03	(27-32 FT)

Fill Area I

AA-I-S1	(AA-I-S1-17-21FT, AA-I-S1-27-31FT)
AA-I-S2	(AA-I-S2-16-20FT, AA-I-S2-26-30FT)
AA-I-S3	(AA-I-S3-24-28FT)
EE-12	(28-33 FT)
EE-13	(23-29 FT)
EE-14	(32.5-37.5 FT)
EE-15	(24-29 FT)

Fill Area L

EEG-103	(16.5-21.5FT)
EEG-105	(no construction log)
EEG-109	(17-22 FT)
EEG-111	(no construction log)
AA-SW-S2	(AA-SW-S2-14-16FT, AA-SW-S2-22-26FT)
AA-SW-S3	(AA-SW-S3-14-16FT, AA-SW-S3-22-26FT)

Residential Area Locations

SGW-S1 (SGW-S1-15FT, SGW-S1-20FT)

SGW-S2	(SGW-S2-15FT, SGW-S2-20FT)
DW-MCDO	Unknown
DW-SCHM	Unknown
DW-SETT	Unknown
DW-WRIG	Unknown

Four private non-potable use wells were sampled in this investigation. These wells are not used as a source of drinking water, however, it was agreed that any COPCs identified these wells in the Class I groundwater screen would be quantitiatively evaluated in a drinking water scenario as an appendix to the risk assessment. This evalaution is presented in Appendix V.

Lead was the only COPC identified in a residential well (DW-MCDO and DW-WRIG). Therefore, a human heath risk assessment for drinking water will be performed for Lead in these two wells in Appendix V.

CAS Number	Constituent	Class I (ug/L) (a)
71-55-6	1,1,1-Trichloroethane	200
79-00-5	1,1,2-Trichloroethane	5
75-34-3	1,1-Dichloroethane	700
75-35-4	1,1-Dichloroethylene	7
120-82-1	1,2,4-Trichlorobenzene	70
96-12-8	1,2-Dibromo-3-chloropropane	0.2
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.05
95-50-1	1,2-Dichlorobenzene (o – Dichlorobenzene)	600
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	5
78-87-5	1,2-Dichloropropane	5
542-75-6	1,3-Dichloropropene	1
106-46-7	1,4-Dichlorobenzene (p - Dichlorobenzene)	75
93-72-1	2,4,5-TP (Silvex)	50
95-95-4	2,4,5-Trichlorophenol	700
88-06-2	2,4,6 Trichlorophenol	6.4
94-75-7	2,4-D	70
120-83-2	2,4-Dichlorophenol	21
105-67-9	2,4-Dimethylphenol	140
51-28-5	2,4-Dinitrophenol	14
121-14-2	2,4-Dinitrotoluene	0.02
606-20-2	2,6-Dinitrotoluene	0.1
95-57-8	2-Chlorophenol	35
95-48-7	2-Methylphenol (o - Cresol)	350
91-94-1	3,3'-Dichlorobenzidine	20
106-47-8	4-Chloroaniline (p-Chloroaniline)	28
83-32-9	Acenaphthene	420
67-64-1	Acetone	700
15972-60-8	Alachlor	2
116-06-3	Aldicarb	3
309-00-2	Aldrin	0.04
319-84-6	alpha-HCH (alpha-BHC)	0.03
120-12-7	Anthracene	2100
1912-24-9	Atrazine	3
71-43-2	Benzene	5
56-55-3	Benzo(a)anthracene	0.13
50-32-8	Benzo(a)pyrene	0.2
205-99-2	Benzo(b)fluoranthene	0.18
207-08-9	Benzo(k)fluroanthene	0.17
65-85-0	Benzoic Acid	28000
111-44-4	Bis(2-chloroethyl)ether	10
117-81-7	Bis(2-ethylhexyl)phthalate	6
75-27-4	Bromodichloromethane	0.02
75-25-2	Bromoform	0.2
71-36-3	Butanol	700
85-68-7	Butyl benzyl phthalate	1400
1563-66-2	Carbofuran	40
75-15-0	Carbon disulfide	700
56-23-5	Carbon tetrachloride	5
57-74-9	Chlordane	2
108-90-7	Chlorobenzene (Monochlorobenzene)	100
124-48-1	Chlorodibromomethane	140
67-66-3	Chloroform	0.02
218-01-9	Chrysene	1.5

Table U-2
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: G
Well: AA-GHL-S1

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
1,2,4-Trichlorobenzene	1	1	1.30E+00	1.30E+00	No	ND	--	No	7.00E+01	No	No	<Tier 1
1,2-Dichlorobenzene	1	1	1.20E+00	1.20E+00	No	ND	--	No	6.00E+02	No	No	<Tier 1
Aluminum	2	1	1.38E+02	1.95E+02	No	ND	--	No	3.60E+04	No	No	<Tier 1
Barium	2	2	1.18E+02	1.35E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	2	2	1.33E+05	1.40E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Chlorobenzene	1	1	9.40E-01	9.40E-01	No	ND	--	No	1.00E+02	No	No	<Tier 1
Chromium	1	1	3.60E+00	3.60E+00	No	1.05E+02	No	Yes	1.00E+02	No	No	<Tier 1
Cis/Trans-1,2-Dichloroethene	1	1	7.10E-01	7.10E-01	No	ND	--	No	7.00E+01	No	No	<Tier 1
Cobalt	1	1	3.50E+00	3.50E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Copper	1	1	2.30E+00	2.30E+00	No	ND	--	No	6.50E+02	No	No	<Tier 1
delta-BHC	2	1	1.90E-02	3.20E-02	No	1.25E-02	Yes	No	3.00E-02	Yes	Yes	>Tier 1
gamma-BHC (Lindane)	2	1	1.98E-02	3.00E-02	No	1.01E-02	Yes	No	2.00E-01	No	No	<Tier 1
Iron	2	2	7.60E+02	7.70E+02	Yes	2.20E+04	No	Yes	5.00E+03	No	No	EN
Magnesium	2	2	2.75E+04	3.00E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	2	2	3.86E+02	7.30E+02	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Molybdenum	2	1	1.05E+01	1.60E+01	No	ND	--	No	1.80E+02	No	No	<Tier 1
Nickel	2	2	1.03E+01	1.15E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Pentachlorophenol	1	1	2.95E-01	2.95E-01	No	ND	--	No	1.00E+00	No	No	<Tier 1
Potassium	2	2	4.73E+03	6.25E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	2	2	1.33E+04	1.55E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Tetrachloroethene	2	2	1.02E+01	1.30E+01	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
Toluene	1	1	6.85E-01	6.85E-01	No	ND	--	No	1.00E+03	No	No	<Tier 1
Total PCBs	2	1	1.09E+00	1.18E+00	No	ND	--	No	5.00E-01	Yes	Yes	>Tier 1
Total TCDD-TEQ	1	1	3.93E-06	3.93E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1
Trichloroethene	2	2	1.20E+00	1.90E+00	No	ND	--	No	5.00E+00	No	No	<Tier 1

CAS Number	Constituent	Class I (ug/L) (a)
156-59-2	cis-1,2-Dichloroethylene	70
75-99-0	Dalapon	200
72-54-8	DDD	0.11
72-55-9	DDE	0.04
50-29-3	DDT	0.12
53-70-3	Dibenzo(a,h)anthracene	0.3
60-57-1	Dieldrin	0.02
84-66-2	Diethyl phthalate	5600
84-74-2	Di-n-butyl phthalate	700
117-84-0	Di-n-octyl phthalate	140
88-85-7	Dinoseb	7
115-29-7	Endosulfan	42
145-73-3	Endothall	100
72-20-8	Endrin	2
100-41-4	Ethylbenzene	700
206-44-0	Fluoranthene	280
86-73-7	Fluorene	280
58-89-9	gamma-HCH (Lindane)	0.2
76-44-8	Heptachlor	0.4
1024-57-3	Heptachlor epoxide	0.2
118-74-1	Hexachlorobenzene	0.06
77-47-4	Hexachlorocyclopentadiene	50
67-72-1	Hexachloroethane	7
193-39-5	Indeno(1,2,3-c,d)pyrene	0.43
78-59-1	Isophorone	1400
72-43-5	Methoxychlor	40
74-83-9	Methyl bromide (Bromomethane)	9.8
75-09-2	Methylene chloride (Dichloromethane)	5
91-20-3	Naphthalene	25
98-95-3	Nitrobenzene	3.5
621-64-7	N-Nitrosodi-n-propylamine	10
122-39-4	N-Nitrosodiphenylamine	10
87-86-5	Pentachlorophenol	1
108-95-2	Phenol	100
1918-02-1	Picloram	500
1336-36-3	Polychlorinated biphenyls (PCBs)	0.5
129-00-0	Pyrene	210
122-34-9	Simazine	4
100-42-5	Styrene	100
127-18-4	Tetrachloroethylene (Perchloroethylene)	5
108-88-3	Toluene	1000
8001-35-2	Toxaphene	3
156-60-5	trans-1,2-Dichloroethylene	100
79-01-6	Trichloroethylene	5
108-05-4	Vinyl acetate	7000
75-01-4	Vinyl chloride	2
1330-20-7	Xylenes (total)	10000

Table U-3
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: G
Well: AA-GHL-S2

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
Aluminum	2	1	8.50E+02	1.60E+03	No	ND	--	No	3.60E+04	No	No	<Tier 1
Arsenic	1	1	3.80E+00	3.80E+00	No	1.17E+01	No	Yes	5.00E+01	No	No	<Tier 1
Barium	2	2	1.24E+02	1.60E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	2	2	1.25E+05	1.40E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Cis/Trans-1,2-Dichloroethene	2	2	1.23E+00	1.90E+00	No	ND	--	No	7.00E+01	No	No	<Tier 1
Cobalt	2	2	3.60E+00	4.20E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Iron	2	2	1.49E+03	2.70E+03	Yes	2.20E+04	No	Yes	5.00E+03	No	No	EN
Magnesium	2	2	2.70E+04	3.20E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	2	2	7.10E+02	1.20E+03	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Molybdenum	2	2	4.50E+00	4.50E+00	No	ND	--	No	1.80E+02	No	No	<Tier 1
Nickel	2	2	9.50E+00	9.80E+00	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Potassium	2	2	4.00E+03	5.00E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	2	2	7.75E+03	8.20E+03	Yes	1.30E+05	No	Yes	NA	--	No	EN
Trichloroethene	2	2	1.20E+00	1.60E+00	No	ND	--	No	5.00E+00	No	No	<Tier 1
Vanadium	1	1	4.00E+00	4.00E+00	No	ND	--	No	4.90E+01	No	No	<Tier 1
Zinc	1	1	9.10E+00	9.10E+00	No	ND	--	No	5.00E+03	No	No	<Tier 1

CAS Number	Constituent	Class I (ug/L) (a)	
	Inorganics		
7440-36-0	Antimony	6	
7440-38-2	Arsenic	50	
7440-39-3	Barium	2000	
7440-41-7	Beryllium	4	
7440-42-8	Boron	2000	
7440-43-9	Cadmium	5	
16887-00-6	Chloride	200000	
18540-29-9	Chromium, ion, hexavalent	NA	
7440-47-3	Chromium, total	100	
7440-48-4	Cobalt	1000	
7440-50-8	Copper	650	
57-12-5	Cyanide	200	
7782-41-4	Fluoride	4000	
7439-89-6	Iron	5000	
7439-92-1	Lead	7.5	
7439-96-5	Manganese	150	
7439-97-6	Mercury	2	
7440-02-0	Nickel	100	
14797-55-8	Nitrate as N	10000	
7782-49-2	Selenium	50	
7440-22-4	Silver	50	
14808-79-8	Sulfate	400000	
7440-28-0	Thallium	2	
7440-62-2	Vanadium	49	
7440-66-6	Zinc	5000	
	Constituents Lacking TACO Standards		
79-34-5	1,1,2,2-Tetrachloroethane	0.055	(n)
541-73-1	1,3-Dichlorobenzene	1500	(b)
93-76-5	2,4,5-T	360	(n)
94-82-6	2,4-DB	290	(n)
91-58-7	2-Chloronaphthalene	490	(n)
91-57-6	2-Methylnaphthalene	39	(c)
88-74-4	2-Nitroaniline	2.1	(n)
106-44-5	3-Methylphenol/4-Methylphenol	350	(d)
108-10-1	4-Methyl-2-pentanone (MIBK)	160	(n)
100-01-6	4-Nitroaniline	2.1	(n)
5103-71-9	Alpha Chlordane	10	(e)
7429-90-5	Aluminum	36000	(n)
191-24-2	Benzo(g,h,i)perylene	1050	(f)
319-85-7	beta-BHC	0.15	(g)
86-74-8	Carbazole	3.4	(n)
540-59-0	Cis/Trans-1,2-Dichloroethene	200	(h)
319-86-8	delta-BHC	0.15	(g)
132-64-9	Dibenzofuran	24	(n)
1918-00-9	Dicamba	1100	(n)
120-36-5	Dichloroprop	NA	(l)
131-11-3	Dimethylphthalate	360000	(n)
1746-01-6	Dioxin	0.00003	(m)
959-98-8	Endosulfan I	210	(i)
33213-65-9	Endosulfan II	210	(i)
7421-93-4	Endrin aldehyde	10	(j)
53494-70-5	Endrin ketone	10	(j)

Table U-4
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: G
Well: AA-GHL-S3

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
Barium	1	1	1.30E+02	1.30E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
bis(2-Ethylhexyl)phthalate	1	1	8.00E-01	8.00E-01	No	ND	--	No	6.00E+00	No	No	<Tier 1
Calcium	1	1	1.70E+05	1.70E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Cobalt	1	1	5.80E+00	5.80E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Iron	1	1	2.00E+02	2.00E+02	Yes	2.20E+04	No	Yes	5.00E+03	No	No	EN
Magnesium	1	1	3.70E+04	3.70E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	1.50E+03	1.50E+03	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Nickel	1	1	1.20E+01	1.20E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Potassium	1	1	1.20E+04	1.20E+04	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	1.90E+04	1.90E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total PCBs	1	1	1.23E+00	1.23E+00	No	ND	--	No	5.00E-01	Yes	Yes	>Tier 1

CAS Number	Constituent	Class I (ug/L) (a)	
5103-74-2	Gamma Chlordane	10	(e)
93-65-2	MCPP	36	(n)
7439-98-7	Molybdenum	180	(n)
85-01-8	Phenanthrene	10500	(k)

Notes:
CAS - Chemical Abstracts Service.
NA - Not Available.
ND - Not Determined.
TACO - Illinois Tiered Approach to Corrective Action.
(a) - Title 35, Subtitle G, Chapter I, Part 742 Illinois Tiered Approach to Corrective Action Objectives (TACO) Tier 1 values from Appendix B, Table E.
(b) - No TACO value available. Therefore, the TACO value for 1,2-dichlorobenzene has been used due to structural similarity.
(c) - No TACO value available. Therefore, the TACO value for naphthalene has been used due to structural similarity.
(d) - No TACO value available. Therefore, the TACO value for 2-methylphenol has been used due to structural similarity.
TACO - Ilinois Tiered Approach to Corrective Action.
(f) - No TACO value available. Therefore, the TACO value for pyrene has been used due to structural similarity.
(g) - No TACO value available. Therefore, the TACO value for alpha-HCH has been used due to structural similarity.
(h) - TACO value for cis-1,2-dichloroethylene.
(i) - No TACO value available. Therefore, the TACO value for endosulfan has been used due to structural similarity.
(j) - No TACO value available. Therefore, the TACO value for endrin has been used due to structural similarity.
(k) - No TACO value available. Therefore, the TACO value for anthracene has been used due to structural similarity.
(l) - No TACO value, PRG value, appropriate surrogate, or dose response value available.
(m) - Drinking Water Standards and Health Adivories. Office of Water, EPA 822-B00-001, Summer 2000. Maximum Contaminant Level (MCL).
(n) - No TACO value, and no appropriate structural surrogate. Therefore, Region IX Preliminary Remediation Goal (PRG), October 1, 1999, used.

Table U-5
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: G
Well: AA-SW-S1

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
Acetone	2	1	2.65E+01	2.80E+01	No	ND	--	No	7.00E+02	No	No	<Tier 1
Aluminum	2	1	2.45E+03	4.80E+03	No	ND	--	No	3.60E+04	No	No	<Tier 1
Arsenic	1	1	4.50E+00	4.50E+00	No	1.17E+01	No	Yes	5.00E+01	No	No	<Tier 1
Barium	2	2	2.40E+02	3.10E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	2	2	1.35E+05	1.40E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Cobalt	2	1	7.35E+00	9.70E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Copper	2	2	2.65E+00	4.30E+00	No	ND	--	No	6.50E+02	No	No	<Tier 1
Iron	2	2	4.91E+03	9.10E+03	Yes	2.20E+04	No	Yes	5.00E+03	Yes	No	EN
Lead	2	1	5.10E+00	7.70E+00	No	ND	--	No	7.50E+00	Yes	Yes	>Tier 1
Magnesium	2	2	3.60E+04	3.90E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	2	2	7.00E+02	7.80E+02	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Molybdenum	2	1	5.10E+00	5.20E+00	No	ND	--	No	1.80E+02	No	No	<Tier 1
Nickel	2	2	1.75E+01	2.30E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Phenanthrene	1	1	4.20E-01	4.20E-01	No	ND	--	No	2.10E+03	No	No	<Tier 1
Potassium	2	2	5.75E+03	6.20E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	2	2	1.10E+04	1.20E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Vanadium	2	1	9.00E+00	1.30E+01	No	ND	--	No	4.90E+01	No	No	<Tier 1
Zinc	2	1	2.30E+01	3.60E+01	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-6
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: G
Well: EEG-101

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
2,4,5-TP (Silvex)	1	1	1.40E-01	1.40E-01	No	3.20E-01	No	Yes	5.00E+01	No	No	<Tier 1
4,4'-DDE	1	1	4.00E-03	4.00E-03	No	ND	--	No	4.00E-02	No	No	<Tier 1
Aluminum	1	1	5.80E+02	5.80E+02	No	ND	--	No	3.60E+04	No	No	<Tier 1
Arsenic	1	1	2.10E+01	2.10E+01	No	1.17E+01	Yes	No	5.00E+01	No	No	<Tier 1
Barium	1	1	1.30E+02	1.30E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	1	1	1.20E+05	1.20E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Chromium	1	1	5.30E+00	5.30E+00	No	1.05E+02	No	Yes	1.00E+02	No	No	<Tier 1
Cobalt	1	1	4.40E+00	4.40E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Copper	1	1	1.50E+00	1.50E+00	No	ND	--	No	6.50E+02	No	No	<Tier 1
delta-BHC	1	1	8.20E-03	8.20E-03	No	1.25E-02	No	Yes	3.00E-02	No	No	<Tier 1
Endosulfan I	1	1	1.60E-03	1.60E-03	No	ND	--	No	4.20E+01	No	No	<Tier 1
Endrin aldehyde	1	1	3.80E-03	3.80E-03	No	ND	--	No	2.00E+00	No	No	<Tier 1
Heptachlor	1	1	1.20E-03	1.20E-03	No	2.60E-02	No	Yes	4.00E-01	No	No	<Tier 1
Iron	1	1	6.40E+03	6.40E+03	Yes	2.20E+04	No	Yes	5.00E+03	Yes	No	EN
Magnesium	1	1	2.50E+04	2.50E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	2.40E+03	2.40E+03	No	1.75E+03	Yes	No	1.50E+02	Yes	Yes	>Tier 1
Molybdenum	1	1	5.20E+00	5.20E+00	No	ND	--	No	1.80E+02	No	No	<Tier 1
Nickel	1	1	2.00E+01	2.00E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Potassium	1	1	4.00E+03	4.00E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	1.60E+04	1.60E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total TCDD-TEQ	1	1	6.46E-06	6.46E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1

Table U-7
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: G
Well: EEG-102

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
1,2,4-Trichlorobenzene	1	1	1.00E+01	1.00E+01	No	ND	--	No	7.00E+01	No	No	<Tier 1
1,4-Dichlorobenzene	1	1	5.80E+01	5.80E+01	No	ND	--	No	7.50E+01	No	No	<Tier 1
alpha-BHC	1	1	1.07E-05	1.07E-05	No	ND	--	No	3.00E-02	No	No	<Tier 1
Arsenic	1	1	2.80E+01	2.80E+01	No	1.17E+01	Yes	No	5.00E+01	No	No	<Tier 1
Barium	1	1	9.50E+01	9.50E+01	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	1	1	8.40E+04	8.40E+04	Yes	4.27E+05	No	Yes	NA	--	No	EN
Chlorobenzene	1	1	1.10E+01	1.10E+01	No	ND	--	No	1.00E+02	No	No	<Tier 1
Cobalt	1	1	5.00E+00	5.00E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Iron	1	1	6.50E+03	6.50E+03	Yes	2.20E+04	No	Yes	5.00E+03	Yes	No	EN
Magnesium	1	1	1.80E+04	1.80E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	8.30E+02	8.30E+02	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Molybdenum	1	1	9.50E+00	9.50E+00	No	ND	--	No	1.80E+02	No	No	<Tier 1
Nickel	1	1	1.70E+01	1.70E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Potassium	1	1	6.70E+03	6.70E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	1.80E+04	1.80E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total TCDD-TEQ	1	1	1.07E-05	1.07E-05	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1
Zinc	1	1	1.90E+01	1.90E+01	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-8
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: G
Well: EEG-104

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
4,4'-DDE	1	1	3.90E-03	3.90E-03	No	ND	--	No	4.00E-02	No	No	<Tier 1
alpha-BHC	1	1	8.00E-04	8.00E-04	No	ND	--	No	3.00E-02	No	No	<Tier 1
Aluminum	1	1	3.10E+01	3.10E+01	No	ND	--	No	3.60E+04	No	No	<Tier 1
Barium	1	1	1.60E+02	1.60E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	1	1	1.50E+05	1.50E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Cobalt	1	1	2.50E+00	2.50E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Dieldrin	1	1	2.60E-03	2.60E-03	No	ND	--	No	2.00E-02	No	No	<Tier 1
Endosulfan II	1	1	6.90E-03	6.90E-03	No	ND	--	No	4.20E+01	No	No	<Tier 1
Endrin aldehyde	1	1	1.10E-02	1.10E-02	No	ND	--	No	2.00E+00	No	No	<Tier 1
Endrin ketone	1	1	9.30E-03	9.30E-03	No	5.21E-02	No	Yes	2.00E+00	No	No	<Tier 1
gamma-BHC (Lindane)	1	1	9.00E-04	9.00E-04	No	1.01E-02	No	Yes	2.00E-01	No	No	<Tier 1
Iron	1	1	1.00E+02	1.00E+02	Yes	2.20E+04	No	Yes	5.00E+03	No	No	EN
Magnesium	1	1	3.80E+04	3.80E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	7.20E+02	7.20E+02	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Nickel	1	1	1.50E+01	1.50E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Potassium	1	1	4.50E+03	4.50E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	1.20E+04	1.20E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total TCDD-TEQ	1	1	2.40E-05	2.40E-05	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1
Zinc	1	1	1.10E+01	1.10E+01	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-9
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: G
Well: EEG-106

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
1,2,4-Trichlorobenzene	1	1	4.70E+01	4.70E+01	No	ND	--	No	7.00E+01	No	No	<Tier 1
1,2-Dichlorobenzene	1	1	4.60E+00	4.60E+00	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,4-Dichlorobenzene	1	1	3.30E+02	3.30E+02	No	ND	--	No	7.50E+01	Yes	Yes	>Tier 1
2,4,6-Trichlorophenol	1	1	4.70E-01	4.70E-01	No	ND	--	No	6.40E+00	No	No	<Tier 1
2,4-Dichlorophenol	1	1	1.10E+01	1.10E+01	No	ND	--	No	2.10E+01	No	No	<Tier 1
2-Chlorophenol	1	1	2.30E+00	2.30E+00	No	ND	--	No	3.50E+01	No	No	<Tier 1
alpha-BHC	1	1	8.30E+00	8.30E+00	No	ND	--	No	3.00E-02	Yes	Yes	>Tier 1
Arsenic	1	1	4.20E+01	4.20E+01	No	1.17E+01	Yes	No	5.00E+01	No	No	<Tier 1
Barium	1	1	1.30E+02	1.30E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Benzene	1	1	9.30E+00	9.30E+00	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
beta-BHC	1	1	3.60E-01	3.60E-01	No	ND	--	No	3.00E-02	Yes	Yes	>Tier 1
Calcium	1	1	2.80E+05	2.80E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Chlorobenzene	1	1	1.80E+02	1.80E+02	No	ND	--	No	1.00E+02	Yes	Yes	>Tier 1
delta-BHC	1	1	1.30E-01	1.30E-01	No	1.25E-02	Yes	No	3.00E-02	Yes	Yes	>Tier 1
Dinoseb	1	1	3.20E-01	3.20E-01	No	ND	--	No	7.00E+00	No	No	<Tier 1
gamma-BHC (Lindane)	1	1	6.80E-02	6.80E-02	No	1.01E-02	Yes	No	2.00E-01	No	No	<Tier 1
Iron	1	1	5.60E+04	5.60E+04	Yes	2.20E+04	Yes	Yes	5.00E+03	Yes	No	EN
Lead	1	1	3.00E+00	3.00E+00	No	ND	--	No	7.50E+00	No	No	<Tier 1
Magnesium	1	1	6.00E+04	6.00E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	2.10E+03	2.10E+03	No	1.75E+03	Yes	No	1.50E+02	Yes	Yes	>Tier 1
Pentachlorophenol	1	1	6.70E-02	6.70E-02	No	ND	--	No	1.00E+00	No	No	<Tier 1
Potassium	1	1	1.40E+04	1.40E+04	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	2.30E+05	2.30E+05	Yes	1.30E+05	Yes	Yes	NA	--	No	EN
Total TCDD-TEQ	1	1	1.03E-05	1.03E-05	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1

Table U-10
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: G
Well: EEG-107

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
1,2,4-Trichlorobenzene	1	1	1.80E+02	1.80E+02	No	ND	--	No	7.00E+01	Yes	Yes	>Tier 1
1,2-Dichlorobenzene	1	1	3.00E+02	3.00E+02	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,4-Dichlorobenzene	1	1	8.50E+02	8.50E+02	No	ND	--	No	7.50E+01	Yes	Yes	>Tier 1
2,4,5-T	1	1	2.40E+01	2.40E+01	No	4.20E-01	Yes	No	3.60E+02	No	No	<Tier 1
2,4-D	1	1	1.20E+02	1.20E+02	No	ND	--	No	7.00E+01	Yes	Yes	>Tier 1
2,4-Dichlorophenol	1	1	3.60E+03	3.60E+03	No	ND	--	No	2.10E+01	Yes	Yes	>Tier 1
2-Chlorophenol	1	1	6.30E+02	6.30E+02	No	ND	--	No	3.50E+01	Yes	Yes	>Tier 1
2-Methylphenol (o-cresol)	1	1	2.30E+02	2.30E+02	No	ND	--	No	3.50E+02	No	No	<Tier 1
3-Methylphenol/4-Methylphenol	1	1	2.40E+03	2.40E+03	No	ND	--	No	3.50E+02	Yes	Yes	>Tier 1
4-Chloroaniline	1	1	2.30E+04	2.30E+04	No	ND	--	No	2.80E+01	Yes	Yes	>Tier 1
4-Methyl-2-pentanone (MIBK)	1	1	1.30E+03	1.30E+03	No	ND	--	No	1.60E+02	Yes	Yes	>Tier 1
Acetone	1	1	5.90E+02	5.90E+02	No	ND	--	No	7.00E+02	No	No	<Tier 1
alpha-BHC	1	1	6.00E+00	6.00E+00	No	ND	--	No	3.00E-02	Yes	Yes	>Tier 1
Aluminum	1	1	6.10E+02	6.10E+02	No	ND	--	No	3.60E+04	No	No	<Tier 1
Antimony	1	1	8.60E+00	8.60E+00	No	ND	--	No	6.00E+00	Yes	Yes	>Tier 1
Arsenic	1	1	1.40E+01	1.40E+01	No	1.17E+01	Yes	No	5.00E+01	No	No	<Tier 1
Barium	1	1	4.20E+02	4.20E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Benzene	1	1	3.70E+03	3.70E+03	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
Cadmium	1	1	2.60E+00	2.60E+00	No	ND	--	No	5.00E+00	No	No	<Tier 1
Calcium	1	1	5.20E+05	5.20E+05	Yes	4.27E+05	Yes	Yes	NA	--	No	EN
Chlorobenzene	1	1	4.30E+03	4.30E+03	No	ND	--	No	1.00E+02	Yes	Yes	>Tier 1
Chromium	1	1	2.20E+01	2.20E+01	No	1.05E+02	No	Yes	1.00E+02	No	No	<Tier 1
Cis/Trans-1,2-Dichloroethene	1	1	1.90E+02	1.90E+02	No	ND	--	No	7.00E+01	Yes	Yes	>Tier 1
Cobalt	1	1	1.40E+02	1.40E+02	No	1.14E+01	Yes	No	1.00E+03	No	No	<Tier 1
Copper	1	1	1.10E+01	1.10E+01	No	ND	--	No	6.50E+02	No	No	<Tier 1
delta-BHC	1	1	1.70E+01	1.70E+01	No	1.25E-02	Yes	No	3.00E-02	Yes	Yes	>Tier 1
Dichloroprop	1	1	4.70E+01	4.70E+01	No	ND	--	No	NA	--	No	No D/R
Ethylbenzene	1	1	3.20E+01	3.20E+01	No	ND	--	No	7.00E+02	No	No	<Tier 1
Iron	1	1	2.70E+05	2.70E+05	Yes	2.20E+04	Yes	Yes	5.00E+03	Yes	No	EN
Lead	1	1	2.40E+01	2.40E+01	No	ND	--	No	7.50E+00	Yes	Yes	>Tier 1
Magnesium	1	1	4.90E+04	4.90E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	6.10E+03	6.10E+03	No	1.75E+03	Yes	No	1.50E+02	Yes	Yes	>Tier 1
Molybdenum	1	1	5.60E+01	5.60E+01	No	ND	--	No	1.80E+02	No	No	<Tier 1
Naphthalene	1	1	2.10E+03	2.10E+03	No	ND	--	No	2.50E+01	Yes	Yes	>Tier 1
Nickel	1	1	1.20E+02	1.20E+02	No	1.30E+02	No	Yes	1.00E+02	Yes	No	BK
Pentachlorophenol	2	2	1.01E+03	2.00E+03	No	ND	--	No	1.00E+00	Yes	Yes	>Tier 1
Phenol	1	1	1.40E+04	1.40E+04	No	ND	--	No	1.00E+02	Yes	Yes	>Tier 1
Potassium	1	1	2.80E+04	2.80E+04	Yes	1.23E+05	No	Yes	NA	--	No	EN
Selenium	1	1	5.00E+00	5.00E+00	No	ND	--	No	5.00E+01	No	No	<Tier 1
Sodium	1	1	1.50E+05	1.50E+05	Yes	1.30E+05	Yes	Yes	NA	--	No	EN
Tetrachloroethene	1	1	1.70E+02	1.70E+02	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
Toluene	1	1	8.50E+03	8.50E+03	No	ND	--	No	1.00E+03	Yes	Yes	>Tier 1
Total TCDD-TEQ	1	1	3.65E-03	3.65E-03	No	5.02E-07	Yes	No	3.00E-05	Yes	Yes	>Tier 1
Trichloroethene	1	1	2.00E+02	2.00E+02	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
Vanadium	1	1	3.30E+02	3.30E+02	No	ND	--	No	4.90E+01	Yes	Yes	>Tier 1
Vinyl chloride	1	1	4.10E+01	4.10E+01	No	ND	--	No	2.00E+00	Yes	Yes	>Tier 1
Xylenes, Total	1	1	1.30E+02	1.30E+02	No	ND	--	No	1.00E+04	No	No	<Tier 1
Zinc	1	1	1.30E+03	1.30E+03	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-11
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: G
Well: EEG-112

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
4-Chloroaniline	1	1	1.10E+00	1.10E+00	No	ND	--	No	2.80E+01	No	No	<Tier 1
Arsenic	1	1	5.50E+01	5.50E+01	No	1.17E+01	Yes	No	5.00E+01	Yes	Yes	>Tier 1
Barium	1	1	3.40E+02	3.40E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Benzene	1	1	1.90E+00	1.90E+00	No	ND	--	No	5.00E+00	No	No	<Tier 1
Calcium	1	1	1.00E+05	1.00E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Chlorobenzene	1	1	2.80E+00	2.80E+00	No	ND	--	No	1.00E+02	No	No	<Tier 1
Iron	1	1	2.70E+04	2.70E+04	Yes	2.20E+04	Yes	Yes	5.00E+03	Yes	No	EN
Magnesium	1	1	2.30E+04	2.30E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	1.10E+03	1.10E+03	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Molybdenum	1	1	3.10E+00	3.10E+00	No	ND	--	No	1.80E+02	No	No	<Tier 1
Potassium	1	1	6.30E+03	6.30E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	5.80E+04	5.80E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total TCDD-TEQ	1	1	3.90E-06	3.90E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1

Table U-12
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: G
Well: EE-05

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
1,2,4-Trichlorobenzene	1	1	1.60E+00	1.60E+00	No	ND	--	No	7.00E+01	No	No	<Tier 1
1,2-Dichlorobenzene	1	1	5.70E+00	5.70E+00	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,3-Dichlorobenzene	1	1	1.90E+00	1.90E+00	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,4-Dichlorobenzene	1	1	1.60E+01	1.60E+01	No	ND	--	No	7.50E+01	No	No	<Tier 1
2,4,5-TP (Silvex)	1	1	3.90E+02	3.90E+02	No	3.20E-01	Yes	No	5.00E+01	Yes	Yes	>Tier 1
2,4-Dichlorophenol	1	1	3.10E+00	3.10E+00	No	ND	--	No	2.10E+01	No	No	<Tier 1
2-Chlorophenol	1	1	3.80E+01	3.80E+01	No	ND	--	No	3.50E+01	Yes	Yes	>Tier 1
2-Methylphenol (o-cresol)	1	1	2.60E+01	2.60E+01	No	ND	--	No	3.50E+02	No	No	<Tier 1
3-Methylphenol/4-Methylphenol	1	1	1.30E+02	1.30E+02	No	ND	--	No	3.50E+02	No	No	<Tier 1
4,4'-DDD	1	1	2.40E-02	2.40E-02	No	ND	--	No	1.10E-01	No	No	<Tier 1
4,4'-DDE	1	1	1.40E-03	1.40E-03	No	ND	--	No	4.00E-02	No	No	<Tier 1
4-Chloroaniline	1	1	1.60E+03	1.60E+03	No	ND	--	No	2.80E+01	Yes	Yes	>Tier 1
4-Nitroaniline	1	1	8.40E+00	8.40E+00	No	ND	--	No	2.10E+00	Yes	Yes	>Tier 1
alpha-BHC	1	1	2.40E-02	2.40E-02	No	ND	--	No	3.00E-02	No	No	<Tier 1
Arsenic	1	1	4.50E+01	4.50E+01	No	1.17E+01	Yes	No	5.00E+01	No	No	<Tier 1
Barium	1	1	4.00E+02	4.00E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Benzene	1	1	1.10E+02	1.10E+02	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
Calcium	1	1	2.70E+05	2.70E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Chlorobenzene	1	1	6.20E+02	6.20E+02	No	ND	--	No	1.00E+02	Yes	Yes	>Tier 1
Cis/Trans-1,2-Dichloroethene	1	1	4.20E+01	4.20E+01	No	ND	--	No	7.00E+01	No	No	<Tier 1
Cobalt	1	1	7.00E+00	7.00E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
delta-BHC	1	1	3.60E-01	3.60E-01	No	1.25E-02	Yes	No	3.00E-02	Yes	Yes	>Tier 1
Dieldrin	1	1	2.00E-02	2.00E-02	No	ND	--	No	2.00E-02	No	No	<Tier 1
Diethylphthalate	1	1	7.10E+00	7.10E+00	No	7.00E-01	Yes	No	5.60E+03	No	No	<Tier 1
Endrin	1	1	2.40E-02	2.40E-02	No	ND	--	No	2.00E+00	No	No	<Tier 1
Endrin aldehyde	1	1	9.20E-02	9.20E-02	No	ND	--	No	2.00E+00	No	No	<Tier 1
Gamma Chlordane	1	1	8.00E-03	8.00E-03	No	ND	--	No	2.00E+00	No	No	<Tier 1
Heptachlor	1	1	2.60E-02	2.60E-02	No	2.60E-02	Yes	No	4.00E-01	No	No	<Tier 1
Heptachlor epoxide	1	1	2.40E-02	2.40E-02	No	2.66E-02	No	Yes	2.00E-01	No	No	<Tier 1
Iron	1	1	4.60E+04	4.60E+04	Yes	2.20E+04	Yes	Yes	5.00E+03	Yes	No	EN
Magnesium	1	1	5.20E+04	5.20E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	1.10E+03	1.10E+03	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Methoxychlor	1	1	6.90E-02	6.90E-02	No	ND	--	No	4.00E+01	No	No	<Tier 1
Molybdenum	1	1	4.50E+02	4.50E+02	No	ND	--	No	1.80E+02	Yes	Yes	>Tier 1
Naphthalene	1	1	3.90E+02	3.90E+02	No	ND	--	No	2.50E+01	Yes	Yes	>Tier 1
Nickel	1	1	5.90E+00	5.90E+00	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Phenol	1	1	3.80E+02	3.80E+02	No	ND	--	No	1.00E+02	Yes	Yes	>Tier 1
Potassium	1	1	3.50E+03	3.50E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	5.90E+04	5.90E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Toluene	1	1	9.70E+02	9.70E+02	No	ND	--	No	1.00E+03	No	No	<Tier 1
Total TCDD-TEQ	1	1	1.78E-04	1.78E-04	No	5.02E-07	Yes	No	3.00E-05	Yes	Yes	>Tier 1
Trichloroethene	1	1	1.80E+01	1.80E+01	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
Vanadium	1	1	3.70E+00	3.70E+00	No	ND	--	No	4.90E+01	No	No	<Tier 1

Table U-13
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: H
Well: EE-01

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
1,1,2,2-Tetrachloroethane	1	1	1.20E+01	1.20E+01	No	ND	--	No	5.50E-02	Yes	Yes	>Tier 1
1,2,4-Trichlorobenzene	1	1	1.90E+01	1.90E+01	No	ND	--	No	7.00E+01	No	No	<Tier 1
1,2-Dichlorobenzene	1	1	7.20E+02	7.20E+02	No	ND	--	No	6.00E+02	Yes	Yes	>Tier 1
1,4-Dichlorobenzene	1	1	2.20E+03	2.20E+03	No	ND	--	No	7.50E+01	Yes	Yes	>Tier 1
2,4,5-Trichlorophenol	1	1	6.20E+01	6.20E+01	No	ND	--	No	7.00E+02	No	No	<Tier 1
2,4,6-Trichlorophenol	1	1	2.70E+02	2.70E+02	No	ND	--	No	6.40E+00	Yes	Yes	>Tier 1
2-Chloronaphthalene	1	1	1.20E+01	1.20E+01	No	ND	--	No	4.90E+02	No	No	<Tier 1
2-Chlorophenol	1	1	7.30E+01	7.30E+01	No	ND	--	No	3.50E+01	Yes	Yes	>Tier 1
2-Methylnaphthalene	1	1	8.00E+00	8.00E+00	No	ND	--	No	2.50E+01	No	No	<Tier 1
2-Methylphenol (o-cresol)	1	1	3.00E+01	3.00E+01	No	ND	--	No	3.50E+02	No	No	<Tier 1
3-Methylphenol/4-Methylphenol	1	1	6.20E+01	6.20E+01	No	ND	--	No	3.50E+02	No	No	<Tier 1
4-Chloroaniline	1	1	1.80E+03	1.80E+03	No	ND	--	No	2.80E+01	Yes	Yes	>Tier 1
Acenaphthene	1	1	2.20E+00	2.20E+00	No	ND	--	No	4.20E+02	No	No	<Tier 1
Aluminum	1	1	3.00E+02	3.00E+02	No	ND	--	No	3.60E+04	No	No	<Tier 1
Arsenic	1	1	3.70E+01	3.70E+01	No	1.17E+01	Yes	No	5.00E+01	No	No	<Tier 1
Barium	1	1	5.70E+02	5.70E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Benzene	1	1	1.50E+03	1.50E+03	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
Cadmium	1	1	2.20E+00	2.20E+00	No	ND	--	No	5.00E+00	No	No	<Tier 1
Calcium	1	1	3.30E+05	3.30E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Carbazole	1	1	5.20E+00	5.20E+00	No	ND	--	No	3.40E+00	Yes	Yes	>Tier 1
Chlorobenzene	1	1	1.20E+03	1.20E+03	No	ND	--	No	1.00E+02	Yes	Yes	>Tier 1
Chromium	1	1	4.20E+00	4.20E+00	No	1.05E+02	No	Yes	1.00E+02	No	No	<Tier 1
Cobalt	1	1	1.30E+02	1.30E+02	No	1.14E+01	Yes	No	1.00E+03	No	No	<Tier 1
Copper	1	1	1.80E+01	1.80E+01	No	ND	--	No	6.50E+02	No	No	<Tier 1
Ethylbenzene	1	1	1.80E+03	1.80E+03	No	ND	--	No	7.00E+02	Yes	Yes	>Tier 1
Fluorene	1	1	3.00E+01	3.00E+01	No	4.80E-01	Yes	No	2.80E+02	No	No	<Tier 1
Iron	1	1	7.70E+04	7.70E+04	Yes	2.20E+04	Yes	Yes	5.00E+03	Yes	No	EN
Magnesium	1	1	6.00E+04	6.00E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	1.60E+03	1.60E+03	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Naphthalene	1	1	2.30E+03	2.30E+03	No	ND	--	No	2.50E+01	Yes	Yes	>Tier 1
Nickel	1	1	6.70E+02	6.70E+02	No	1.30E+02	Yes	No	1.00E+02	Yes	Yes	>Tier 1
N-Nitrosodiphenylamine	1	1	7.60E+00	7.60E+00	No	5.00E-01	Yes	No	1.00E+01	No	No	<Tier 1
Pentachlorophenol	2	2	3.35E+03	4.30E+03	No	ND	--	No	1.00E+00	Yes	Yes	>Tier 1
Phenanthrene	1	1	4.80E+00	4.80E+00	No	ND	--	No	2.10E+03	No	No	<Tier 1
Phenol	1	1	7.20E+01	7.20E+01	No	ND	--	No	1.00E+02	No	No	<Tier 1
Potassium	1	1	2.70E+04	2.70E+04	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	5.10E+04	5.10E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Toluene	1	1	9.40E+01	9.40E+01	No	ND	--	No	1.00E+03	No	No	<Tier 1
Total TCDD-TEQ	1	1	4.57E-05	4.57E-05	No	5.02E-07	Yes	No	3.00E-05	Yes	Yes	>Tier 1
Xylenes, Total	1	1	2.00E+02	2.00E+02	No	ND	--	No	1.00E+04	No	No	<Tier 1
Zinc	1	1	4.80E+02	4.80E+02	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-14
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: H
Well: EE-02

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
1,2,4-Trichlorobenzene	1	1	3.15E+02	3.15E+02	No	ND	--	No	7.00E+01	Yes	Yes	>Tier 1
1,2-Dichlorobenzene	1	1	2.20E+02	2.20E+02	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,3-Dichlorobenzene	1	1	5.45E+00	5.45E+00	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,4-Dichlorobenzene	1	1	6.35E+02	6.35E+02	No	ND	--	No	7.50E+01	Yes	Yes	>Tier 1
2,4,5-T	1	1	3.50E+01	3.50E+01	No	4.20E-01	Yes	No	3.60E+02	No	No	<Tier 1
2,4,5-Trichlorophenol	1	1	1.90E+02	1.90E+02	No	ND	--	No	7.00E+02	No	No	<Tier 1
2,4,6-Trichlorophenol	1	1	4.65E+02	4.65E+02	No	ND	--	No	6.40E+00	Yes	Yes	>Tier 1
2,4-D	1	1	1.80E+02	1.80E+02	No	ND	--	No	7.00E+01	Yes	Yes	>Tier 1
2,4-Dichlorophenol	1	1	3.70E+02	3.70E+02	No	ND	--	No	2.10E+01	Yes	Yes	>Tier 1
2-Chlorophenol	1	1	2.25E+01	2.25E+01	No	ND	--	No	3.50E+01	No	No	<Tier 1
2-Methylnaphthalene	1	1	1.80E+00	1.80E+00	No	ND	--	No	2.50E+01	No	No	<Tier 1
2-Methylphenol (o-cresol)	1	1	2.80E+01	2.80E+01	No	ND	--	No	3.50E+02	No	No	<Tier 1
2-Nitroaniline	1	1	1.35E+01	1.35E+01	No	ND	--	No	2.10E+00	Yes	Yes	>Tier 1
3-Methylphenol/4-Methylphenol	1	1	2.15E+02	2.15E+02	No	ND	--	No	3.50E+02	No	No	<Tier 1
4-Chloroaniline	1	1	7.75E+02	7.75E+02	No	ND	--	No	2.80E+01	Yes	Yes	>Tier 1
Acetone	1	1	4.90E+02	4.90E+02	No	ND	--	No	7.00E+02	No	No	<Tier 1
Alpha Chlordane	1	1	2.40E+00	2.40E+00	No	ND	--	No	2.00E+00	Yes	Yes	>Tier 1
alpha-BHC	1	1	4.95E-01	4.95E-01	No	ND	--	No	3.00E-02	Yes	Yes	>Tier 1
Antimony	1	1	1.05E+02	1.05E+02	No	ND	--	No	6.00E+00	Yes	Yes	>Tier 1
Arsenic	1	1	1.25E+03	1.25E+03	No	1.17E+01	Yes	No	5.00E+01	Yes	Yes	>Tier 1
Barium	1	1	6.35E+01	6.35E+01	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Benzene	1	1	2.25E+03	2.25E+03	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
bis(2-Ethylhexyl)phthalate	1	1	7.40E-01	7.40E-01	No	ND	--	No	6.00E+00	No	No	<Tier 1
Calcium	1	1	7.20E+05	7.20E+05	Yes	4.27E+05	Yes	Yes	NA	--	No	EN
Carbazole	1	1	1.15E+00	1.15E+00	No	ND	--	No	3.40E+00	No	No	<Tier 1
Chlorobenzene	1	1	4.35E+03	4.35E+03	No	ND	--	No	1.00E+02	Yes	Yes	>Tier 1
Chloroform	1	1	4.25E+02	4.25E+02	No	ND	--	No	2.00E-02	Yes	Yes	>Tier 1
Chromium	1	1	3.00E+00	3.00E+00	No	1.05E+02	No	Yes	1.00E+02	No	No	<Tier 1
Cobalt	1	1	3.95E+01	3.95E+01	No	1.14E+01	Yes	No	1.00E+03	No	No	<Tier 1
Copper	1	1	6.30E+00	6.30E+00	No	ND	--	No	6.50E+02	No	No	<Tier 1
Cyanide, Total	1	1	1.80E+01	1.80E+01	No	ND	--	No	2.00E+02	No	No	<Tier 1
Diethylphthalate	1	1	2.10E+01	2.10E+01	No	7.00E-01	Yes	No	5.60E+03	No	No	<Tier 1
Dimethylphthalate	1	1	3.65E+00	3.65E+00	No	ND	--	No	3.60E+05	No	No	<Tier 1
Endrin	1	1	3.60E-01	3.60E-01	No	ND	--	No	2.00E+00	No	No	<Tier 1
Fluorene	1	1	1.00E+00	1.00E+00	No	4.80E-01	Yes	No	2.80E+02	No	No	<Tier 1
Heptachlor epoxide	1	1	4.40E+00	4.40E+00	No	2.66E-02	Yes	No	2.00E-01	Yes	Yes	>Tier 1
Iron	1	1	2.40E+04	2.40E+04	Yes	2.20E+04	Yes	Yes	5.00E+03	Yes	No	EN
Magnesium	1	1	3.95E+04	3.95E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	8.80E+03	8.80E+03	No	1.75E+03	Yes	No	1.50E+02	Yes	Yes	>Tier 1
Mercury	1	1	9.00E-02	9.00E-02	No	ND	--	No	2.00E+00	No	No	<Tier 1
Methoxychlor	1	1	3.60E-01	3.60E-01	No	ND	--	No	4.00E+01	No	No	<Tier 1
Molybdenum	1	1	5.45E+00	5.45E+00	No	ND	--	No	1.80E+02	No	No	<Tier 1
Naphthalene	1	1	1.95E+02	1.95E+02	No	ND	--	No	2.50E+01	Yes	Yes	>Tier 1
Nickel	1	1	4.30E+02	4.30E+02	No	1.30E+02	Yes	No	1.00E+02	Yes	Yes	>Tier 1
Nitrobenzene	1	1	5.65E+01	5.65E+01	No	ND	--	No	3.50E+00	Yes	Yes	>Tier 1
Pentachlorophenol	2	2	6.50E+02	6.70E+02	No	ND	--	No	1.00E+00	Yes	Yes	>Tier 1
Phenol	1	1	3.15E+02	3.15E+02	No	ND	--	No	1.00E+02	Yes	Yes	>Tier 1
Potassium	1	1	2.60E+04	2.60E+04	Yes	1.23E+05	No	Yes	NA	--	No	EN
Selenium	1	1	7.15E+00	7.15E+00	No	ND	--	No	5.00E+01	No	No	<Tier 1
Sodium	1	1	3.25E+04	3.25E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Thallium	1	1	5.05E+00	5.05E+00	No	ND	--	No	2.00E+00	Yes	Yes	>Tier 1
Total TCDD-TEQ	1	1	2.31E-06	2.31E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1
Toluene	1	1	1.55E+03	1.55E+03	No	ND	--	No	1.00E+03	Yes	Yes	>Tier 1
Trichloroethene	1	1	4.95E+01	4.95E+01	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
Vanadium	1	1	3.50E+00	3.50E+00	No	ND	--	No	4.90E+01	No	No	<Tier 1
Zinc	1	1	6.05E+01	6.05E+01	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-15
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: H
Well: EE-03

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
1,2-Dichlorobenzene	1	1	2.20E+00	2.20E+00	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,4-Dichlorobenzene	1	1	2.10E+01	2.10E+01	No	ND	--	No	7.50E+01	No	No	<Tier 1
2,4-Dichlorophenol	1	1	7.50E-01	7.50E-01	No	ND	--	No	2.10E+01	No	No	<Tier 1
Arsenic	1	1	2.80E+01	2.80E+01	No	1.17E+01	Yes	No	5.00E+01	No	No	<Tier 1
Barium	1	1	1.30E+02	1.30E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	1	1	2.60E+05	2.60E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Chlorobenzene	1	1	1.40E+01	1.40E+01	No	ND	--	No	1.00E+02	No	No	<Tier 1
Iron	1	1	3.60E+04	3.60E+04	Yes	2.20E+04	Yes	Yes	5.00E+03	Yes	No	EN
Magnesium	1	1	7.90E+04	7.90E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	1.40E+03	1.40E+03	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Nickel	1	1	5.40E+00	5.40E+00	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Pentachlorophenol	2	1	1.75E+00	3.00E+00	No	ND	--	No	1.00E+00	Yes	Yes	>Tier 1
Potassium	1	1	1.20E+04	1.20E+04	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	9.80E+04	9.80E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total TCDD-TEQ	1	1	5.02E-05	5.02E-05	No	5.02E-07	Yes	No	3.00E-05	Yes	Yes	>Tier 1

Table U-16
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: H
Well: EEG-110

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
Arsenic	1	1	4.50E+00	4.50E+00	No	1.17E+01	No	Yes	5.00E+01	No	No	<Tier 1
Barium	1	1	1.20E+02	1.20E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Cadmium	1	1	2.10E+00	2.10E+00	No	ND	--	No	5.00E+00	No	No	<Tier 1
Calcium	1	1	1.20E+05	1.20E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Cobalt	1	1	1.90E+00	1.90E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
delta-BHC	1	1	1.60E-03	1.60E-03	No	1.25E-02	No	Yes	3.00E-02	No	No	<Tier 1
Heptachlor	1	1	9.90E-03	9.90E-03	No	2.60E-02	No	Yes	4.00E-01	No	No	<Tier 1
Iron	1	1	4.80E+02	4.80E+02	Yes	2.20E+04	No	Yes	5.00E+03	No	No	EN
Magnesium	1	1	2.10E+04	2.10E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	1.60E+03	1.60E+03	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Methylene chloride	1	1	3.20E+00	3.20E+00	No	ND	--	No	5.00E+00	No	No	<Tier 1
Molybdenum	1	1	1.00E+01	1.00E+01	No	ND	--	No	1.80E+02	No	No	<Tier 1
Nickel	1	1	1.50E+02	1.50E+02	No	1.30E+02	Yes	No	1.00E+02	Yes	Yes	>Tier 1
Potassium	1	1	3.60E+03	3.60E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	1.50E+04	1.50E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Zinc	1	1	5.40E+02	5.40E+02	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-17
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: I
Well: AA-I-S1

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
1,1-Dichloroethane	2	1	6.05E+02	9.60E+02	No	ND	--	No	7.00E+02	Yes	Yes	>Tier 1
1,1-Dichloroethene	1	1	3.20E+01	3.20E+01	No	ND	--	No	7.00E+00	Yes	Yes	>Tier 1
1,2-Dichlorobenzene	2	2	7.15E+01	1.30E+02	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,3-Dichlorobenzene	2	1	5.75E+01	1.10E+02	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,4-Dichlorobenzene	2	2	2.21E+03	4.40E+03	No	ND	--	No	7.50E+01	Yes	Yes	>Tier 1
2,4,5-TP (Silvex)	2	2	7.25E-01	1.10E+00	No	3.20E-01	Yes	No	5.00E+01	No	No	<Tier 1
2-Chlorophenol	2	1	5.25E+00	5.50E+00	No	ND	--	No	3.50E+01	No	No	<Tier 1
4,4'-DDD	1	1	3.60E-03	3.60E-03	No	ND	--	No	1.10E-01	No	No	<Tier 1
4,4'-DDT	1	1	2.20E-03	2.20E-03	No	ND	--	No	1.20E-01	No	No	<Tier 1
4-Chloroaniline	2	2	3.25E+03	4.10E+03	No	ND	--	No	2.80E+01	Yes	Yes	>Tier 1
Aldrin	2	2	4.10E-03	5.50E-03	No	ND	--	No	4.00E-02	No	No	<Tier 1
alpha-BHC	2	2	3.30E-02	5.40E-02	No	ND	--	No	3.00E-02	Yes	Yes	>Tier 1
Aluminum	2	2	7.65E+02	1.40E+03	No	ND	--	No	3.60E+04	No	No	<Tier 1
Arsenic	2	2	1.04E+02	1.40E+02	No	1.17E+01	Yes	No	5.00E+01	Yes	Yes	>Tier 1
Barium	2	2	5.35E+02	7.60E+02	No	6.17E+02	Yes	No	2.00E+03	No	No	<Tier 1
Benzene	2	2	4.55E+02	6.20E+02	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
beta-BHC	2	1	4.90E-02	9.10E-02	No	ND	--	No	3.00E-02	Yes	Yes	>Tier 1
bis(2-Chloroethyl)ether	1	1	1.10E+00	1.10E+00	No	ND	--	No	1.00E+01	No	No	<Tier 1
bis(2-Ethylhexyl)phthalate	1	1	6.90E-01	6.90E-01	No	ND	--	No	6.00E+00	No	No	<Tier 1
Calcium	2	2	2.55E+05	3.20E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Carbazole	1	1	1.40E+00	1.40E+00	No	ND	--	No	3.40E+00	No	No	<Tier 1
Chlorobenzene	2	2	5.15E+03	8.70E+03	No	ND	--	No	1.00E+02	Yes	Yes	>Tier 1
Chromium	1	1	3.10E+00	3.10E+00	No	1.05E+02	No	Yes	1.00E+02	No	No	<Tier 1
Cis/Trans-1,2-Dichloroethene	2	1	7.25E+02	1.20E+03	No	ND	--	No	7.00E+01	Yes	Yes	>Tier 1
Cobalt	2	1	7.50E+00	1.00E+01	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
delta-BHC	2	2	6.80E-02	1.00E-01	No	1.25E-02	Yes	No	3.00E-02	Yes	Yes	>Tier 1
Dicamba	1	1	1.40E-01	1.40E-01	No	ND	--	No	1.10E+03	No	No	<Tier 1
Dieldrin	1	1	3.90E-03	3.90E-03	No	ND	--	No	2.00E-02	No	No	<Tier 1
Dinoseb	1	1	2.70E-01	2.70E-01	No	ND	--	No	7.00E+00	No	No	<Tier 1
Endosulfan II	1	1	1.00E-03	1.00E-03	No	ND	--	No	4.20E+01	No	No	<Tier 1
Endrin	1	1	2.70E-03	2.70E-03	No	ND	--	No	2.00E+00	No	No	<Tier 1
Endrin ketone	1	1	4.40E-03	4.40E-03	No	5.21E-02	No	Yes	2.00E+00	No	No	<Tier 1
Ethylbenzene	2	2	5.55E+02	8.70E+02	No	ND	--	No	7.00E+02	Yes	Yes	>Tier 1
gamma-BHC (Lindane)	2	1	3.93E-02	6.90E-02	No	1.01E-02	Yes	No	2.00E-01	No	No	<Tier 1
Heptachlor	2	2	2.60E-02	2.80E-02	No	2.60E-02	Yes	No	4.00E-01	No	No	<Tier 1
Heptachlor epoxide	2	2	1.09E-02	1.40E-02	No	2.66E-02	No	Yes	2.00E-01	No	No	<Tier 1
Iron	2	2	4.90E+04	6.50E+04	Yes	2.20E+04	Yes	Yes	5.00E+03	Yes	No	EN
Lead	2	1	2.65E+00	2.80E+00	No	ND	--	No	7.50E+00	No	No	<Tier 1
Magnesium	2	2	6.30E+04	7.10E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	2	2	2.55E+03	3.70E+03	No	1.75E+03	Yes	No	1.50E+02	Yes	Yes	>Tier 1
Molybdenum	2	1	6.40E+00	7.80E+00	No	ND	--	No	1.80E+02	No	No	<Tier 1
Naphthalene	1	1	4.20E+00	4.20E+00	No	ND	--	No	2.50E+01	No	No	<Tier 1
Nickel	2	1	3.40E+01	4.80E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
N-Nitrosodiphenylamine	2	1	3.90E+00	5.30E+00	No	5.00E-01	Yes	No	1.00E+01	No	No	<Tier 1
Pentachlorophenol	1	1	1.30E-01	1.30E-01	No	ND	--	No	1.00E+00	No	No	<Tier 1
Potassium	2	2	1.14E+04	1.30E+04	Yes	1.23E+05	No	Yes	NA	--	No	BK
Sodium	2	2	9.20E+04	1.30E+05	Yes	1.30E+05	No	Yes	NA	--	No	BK
Toluene	1	1	1.80E+01	1.80E+01	No	ND	--	No	1.00E+03	No	No	<Tier 1
Total PCBs	2	1	1.07E+00	1.13E+00	No	ND	--	No	5.00E-01	Yes	Yes	>Tier 1
Vanadium	1	1	4.50E+00	4.50E+00	No	ND	--	No	4.90E+01	No	No	<Tier 1
Vinyl chloride	2	1	7.35E+02	9.70E+02	No	ND	--	No	2.00E+00	Yes	Yes	>Tier 1

Table U-18
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: I
Well: AA-I-S2

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
1,1-Dichloroethane	2	2	1.70E+02	1.80E+02	No	ND	--	No	7.00E+02	No	No	<Tier 1
1,1-Dichloroethene	1	1	3.10E+01	3.10E+01	No	ND	--	No	7.00E+00	Yes	Yes	>Tier 1
1,2-Dichlorobenzene	2	1	7.25E+01	1.40E+02	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,3-Dichlorobenzene	2	1	6.25E+01	1.20E+02	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,4-Dichlorobenzene	2	2	2.15E+03	4.20E+03	No	ND	--	No	7.50E+01	Yes	Yes	>Tier 1
2,4,5-TP (Silvex)	1	1	1.80E-01	1.80E-01	No	3.20E-01	No	Yes	5.00E+01	No	No	<Tier 1
2,4-D	2	1	2.60E-01	2.70E-01	No	ND	--	No	7.00E+01	No	No	<Tier 1
2,4-Dichlorophenol	2	1	5.80E+00	6.60E+00	No	ND	--	No	2.10E+01	No	No	<Tier 1
2-Chlorophenol	2	1	5.15E+00	5.30E+00	No	ND	--	No	3.50E+01	No	No	<Tier 1
4-Chloroaniline	2	2	3.51E+02	6.80E+02	No	ND	--	No	2.80E+01	Yes	Yes	>Tier 1
alpha-BHC	1	1	8.40E-03	8.40E-03	No	ND	--	No	3.00E-02	No	No	<Tier 1
Arsenic	2	1	2.30E+01	4.10E+01	No	1.17E+01	Yes	No	5.00E+01	No	No	<Tier 1
Barium	2	2	6.30E+01	7.90E+01	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Benzene	2	2	6.13E+01	1.20E+02	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
Benzo(a)anthracene	1	1	5.90E-01	5.90E-01	No	ND	--	No	1.30E-01	Yes	Yes	>Tier 1
Benzo(a)pyrene	1	1	9.80E-01	9.80E-01	No	ND	--	No	2.00E-01	Yes	Yes	>Tier 1
Benzo(k)fluoranthene	1	1	1.20E+00	1.20E+00	No	ND	--	No	1.70E-01	Yes	Yes	>Tier 1
Cadmium	2	1	3.63E+01	7.00E+01	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
Calcium	2	2	3.05E+05	3.50E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Chlorobenzene	2	2	1.66E+03	3.20E+03	No	ND	--	No	1.00E+02	Yes	Yes	>Tier 1
Chrysene	1	1	7.30E-01	7.30E-01	No	ND	--	No	1.50E+00	No	No	<Tier 1
Cis/Trans-1,2-Dichloroethene	2	2	4.05E+02	5.10E+02	No	ND	--	No	7.00E+01	Yes	Yes	>Tier 1
Cobalt	2	2	4.35E+01	4.70E+01	No	1.14E+01	Yes	No	1.00E+03	No	No	<Tier 1
delta-BHC	2	1	2.40E-02	4.20E-02	No	1.25E-02	Yes	No	3.00E-02	Yes	Yes	>Tier 1
Dibenzo(a,h)anthracene	2	2	9.75E-01	1.10E+00	No	ND	--	No	3.00E-01	Yes	Yes	>Tier 1
Ethylbenzene	2	1	1.11E+02	2.10E+02	No	ND	--	No	7.00E+02	No	No	<Tier 1
Heptachlor	2	2	7.60E-03	8.30E-03	No	2.60E-02	No	Yes	4.00E-01	No	No	<Tier 1
Iron	2	1	1.17E+04	2.30E+04	Yes	2.20E+04	Yes	Yes	5.00E+03	Yes	No	EN
Magnesium	2	2	5.80E+04	6.50E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	2	2	4.85E+03	7.40E+03	No	1.75E+03	Yes	No	1.50E+02	Yes	Yes	>Tier 1
Molybdenum	2	2	3.00E+00	3.10E+00	No	ND	--	No	1.80E+02	No	No	<Tier 1
Nickel	2	2	4.40E+03	7.80E+03	No	1.30E+02	Yes	No	1.00E+02	Yes	Yes	>Tier 1
Potassium	2	2	1.20E+04	1.30E+04	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	2	2	9.00E+04	1.20E+05	Yes	1.30E+05	No	Yes	NA	--	No	EN
Tetrachloroethene	1	1	7.40E+00	7.40E+00	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
Total TCDD-TEQ	1	1	1.88E-06	1.88E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1
Trichloroethene	2	1	1.04E+02	1.80E+02	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
Vanadium	1	1	2.70E+00	2.70E+00	No	ND	--	No	4.90E+01	No	No	<Tier 1
Vinyl chloride	2	2	2.00E+02	2.40E+02	No	ND	--	No	2.00E+00	Yes	Yes	>Tier 1
Zinc	2	2	1.83E+04	3.30E+04	No	ND	--	No	5.00E+03	Yes	Yes	>Tier 1

Table U-19
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: I
Well: AA-I-S3

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
Barium	1	1	3.30E+02	3.30E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Benzo(a)pyrene	1	1	4.50E-01	4.50E-01	No	ND	--	No	2.00E-01	Yes	Yes	>Tier 1
Benzo(b)fluoranthene	1	1	3.00E-01	3.00E-01	No	ND	--	No	1.80E-01	Yes	Yes	>Tier 1
Calcium	1	1	2.40E+05	2.40E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Heptachlor	1	1	9.20E-03	9.20E-03	No	2.60E-02	No	Yes	4.00E-01	No	No	<Tier 1
Magnesium	1	1	3.30E+04	3.30E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	4.30E+02	4.30E+02	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Molybdenum	1	1	1.10E+01	1.10E+01	No	ND	--	No	1.80E+02	No	No	<Tier 1
Potassium	1	1	1.70E+05	1.70E+05	Yes	1.23E+05	Yes	Yes	NA	--	No	EN
Sodium	1	1	1.80E+05	1.80E+05	Yes	1.30E+05	Yes	Yes	NA	--	No	EN
Total TCDD-TEQ	1	1	2.41E-06	2.41E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1

Table U-20
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: I
Well: EE-12

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
1,2,4-Trichlorobenzene	1	1	5.50E-01	5.50E-01	No	ND	--	No	7.00E+01	No	No	<Tier 1
1,2-Dichlorobenzene	1	1	3.90E+00	3.90E+00	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,3-Dichlorobenzene	1	1	1.30E+01	1.30E+01	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,4-Dichlorobenzene	1	1	9.60E+01	9.60E+01	No	ND	--	No	7.50E+01	Yes	Yes	>Tier 1
2,4,5-TP (Silvex)	1	1	4.50E-01	4.50E-01	No	3.20E-01	Yes	No	5.00E+01	No	No	<Tier 1
2-Chlorophenol	1	1	1.00E+01	1.00E+01	No	ND	--	No	3.50E+01	No	No	<Tier 1
2-Methylphenol (o-cresol)	1	1	3.90E-01	3.90E-01	No	ND	--	No	3.50E+02	No	No	<Tier 1
3-Methylphenol/4-Methylphenol	1	1	4.80E+00	4.80E+00	No	ND	--	No	3.50E+02	No	No	<Tier 1
4,4'-DDE	1	1	2.20E+00	2.20E+00	No	ND	--	No	4.00E-02	Yes	Yes	>Tier 1
4-Chloroaniline	1	1	1.40E+03	1.40E+03	No	ND	--	No	2.80E+01	Yes	Yes	>Tier 1
alpha-BHC	1	1	2.40E+00	2.40E+00	No	ND	--	No	3.00E-02	Yes	Yes	>Tier 1
Aluminum	1	1	4.90E+03	4.90E+03	No	ND	--	No	3.60E+04	No	No	<Tier 1
Arsenic	1	1	9.70E+00	9.70E+00	No	1.17E+01	No	Yes	5.00E+01	No	No	<Tier 1
Barium	1	1	9.20E+02	9.20E+02	No	6.17E+02	Yes	No	2.00E+03	No	No	<Tier 1
Benzene	1	1	6.80E+02	6.80E+02	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
bis(2-Ethylhexyl)phthalate	1	1	7.90E-01	7.90E-01	No	ND	--	No	6.00E+00	No	No	<Tier 1
Cadmium	1	1	9.60E-01	9.60E-01	No	ND	--	No	5.00E+00	No	No	<Tier 1
Calcium	1	1	4.80E+05	4.80E+05	Yes	4.27E+05	Yes	Yes	NA	--	No	EN
Carbazole	1	1	3.50E+00	3.50E+00	No	ND	--	No	3.40E+00	Yes	Yes	>Tier 1
Chlorobenzene	1	1	1.40E+03	1.40E+03	No	ND	--	No	1.00E+02	Yes	Yes	>Tier 1
Chromium	1	1	7.30E+00	7.30E+00	No	1.05E+02	No	Yes	1.00E+02	No	No	<Tier 1
Cobalt	1	1	2.80E+00	2.80E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Copper	1	1	1.00E+01	1.00E+01	No	ND	--	No	6.50E+02	No	No	<Tier 1
Di-n-butylphthalate	1	1	1.40E+00	1.40E+00	No	ND	--	No	7.00E+02	No	No	<Tier 1
Endosulfan II	1	1	2.00E+00	2.00E+00	No	ND	--	No	4.20E+01	No	No	<Tier 1
Endrin ketone	1	1	1.80E+00	1.80E+00	No	5.21E-02	Yes	No	2.00E+00	No	No	<Tier 1
Ethylbenzene	1	1	4.60E+00	4.60E+00	No	ND	--	No	7.00E+02	No	No	<Tier 1
Fluoranthene	1	1	4.10E-01	4.10E-01	No	ND	--	No	2.80E+02	No	No	<Tier 1
Gamma Chlordane	1	1	3.50E+00	3.50E+00	No	ND	--	No	2.00E+00	Yes	Yes	>Tier 1
Heptachlor	1	1	2.50E+00	2.50E+00	No	2.60E-02	Yes	No	4.00E-01	Yes	Yes	>Tier 1
Heptachlor epoxide	1	1	5.60E+00	5.60E+00	No	2.66E-02	Yes	No	2.00E-01	Yes	Yes	>Tier 1
Iron	1	1	6.20E+04	6.20E+04	Yes	2.20E+04	Yes	Yes	5.00E+03	Yes	No	EN
Magnesium	1	1	1.10E+05	1.10E+05	Yes	9.23E+04	Yes	Yes	NA	--	No	EN
Manganese	1	1	6.80E+03	6.80E+03	No	1.75E+03	Yes	No	1.50E+02	Yes	Yes	>Tier 1
Mercury	1	1	1.30E-01	1.30E-01	No	ND	--	No	2.00E+00	No	No	<Tier 1
Methoxychlor	1	1	2.80E+00	2.80E+00	No	ND	--	No	4.00E+01	No	No	<Tier 1
Naphthalene	1	1	6.50E+00	6.50E+00	No	ND	--	No	2.50E+01	No	No	<Tier 1
Nickel	1	1	9.50E+00	9.50E+00	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Pentachlorophenol	1	1	6.70E-02	6.70E-02	No	ND	--	No	1.00E+00	No	No	<Tier 1
Phenol	1	1	1.90E+01	1.90E+01	No	ND	--	No	1.00E+02	No	No	<Tier 1
Potassium	1	1	2.60E+04	2.60E+04	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	2.40E+05	2.40E+05	Yes	1.30E+05	Yes	Yes	NA	--	No	EN
Toluene	1	1	5.00E+00	5.00E+00	No	ND	--	No	1.00E+03	No	No	<Tier 1
Total TCDD-TEQ	1	1	3.05E-03	3.05E-03	No	5.02E-07	Yes	No	3.00E-05	Yes	Yes	>Tier 1
Vanadium	1	1	2.20E+01	2.20E+01	No	ND	--	No	4.90E+01	No	No	<Tier 1
Xylenes, Total	1	1	1.40E+01	1.40E+01	No	ND	--	No	1.00E+04	No	No	<Tier 1
Zinc	1	1	1.20E+02	1.20E+02	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-21
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: I
Well: EE-13

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
Aluminum	1	1	1.50E+03	1.50E+03	No	ND	--	No	3.60E+04	No	No	<Tier 1
Barium	1	1	1.70E+02	1.70E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	1	1	1.50E+05	1.50E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Chromium	1	1	2.50E+00	2.50E+00	No	1.05E+02	No	Yes	1.00E+02	No	No	<Tier 1
Cobalt	1	1	4.10E+00	4.10E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Copper	1	1	3.80E+00	3.80E+00	No	ND	--	No	6.50E+02	No	No	<Tier 1
delta-BHC	1	1	2.10E-02	2.10E-02	No	1.25E-02	Yes	No	3.00E-02	No	No	<Tier 1
Iron	1	1	2.10E+03	2.10E+03	Yes	2.20E+04	No	Yes	5.00E+03	No	No	EN
Magnesium	1	1	3.10E+04	3.10E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	3.20E+02	3.20E+02	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Nickel	1	1	1.10E+01	1.10E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Pentachlorophenol	1	1	6.60E-02	6.60E-02	No	ND	--	No	1.00E+00	No	No	<Tier 1
Potassium	1	1	7.60E+03	7.60E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	3.70E+04	3.70E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total TCDD-TEQ	1	1	4.74E-05	4.74E-05	No	5.02E-07	Yes	No	3.00E-05	Yes	Yes	>Tier 1
Vanadium	1	1	5.00E+00	5.00E+00	No	ND	--	No	4.90E+01	No	No	<Tier 1
Zinc	1	1	1.00E+01	1.00E+01	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-22
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: I
Well: EE-14

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
1,2,4-Trichlorobenzene	1	1	5.10E+02	5.10E+02	No	ND	--	No	7.00E+01	Yes	Yes	>Tier 1
1,2-Dichlorobenzene	1	1	5.00E+02	5.00E+02	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,3-Dichlorobenzene	1	1	4.50E+01	4.50E+01	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,4-Dichlorobenzene	1	1	1.40E+04	1.40E+04	No	ND	--	No	7.50E+01	Yes	Yes	>Tier 1
2,4,5-Trichlorophenol	1	1	1.60E+00	1.60E+00	No	ND	--	No	7.00E+02	No	No	<Tier 1
2,4,6-Trichlorophenol	1	1	1.50E+01	1.50E+01	No	ND	--	No	6.40E+00	Yes	Yes	>Tier 1
2-Chlorophenol	1	1	2.70E+01	2.70E+01	No	ND	--	No	3.50E+01	No	No	<Tier 1
2-Methylnaphthalene	1	1	4.20E+00	4.20E+00	No	ND	--	No	2.50E+01	No	No	<Tier 1
2-Methylphenol (o-cresol)	1	1	2.10E+01	2.10E+01	No	ND	--	No	3.50E+02	No	No	<Tier 1
3-Methylphenol/4-Methylphenol	1	1	1.10E+02	1.10E+02	No	ND	--	No	3.50E+02	No	No	<Tier 1
4,4'-DDE	1	1	1.80E-01	1.80E-01	No	ND	--	No	4.00E-02	Yes	Yes	>Tier 1
4-Chloroaniline	1	1	1.80E+03	1.80E+03	No	ND	--	No	2.80E+01	Yes	Yes	>Tier 1
alpha-BHC	1	1	1.10E+00	1.10E+00	No	ND	--	No	3.00E-02	Yes	Yes	>Tier 1
Arsenic	1	1	1.60E+01	1.60E+01	No	1.17E+01	Yes	No	5.00E+01	No	No	<Tier 1
Barium	1	1	5.80E+02	5.80E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Benzene	1	1	7.50E+02	7.50E+02	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
beta-BHC	1	1	1.00E+00	1.00E+00	No	ND	--	No	3.00E-02	Yes	Yes	>Tier 1
bis(2-Ethylhexyl)phthalate	1	1	1.10E+00	1.10E+00	No	ND	--	No	6.00E+00	No	No	<Tier 1
Butylbenzylphthalate	1	1	1.00E+01	1.00E+01	No	ND	--	No	1.40E+03	No	No	<Tier 1
Calcium	1	1	1.90E+05	1.90E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Carbazole	1	1	2.60E+01	2.60E+01	No	ND	--	No	3.40E+00	Yes	Yes	>Tier 1
Chlorobenzene	1	1	3.80E+03	3.80E+03	No	ND	--	No	1.00E+02	Yes	Yes	>Tier 1
Chromium	1	1	7.80E+00	7.80E+00	No	1.05E+02	No	Yes	1.00E+02	No	No	<Tier 1
Cis/Trans-1,2-Dichloroethene	1	1	1.60E+02	1.60E+02	No	ND	--	No	7.00E+01	Yes	Yes	>Tier 1
Cobalt	1	1	4.00E+00	4.00E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Copper	1	1	1.90E+01	1.90E+01	No	ND	--	No	6.50E+02	No	No	<Tier 1
Endrin ketone	1	1	1.10E-01	1.10E-01	No	5.21E-02	Yes	No	2.00E+00	No	No	<Tier 1
Ethylbenzene	1	1	8.30E+01	8.30E+01	No	ND	--	No	7.00E+02	No	No	<Tier 1
Gamma Chlordane	1	1	2.50E-01	2.50E-01	No	ND	--	No	2.00E+00	No	No	<Tier 1
gamma-BHC (Lindane)	1	1	4.00E-01	4.00E-01	No	1.01E-02	Yes	No	2.00E-01	Yes	Yes	>Tier 1
Heptachlor epoxide	1	1	6.80E-01	6.80E-01	No	2.66E-02	Yes	No	2.00E-01	Yes	Yes	>Tier 1
Iron	1	1	6.40E+04	6.40E+04	Yes	2.20E+04	Yes	Yes	5.00E+03	Yes	No	EN
Lead	1	1	2.20E+01	2.20E+01	No	ND	--	No	7.50E+00	Yes	Yes	>Tier 1
Magnesium	1	1	4.90E+04	4.90E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	1.20E+03	1.20E+03	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Mercury	1	1	1.80E-01	1.80E-01	No	ND	--	No	2.00E+00	No	No	<Tier 1
Methoxychlor	1	1	2.20E-01	2.20E-01	No	ND	--	No	4.00E+01	No	No	<Tier 1
Naphthalene	1	1	3.60E+01	3.60E+01	No	ND	--	No	2.50E+01	Yes	Yes	>Tier 1
Nickel	1	1	1.50E+02	1.50E+02	No	1.30E+02	Yes	No	1.00E+02	Yes	Yes	>Tier 1
N-Nitrosodiphenylamine	1	1	2.30E+01	2.30E+01	No	5.00E-01	Yes	No	1.00E+01	Yes	Yes	>Tier 1
Pentachlorophenol	2	2	3.30E+02	5.00E+02	No	ND	--	No	1.00E+00	Yes	Yes	>Tier 1
Phenol	1	1	1.70E+01	1.70E+01	No	ND	--	No	1.00E+02	No	No	<Tier 1
Potassium	1	1	1.10E+04	1.10E+04	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	8.80E+04	8.80E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Toluene	1	1	4.20E+01	4.20E+01	No	ND	--	No	1.00E+03	No	No	<Tier 1
Total PCBs	1	1	5.88E+00	5.88E+00	No	ND	--	No	5.00E-01	Yes	Yes	>Tier 1
Total TCDD-TEQ	1	1	7.69E-04	7.69E-04	No	5.02E-07	Yes	No	3.00E-05	Yes	Yes	>Tier 1
Vanadium	1	1	5.70E+00	5.70E+00	No	ND	--	No	4.90E+01	No	No	<Tier 1
Zinc	1	1	9.30E+01	9.30E+01	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-23
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: I
Well: EE-15

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
1,1-Dichloroethane	1	1	1.10E+01	1.10E+01	No	ND	--	No	7.00E+02	No	No	<Tier 1
1,2-Dichlorobenzene	1	1	2.40E+01	2.40E+01	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,3-Dichlorobenzene	1	1	1.10E+01	1.10E+01	No	ND	--	No	6.00E+02	No	No	<Tier 1
1,4-Dichlorobenzene	1	1	4.30E+02	4.30E+02	No	ND	--	No	7.50E+01	Yes	Yes	>Tier 1
2-Chlorophenol	1	1	3.15E+00	3.15E+00	No	ND	--	No	3.50E+01	No	No	<Tier 1
4-Chloroaniline	1	1	7.25E+00	7.25E+00	No	ND	--	No	2.80E+01	No	No	<Tier 1
Aluminum	1	1	4.25E+03	4.25E+03	No	ND	--	No	3.60E+04	No	No	<Tier 1
Arsenic	1	1	2.10E+01	2.10E+01	No	1.17E+01	Yes	No	5.00E+01	No	No	<Tier 1
Barium	1	1	2.55E+02	2.55E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Benzene	1	1	3.90E+00	3.90E+00	No	ND	--	No	5.00E+00	No	No	<Tier 1
Calcium	1	1	1.50E+05	1.50E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Chlorobenzene	1	1	1.95E+02	1.95E+02	No	ND	--	No	1.00E+02	Yes	Yes	>Tier 1
Chromium	1	1	8.10E+00	8.10E+00	No	1.05E+02	No	Yes	1.00E+02	No	No	<Tier 1
Cis/Trans-1,2-Dichloroethene	1	1	6.40E+01	6.40E+01	No	ND	--	No	7.00E+01	No	No	<Tier 1
Cobalt	1	1	6.25E+00	6.25E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Copper	1	1	8.45E+00	8.45E+00	No	ND	--	No	6.50E+02	No	No	<Tier 1
gamma-BHC (Lindane)	1	1	5.30E-03	5.30E-03	No	1.01E-02	No	Yes	2.00E-01	No	No	<Tier 1
Iron	1	1	3.50E+04	3.50E+04	Yes	2.20E+04	Yes	Yes	5.00E+03	Yes	No	EN
Magnesium	1	1	4.05E+04	4.05E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	1.15E+03	1.15E+03	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Mercury	1	1	1.10E-01	1.10E-01	No	ND	--	No	2.00E+00	No	No	<Tier 1
Nickel	1	1	1.90E+01	1.90E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Potassium	1	1	6.15E+03	6.15E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	3.05E+04	3.05E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total TCDD-TEQ	1	1	2.95E-06	2.95E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1
Trichloroethene	1	1	6.55E-01	6.55E-01	No	ND	--	No	5.00E+00	No	No	<Tier 1
Vanadium	1	1	1.62E+01	1.62E+01	No	ND	--	No	4.90E+01	No	No	<Tier 1
Zinc	1	1	2.71E+01	2.71E+01	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-24
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: L
Well: EEG-103

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
Aluminum	1	1	4.20E+01	4.20E+01	No	ND	--	No	3.60E+04	No	No	<Tier 1
Arsenic	1	1	1.40E+01	1.40E+01	No	1.17E+01	Yes	No	5.00E+01	No	No	<Tier 1
Barium	1	1	1.70E+02	1.70E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	1	1	9.70E+04	9.70E+04	Yes	4.27E+05	No	Yes	NA	--	No	EN
Cobalt	1	1	1.90E+00	1.90E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Copper	1	1	1.60E+00	1.60E+00	No	ND	--	No	6.50E+02	No	No	<Tier 1
Iron	1	1	1.40E+03	1.40E+03	Yes	2.20E+04	No	Yes	5.00E+03	No	No	EN
Magnesium	1	1	2.10E+04	2.10E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	2.70E+02	2.70E+02	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Molybdenum	1	1	7.90E+00	7.90E+00	No	ND	--	No	1.80E+02	No	No	<Tier 1
Nickel	1	1	4.90E+00	4.90E+00	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Potassium	1	1	4.10E+03	4.10E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	1.60E+04	1.60E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total TCDD-TEQ	1	1	3.58E-06	3.58E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1

Table U-25
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: L
Well: EEG-105

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
alpha-BHC	1	1	3.10E-03	3.10E-03	No	ND	--	No	3.00E-02	No	No	<Tier 1
Barium	1	1	1.30E+02	1.30E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	1	1	8.60E+04	8.60E+04	Yes	4.27E+05	No	Yes	NA	--	No	EN
Cobalt	1	1	1.60E+00	1.60E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
delta-BHC	1	1	1.20E-02	1.20E-02	No	1.25E-02	No	Yes	3.00E-02	No	No	<Tier 1
gamma-BHC (Lindane)	1	1	7.40E-03	7.40E-03	No	1.01E-02	No	Yes	2.00E-01	No	No	<Tier 1
Iron	1	1	2.80E+02	2.80E+02	Yes	2.20E+04	No	Yes	5.00E+03	No	No	EN
Magnesium	1	1	1.50E+04	1.50E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	4.50E+02	4.50E+02	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Molybdenum	1	1	5.70E+00	5.70E+00	No	ND	--	No	1.80E+02	No	No	<Tier 1
Nickel	1	1	6.70E+00	6.70E+00	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Pentachlorophenol	1	1	9.70E-02	9.70E-02	No	ND	--	No	1.00E+00	No	No	<Tier 1
Potassium	1	1	7.70E+03	7.70E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	1.90E+04	1.90E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total TCDD-TEQ	1	1	2.90E-06	2.90E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1

Table U-26
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: L
Well: EEG-109

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
2,4,5-T	1	1	3.20E+00	3.20E+00	No	4.20E-01	Yes	No	3.60E+02	No	No	<Tier 1
2,4-D	1	1	6.10E+00	6.10E+00	No	ND	--	No	7.00E+01	No	No	<Tier 1
2,4-Dichlorophenol	1	1	2.60E+01	2.60E+01	No	ND	--	No	2.10E+01	Yes	Yes	>Tier 1
2-Chlorophenol	1	1	2.10E+01	2.10E+01	No	ND	--	No	3.50E+01	No	No	<Tier 1
3-Methylphenol/4-Methylphenol	1	1	5.50E+00	5.50E+00	No	ND	--	No	3.50E+02	No	No	<Tier 1
4,4'-DDD	1	1	4.40E-02	4.40E-02	No	ND	--	No	1.10E-01	No	No	<Tier 1
4-Chloroaniline	1	1	5.50E+01	5.50E+01	No	ND	--	No	2.80E+01	Yes	Yes	>Tier 1
4-Methyl-2-pentanone (MIBK)	1	1	5.00E+01	5.00E+01	No	ND	--	No	1.60E+02	No	No	<Tier 1
Alpha Chlordane	1	1	3.80E-02	3.80E-02	No	ND	--	No	2.00E+00	No	No	<Tier 1
Aluminum	1	1	1.50E+03	1.50E+03	No	ND	--	No	3.60E+04	No	No	<Tier 1
Arsenic	1	1	4.30E+03	4.30E+03	No	1.17E+01	Yes	No	5.00E+01	Yes	Yes	>Tier 1
Barium	1	1	2.10E+01	2.10E+01	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Benzene	1	1	4.40E+01	4.40E+01	No	ND	--	No	5.00E+00	Yes	Yes	>Tier 1
Calcium	1	1	5.30E+05	5.30E+05	Yes	4.27E+05	Yes	Yes	NA	--	No	EN
Chlorobenzene	1	1	2.80E+00	2.80E+00	No	ND	--	No	1.00E+02	No	No	<Tier 1
Chloroform	1	1	7.60E+01	7.60E+01	No	ND	--	No	2.00E-02	Yes	Yes	>Tier 1
Cobalt	1	1	2.20E+02	2.20E+02	No	1.14E+01	Yes	No	1.00E+03	No	No	<Tier 1
Copper	1	1	4.40E+01	4.40E+01	No	ND	--	No	6.50E+02	No	No	<Tier 1
Dieldrin	1	1	2.90E-03	2.90E-03	No	ND	--	No	2.00E-02	No	No	<Tier 1
Endrin ketone	1	1	9.40E-03	9.40E-03	No	5.21E-02	No	Yes	2.00E+00	No	No	<Tier 1
Gamma Chlordane	1	1	1.00E-02	1.00E-02	No	ND	--	No	2.00E+00	No	No	<Tier 1
gamma-BHC (Lindane)	1	1	1.10E-02	1.10E-02	No	1.01E-02	Yes	No	2.00E-01	No	No	<Tier 1
Iron	1	1	2.90E+05	2.90E+05	Yes	2.20E+04	Yes	Yes	5.00E+03	Yes	No	EN
Magnesium	1	1	1.60E+05	1.60E+05	Yes	9.23E+04	Yes	Yes	NA	--	No	EN
Manganese	1	1	1.00E+04	1.00E+04	No	1.75E+03	Yes	No	1.50E+02	Yes	Yes	>Tier 1
Methylene chloride	1	1	3.60E+00	3.60E+00	No	ND	--	No	5.00E+00	No	No	<Tier 1
Naphthalene	1	1	2.80E+01	2.80E+01	No	ND	--	No	2.50E+01	Yes	Yes	>Tier 1
Nickel	1	1	1.80E+05	1.80E+05	No	1.30E+02	Yes	No	1.00E+02	Yes	Yes	>Tier 1
Pentachlorophenol	1	1	3.70E-01	3.70E-01	No	ND	--	No	1.00E+00	No	No	<Tier 1
Potassium	1	1	2.90E+04	2.90E+04	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	4.70E+04	4.70E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total TCDD-TEQ	1	1	3.16E-06	3.16E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1
Trichloroethene	1	1	1.60E+00	1.60E+00	No	ND	--	No	5.00E+00	No	No	<Tier 1
Xylenes, Total	1	1	3.80E+00	3.80E+00	No	ND	--	No	1.00E+04	No	No	<Tier 1
Zinc	1	1	1.20E+03	1.20E+03	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-27
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: L
Well: EEG-111

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
Aluminum	1	1	5.50E+03	5.50E+03	No	ND	--	No	3.60E+04	No	No	<Tier 1
Arsenic	1	1	4.20E+00	4.20E+00	No	1.17E+01	No	Yes	5.00E+01	No	No	<Tier 1
Barium	1	1	4.70E+02	4.70E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	1	1	1.50E+05	1.50E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Chromium	1	1	1.80E+01	1.80E+01	No	1.05E+02	No	Yes	1.00E+02	No	No	<Tier 1
Cobalt	1	1	9.30E+00	9.30E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Copper	1	1	9.40E+00	9.40E+00	No	ND	--	No	6.50E+02	No	No	<Tier 1
delta-BHC	1	1	9.80E-03	9.80E-03	No	1.25E-02	No	Yes	3.00E-02	No	No	<Tier 1
Iron	1	1	1.10E+04	1.10E+04	Yes	2.20E+04	No	Yes	5.00E+03	Yes	No	EN
Magnesium	1	1	2.90E+04	2.90E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	4.00E+02	4.00E+02	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Molybdenum	1	1	1.00E+01	1.00E+01	No	ND	--	No	1.80E+02	No	No	<Tier 1
Nickel	1	1	2.40E+01	2.40E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Pentachlorophenol	1	1	1.30E-01	1.30E-01	No	ND	--	No	1.00E+00	No	No	<Tier 1
Potassium	1	1	5.80E+03	5.80E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	2.80E+04	2.80E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Vanadium	1	1	1.70E+01	1.70E+01	No	ND	--	No	4.90E+01	No	No	<Tier 1
Zinc	1	1	3.70E+01	3.70E+01	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-28
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: L
Well: AA-SW-S2

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
Aluminum	2	1	1.37E+03	2.60E+03	No	ND	--	No	3.60E+04	No	No	<Tier 1
Barium	2	2	2.05E+02	2.10E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	2	2	1.30E+05	1.40E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Cobalt	2	1	6.15E+00	7.30E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Copper	1	1	2.30E+00	2.30E+00	No	ND	--	No	6.50E+02	No	No	<Tier 1
Iron	2	2	3.83E+03	6.70E+03	Yes	2.20E+04	No	Yes	5.00E+03	Yes	No	EN
Lead	2	1	2.55E+00	2.60E+00	No	ND	--	No	7.50E+00	No	No	<Tier 1
Magnesium	2	2	3.20E+04	3.60E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	2	2	7.15E+02	1.30E+03	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Molybdenum	2	2	3.50E+00	3.70E+00	No	ND	--	No	1.80E+02	No	No	<Tier 1
Nickel	2	2	1.39E+01	1.90E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Potassium	2	2	4.55E+03	5.60E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	2	2	5.65E+03	6.50E+03	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total PCBs	2	2	1.17E+00	1.18E+00	No	ND	--	No	5.00E-01	Yes	Yes	>Tier 1
Total TCDD-TEQ	1	1	3.99E-06	3.99E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1
Vanadium	2	1	5.95E+00	6.90E+00	No	ND	--	No	4.90E+01	No	No	<Tier 1

Table U-29
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: L
Well: AA-SW-S3

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
Aluminum	2	2	2.55E+03	4.40E+03	No	ND	--	No	3.60E+04	No	No	<Tier 1
Arsenic	2	1	6.95E+00	8.90E+00	No	1.17E+01	No	Yes	5.00E+01	No	No	<Tier 1
Barium	2	2	2.40E+02	2.90E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	2	2	1.65E+05	1.80E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Cobalt	2	2	6.90E+00	8.50E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Copper	1	1	4.50E+00	4.50E+00	No	ND	--	No	6.50E+02	No	No	<Tier 1
Di-n-butylphthalate	1	1	3.20E-01	3.20E-01	No	ND	--	No	7.00E+02	No	No	<Tier 1
Iron	2	2	5.35E+03	8.70E+03	Yes	2.20E+04	No	Yes	5.00E+03	Yes	No	EN
Lead	2	1	2.60E+00	2.70E+00	No	ND	--	No	7.50E+00	No	No	<Tier 1
Magnesium	2	2	3.45E+04	4.20E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	2	2	1.18E+03	2.00E+03	No	1.75E+03	Yes	No	1.50E+02	Yes	Yes	>Tier 1
Molybdenum	2	1	5.65E+00	6.30E+00	No	ND	--	No	1.80E+02	No	No	<Tier 1
Nickel	2	2	1.80E+01	1.90E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Potassium	2	2	6.85E+03	7.10E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	2	2	7.25E+03	7.70E+03	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total PCBs	2	2	1.17E+00	1.18E+00	No	ND	--	No	5.00E-01	Yes	Yes	>Tier 1
Total TCDD-TEQ	1	1	6.05E-06	6.05E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1
Trichloroethene	1	1	3.40E-01	3.40E-01	No	ND	--	No	5.00E+00	No	No	<Tier 1
Vanadium	2	1	9.50E+00	1.40E+01	No	ND	--	No	4.90E+01	No	No	<Tier 1

Table U-30
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: RES
Well: SGW-S1

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
4,4'-DDD	1	1	4.00E-03	4.00E-03	No	ND	--	No	1.10E-01	No	No	<Tier 1
alpha-BHC	1	1	2.10E-03	2.10E-03	No	ND	--	No	3.00E-02	No	No	<Tier 1
Aluminum	2	2	2.35E+03	4.00E+03	No	ND	--	No	3.60E+04	No	No	<Tier 1
Arsenic	2	2	2.85E+01	4.40E+01	No	1.17E+01	Yes	No	5.00E+01	No	No	<Tier 1
Barium	2	2	3.95E+02	5.40E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	2	2	1.05E+05	1.30E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Chromium	2	2	1.12E+01	1.80E+01	No	1.05E+02	No	Yes	1.00E+02	No	No	<Tier 1
Cobalt	2	2	8.10E+00	1.20E+01	No	1.14E+01	Yes	No	1.00E+03	No	No	<Tier 1
Copper	2	2	6.55E+00	1.10E+01	No	ND	--	No	6.50E+02	No	No	<Tier 1
Dieldrin	1	1	3.20E-03	3.20E-03	No	ND	--	No	2.00E-02	No	No	<Tier 1
gamma-BHC (Lindane)	2	2	3.80E-03	4.10E-03	No	1.01E-02	No	Yes	2.00E-01	No	No	<Tier 1
Heptachlor epoxide	1	1	1.40E-03	1.40E-03	No	2.66E-02	No	Yes	2.00E-01	No	No	<Tier 1
Iron	2	2	9.80E+03	1.20E+04	Yes	2.20E+04	No	Yes	5.00E+03	Yes	No	EN
Lead	2	2	9.20E+00	1.50E+01	No	ND	--	No	7.50E+00	Yes	Yes	>Tier 1
Magnesium	2	2	1.14E+04	1.40E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	2	2	1.28E+03	1.70E+03	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Methoxychlor	1	1	5.40E-03	5.40E-03	No	ND	--	No	4.00E+01	No	No	<Tier 1
Molybdenum	2	2	6.05E+00	9.20E+00	No	ND	--	No	1.80E+02	No	No	<Tier 1
Nickel	2	2	1.85E+01	2.70E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Potassium	2	2	1.12E+04	1.60E+04	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	2	2	1.40E+04	1.50E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Vanadium	2	2	8.90E+00	1.40E+01	No	ND	--	No	4.90E+01	No	No	<Tier 1
Zinc	2	2	3.15E+01	5.10E+01	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-31
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: RES
Well: SGW-S2

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
2,4-DB	2	1	4.55E-01	6.60E-01	No	ND	--	No	2.90E+02	No	No	<Tier 1
4,4'-DDE	1	1	2.00E-03	2.00E-03	No	ND	--	No	4.00E-02	No	No	<Tier 1
Aluminum	2	2	3.90E+03	4.60E+03	No	ND	--	No	3.60E+04	No	No	<Tier 1
Arsenic	1	1	4.70E+00	4.70E+00	No	1.17E+01	No	Yes	5.00E+01	No	No	<Tier 1
Barium	2	2	4.05E+02	4.30E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
beta-BHC	1	1	2.00E-03	2.00E-03	No	ND	--	No	3.00E-02	No	No	<Tier 1
Calcium	2	2	1.55E+05	1.70E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Chromium	2	2	1.01E+01	1.10E+01	No	1.05E+02	No	Yes	1.00E+02	No	No	<Tier 1
Cobalt	2	2	8.60E+00	1.00E+01	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Copper	2	2	5.30E+00	5.90E+00	No	ND	--	No	6.50E+02	No	No	<Tier 1
Gamma Chlordane	1	1	1.20E-03	1.20E-03	No	ND	--	No	2.00E+00	No	No	<Tier 1
gamma-BHC (Lindane)	1	1	1.70E-03	1.70E-03	No	1.01E-02	No	Yes	2.00E-01	No	No	<Tier 1
Iron	2	2	7.55E+03	8.40E+03	Yes	2.20E+04	No	Yes	5.00E+03	Yes	No	EN
Lead	2	2	4.60E+00	4.70E+00	No	ND	--	No	7.50E+00	No	No	<Tier 1
Magnesium	2	2	2.70E+04	2.70E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	2	2	7.75E+02	1.20E+03	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Molybdenum	2	1	5.85E+00	6.70E+00	No	ND	--	No	1.80E+02	No	No	<Tier 1
Nickel	2	2	1.90E+01	2.20E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Potassium	2	2	5.20E+03	5.60E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	2	2	1.85E+04	1.90E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total TCDD-TEQ	2	2	1.36E-05	1.22E-05	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1
Vanadium	2	2	1.25E+01	1.40E+01	No	ND	--	No	4.90E+01	No	No	<Tier 1
Zinc	2	2	2.80E+01	3.00E+01	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-32
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: RES
Well: DW-MCDO

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
Arsenic	1	1	2.90E+01	2.90E+01	No	1.17E+01	Yes	No	5.00E+01	No	No	<Tier 1
Barium	1	1	2.65E+02	2.65E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	1	1	1.00E+05	1.00E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Carbon disulfide	1	1	7.25E+00	7.25E+00	No	8.50E+00	No	Yes	7.00E+02	No	No	<Tier 1
Copper	1	1	1.85E+01	1.85E+01	No	ND	--	No	6.50E+02	No	No	<Tier 1
delta-BHC	1	1	2.90E-03	2.90E-03	No	1.25E-02	No	Yes	3.00E-02	No	No	<Tier 1
Fluoranthene	1	1	3.85E-01	3.85E-01	No	ND	--	No	2.80E+02	No	No	<Tier 1
Iron	1	1	1.01E+04	1.01E+04	Yes	2.20E+04	No	Yes	5.00E+03	Yes	No	EN
Lead	1	1	1.29E+02	1.29E+02	No	ND	--	No	7.50E+00	Yes	Yes	>Tier 1
Magnesium	1	1	2.20E+04	2.20E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	5.75E+02	5.75E+02	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Phenanthrene	1	1	3.80E-01	3.80E-01	No	ND	--	No	2.10E+03	No	No	<Tier 1
Potassium	1	1	4.05E+03	4.05E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	9.55E+03	9.55E+03	Yes	1.30E+05	No	Yes	NA	--	No	EN
Toluene	1	1	6.35E-01	6.35E-01	No	ND	--	No	1.00E+03	No	No	<Tier 1
Total TCDD-TEQ	1	1	3.45E-06	3.45E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1
Vanadium	1	1	2.50E+00	2.50E+00	No	ND	--	No	4.90E+01	No	No	<Tier 1
Zinc	1	1	4.05E+03	4.05E+03	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-33
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: RES
Well: DW-SCHM

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
Arsenic	1	1	6.40E+00	6.40E+00	No	1.17E+01	No	Yes	5.00E+01	No	No	<Tier 1
Barium	1	1	2.20E+02	2.20E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	1	1	1.70E+05	1.70E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Copper	1	1	2.80E+00	2.80E+00	No	ND	--	No	6.50E+02	No	No	<Tier 1
Iron	1	1	1.70E+04	1.70E+04	Yes	2.20E+04	No	Yes	5.00E+03	Yes	No	EN
Magnesium	1	1	3.90E+04	3.90E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	1.20E+03	1.20E+03	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Potassium	1	1	6.80E+03	6.80E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	2.20E+04	2.20E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total TCDD-TEQ	1	1	2.05E-06	2.05E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1
Zinc	1	1	1.20E+02	1.20E+02	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-34
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: RES
Well: DW-SETT

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
Barium	1	1	1.80E+02	1.80E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Calcium	1	1	1.80E+05	1.80E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Carbon disulfide	1	1	1.50E+00	1.50E+00	No	8.50E+00	No	Yes	7.00E+02	No	No	<Tier 1
Cobalt	1	1	3.00E+00	3.00E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Copper	1	1	2.60E+00	2.60E+00	No	ND	--	No	6.50E+02	No	No	<Tier 1
Iron	1	1	2.40E+03	2.40E+03	Yes	2.20E+04	No	Yes	5.00E+03	No	No	EN
Lead	1	1	2.70E+00	2.70E+00	No	ND	--	No	7.50E+00	No	No	<Tier 1
Magnesium	1	1	4.10E+04	4.10E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	8.60E+02	8.60E+02	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Nickel	1	1	6.20E+00	6.20E+00	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Potassium	1	1	5.70E+03	5.70E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	2.40E+04	2.40E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Zinc	1	1	7.50E+01	7.50E+01	No	ND	--	No	5.00E+03	No	No	<Tier 1

Table U-35
Comparison of Groundwater Data to TACO Tier I Screening Criteria for Class I Groundwater
Area: RES
Well: DW-WRIG

	Summary Statistics				COPC Selection - Chronic Exposure Screen							
Constituent	Number of Samples	Number of Detects	Average (ug/L)	Maximum (MAX) Detection (ug/L)	Is Constituent an Essential Nutrient (EN)?	Background (BK) Concentration (ug/L)	Is Max> BK?	Pass EN/BK?	TACO Class I Groundwater Criteria (ug/L)	Is Max> Class I?	COPC?	Reason
Barium	1	1	1.30E+02	1.30E+02	No	6.17E+02	No	Yes	2.00E+03	No	No	<Tier 1
Cadmium	1	1	1.00E+00	1.00E+00	No	ND	--	No	5.00E+00	No	No	<Tier 1
Calcium	1	1	1.50E+05	1.50E+05	Yes	4.27E+05	No	Yes	NA	--	No	EN
Cobalt	1	1	4.10E+00	4.10E+00	No	1.14E+01	No	Yes	1.00E+03	No	No	<Tier 1
Copper	1	1	1.10E+00	1.10E+00	No	ND	--	No	6.50E+02	No	No	<Tier 1
delta-BHC	1	1	4.00E-03	4.00E-03	No	1.25E-02	No	Yes	3.00E-02	No	No	<Tier 1
Fluoranthene	1	1	3.60E-01	3.60E-01	No	ND	--	No	2.80E+02	No	No	<Tier 1
Iron	1	1	1.90E+03	1.90E+03	Yes	2.20E+04	No	Yes	5.00E+03	No	No	EN
Lead	1	1	1.50E+01	1.50E+01	No	ND	--	No	7.50E+00	Yes	Yes	>Tier 1
Magnesium	1	1	3.80E+04	3.80E+04	Yes	9.23E+04	No	Yes	NA	--	No	EN
Manganese	1	1	1.10E+03	1.10E+03	No	1.75E+03	No	Yes	1.50E+02	Yes	No	BK
Nickel	1	1	5.30E+01	5.30E+01	No	1.30E+02	No	Yes	1.00E+02	No	No	<Tier 1
Potassium	1	1	5.70E+03	5.70E+03	Yes	1.23E+05	No	Yes	NA	--	No	EN
Sodium	1	1	2.90E+04	2.90E+04	Yes	1.30E+05	No	Yes	NA	--	No	EN
Total TCDD-TEQ	1	1	2.58E-06	2.58E-06	No	5.02E-07	Yes	No	3.00E-05	No	No	<Tier 1
Zinc	1	1	9.50E+02	9.50E+02	No	ND	--	No	5.00E+03	No	No	<Tier 1

TABLE U-36
SUMMARY OF CONSTITUENTS OF POTENTIAL CONCERN
GROUNDWATER - CLASS I (DRINKING WATER) SCENARIO
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Site	G								H				I							L			Res		
Constituent / Location	AA-GHL-S1	AA-GHL-S3	AA-SW-S1	EEG-101	EEG-106	EEG-107	EEG-112	EE-05	EEG-110	EE-01	EE-02	EE-03	AA-I-S1	AA-I-S2	AA-I-S3	EE-12	EE-13	EE-14	EE-15	EEG-109	AA-SW-S2	AA-SW-S3	SGW-S1	DW-MCDO	DW-WRIG
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	--	--	--	--	--	--	--	--	--	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	--	--	--	--	--	X	--	--	--	--	X	--	--	--	--	--	--	X	--	--	--	--	--	--	--
1,2-Dichlorobenzene	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	--	--	--	--	X	X	--	--	--	X	X	--	X	X	--	X	--	X	X	--	--	--	--	--	--
2,4,5-TP (Silvex)	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	--	--	--	--	--	--	--	--	--	X	X	--	--	--	--	--	--	X	--	--	--	--	--	--	--
2,4-D	--	--	--	--	--	X	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	--	--	X	--	--	--	--	X	--	--	--	--	--	--	--	--	X	--	--	--	--	--
2-Chlorophenol	--	--	--	--	--	X	--	X	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Nitroaniline	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Methylphenol/4-Methylphenol	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X	--	X	--	--	--	--	--	--	--
4-Chloroaniline	--	--	--	--	--	X	--	X	--	X	X	--	X	X	--	X	--	X	--	X	--	--	--	--	--
4-Methyl-2-pentanone (MIBK)	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitroaniline	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alpha Chlordane	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--
alpha-BHC	--	--	--	--	X	X	--	--	--	--	X	--	X	--	--	X	--	X	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	X	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	--	--	X	--	--	--	X	--	X	--	--	--	--	--	--	X	--	--	--	--	--
Benzene	--	--	--	--	X	X	--	X	--	X	X	--	X	X	--	X	--	X	--	X	--	--	--	--	--
Benzo(a)anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--
beta-BHC	--	--	--	--	X	--	--	--	--	--	--	--	X	--	--	--	--	X	--	--	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	X	--	X	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	X	X	--	X	--	X	X	--	X	X	--	X	--	X	X	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	X	--	--	--	--	--
Cis/Trans-1,2-Dichloroethene	--	--	--	--	--	X	--	--	--	--	--	--	X	X	--	--	--	X	--	--	--	--	--	--	--
delta-BHC	X	--	--	--	X	X	--	X	--	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	X	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--
Gamma Chlordane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--
gamma-BHC (Lindane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--
Heptachlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--
Heptachlor epoxide	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	X	--	X	--	--	--	--	--	--	--
Lead	--	--	X	--	--	X	--	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	X	X	X
Manganese	--	--	--	X	X	X	--	--	--	--	X	--	X	X	--	X	--	--	--	X	--	X	--	--	--
Molybdenum	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	X	--	X	--	X	X	--	--	--	--	--	--	X	--	X	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	X	X	X	--	--	X	--	--	--	X	--	X	--	--	--	--	--
Nitrobenzene	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--
Pentachlorophenol	--	--	--	--	--	X	--	--	--	X	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--
Phenol	--	--	--	--	--	X	--	X	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	X	--	--	--	--	X	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	X	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs	X	X	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	X	--	--	X	X	--	--	--
Total TCDD-TEQ	--	--	--	--	--	X	--	X	--	X	--	X	--	--	--	X	X	X	--	--	--	--	--	--	--
Trichloroethene	--	--	--	--	--	X	--	X	--	--	X	--	--	X	--	--	--	--	--	--	--	--	--	--	--
Vanadium	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl chloride	--	--	--	--	--	X	--	--	--	--	--	--	X	X	--	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--
Total:	3	1	1	1	7	25	1	12	1	14	24	2	15	18	2	12	1	20	2	8	1	2	1	1	1

Notes:
-- This constituent was not identifed as a constituent of potential concern based on this scenario.
RES - Residential Non-Potable Use Well.

ATTACHMENT 14

APPENDIX V - RISK ASSESSMENT FOR NONPOTABLE USE

RESIDENTIAL WELLS

APPENDIX V

ASSESSMENT OF POTENTIAL LEAD EXPOSURES RESIDENTIAL DRINKING WATER

APPENDIX V

ASSESSMENT OF POTENTIAL LEAD EXPOSURES - RESIDENTIAL DRINKING WATER

Lead was identified as constituent of potential concern (COPC) for the drinking water scenario using TACO Class I standards in Appendix U in two non-potable use residential wells (DW-MCDO, DW-WRIG) within the study area. Lead is the only COPC identified in each well. Therefore, ingestion of groundwater as drinking water was evaluated in the risk assessment. However, it should be noted that neither well is actually used for drinking water. Table V-1 provides a summary of field information collected for each well.

Risk Assessment Approach for Lead

For many compounds associated with known or potential noncarcinogenic health effects, it has been demonstrated that there is a threshold for these effects. It is conventionally assumed for all such compounds that there is a dose below which no adverse effect occurs or, conversely, above which an adverse effect may be seen. For compounds with known or suspected carcinogenic effects, the underlying assumption for all regulatory risk assessment is that there is no threshold for effects. Thus, every dose, no matter how small, is assumed to pose some finite level of risk.

Because of the uncertainties in the dose-response relationship between exposure to lead and biological effects, it is unclear whether the noncarcinogenic effects of lead exhibit a threshold response. Therefore, an RfD for lead is not available. Although USEPA has classified lead as a B2 (probable human) carcinogen, no cancer slope factor (CSF) has been developed. Therefore, potential exposures to lead cannot be evaluated using the traditional methods of risk assessment. However, the USEPA has developed an Integrated Exposure Uptake Biokinetic (IEUBK) model that correlates lead levels in the environment to blood lead levels in children (USEPA, 1994). In addition, a model for assessing adult exposures to lead in multiple environmental media (air, soil, and water) in an industrial/commercial setting is available in the peer reviewed literature (Bowers et al., 1994). The IEUBK model is used to evaluate residential drinking water scenarios.

USEPA IEUBK Model

It is generally believed that increasing blood lead concentrations in children correlate with adverse neurological effects. The IEUBK model is a computer program that links typical risk assessment exposure analysis with a biokinetic model of lead uptake and distribution in the body to enable estimates of blood lead levels that may occur due to overall exposures to lead in the environment. The IEUBK model predicts blood lead levels in children 0-7 years of age due to exposure to lead from multiple sources, including air, water, diet, soil, and maternal sources, and considers differing exposure patterns and physiological changes in the various age groups. Children 0-7 years of age are considered by USEPA to be sensitive receptors for lead exposure because, compared to older

receptors, young children ingest more soil, absorb more lead from the gastrointestinal tract, and are more sensitive to the effects of lead in the bloodstream. The health effects of most concern from lead exposures are impaired mental and physical development in young children. Available evidence suggests that a threshold dose for these effects lies between 10 to 15 micrograms of lead per deciliter of blood (μg/dL) (USEPA, 1994).

Potential risk associated with incidental exposure of a young child (0-7 years of age) to lead as a result of ingestion of groundwater as drinking water was evaluated using USEPA's IEUBK model (version 0.99d) (USEPA, 1994).

Key assumptions in the IEUBK model are briefly discussed below:

Lead In Air: The model assumes a background concentration of lead in outdoor air of 0.1 $\mu g/m^3$ lead (based on the average lead concentration in outdoor air in urban areas in 1990) and in indoor air was assumed to be 30 percent of that for outdoor air or 0.03 $\mu g/m^3$. Age-specific air inhalation rates ranging from 2 to 7 m 3 /day are used to estimate intake of lead via inhalation, and fractional uptake of inhaled lead was assumed to be 0.32.

Lead in the Diet: The model assumes an average ingestion of lead in diet that on an age-specific basis ranges from 0.006 to 0.007 mg lead/day. These values are based on FDA reported dietary lead intake for US children (6 months to 7 years of age) from 1987 to 1994. Fractional uptake of lead ingestion in the diet was assumed to be 0.50.

Lead in Drinking Water: The model assumes a background concentration of lead in drinking water of 4 μg/L. Age-specific drinking water ingestion rates ranging from 0.20 to 0.59 L/day for children ages 6 months to 6 years were used to estimate lead intake and fractional uptake of lead ingested in water was assumed to be 0.50. In order to evaluate site-specific exposure to lead in non-potable groundwater, a site-specific water concentration of 129 μg/L in well DW-MCDO and 15 μg/L in well DW-WRIG were substituted for all age groups evaluated (0-7 years of age).

Lead in Outdoor Soil and Indoor Dust: Age-specific average outdoor soil plus indoor dust ingestion rates ranging from 85 to 135 mg/day are used by the model and it is assumed that 45 percent of total ingestion is from soil and 55 percent is from dust. USEPA recommends that central tendency (average) rates of soil plus dust ingestion be used in IEUBK model, rather than the upper-bound soil plus dust ingestion rate of 200 mg/day. The source of lead in indoor dust is assumed to be lead in outdoor soil, and the concentration of lead in indoor dust is assumed to be 0.7 of that in outdoor soil, based on measured soil-dust relationships at other sites where soil was a major contributor to indoor dust. The fractional uptake of lead from soil and dust was assumed to be 0.30. Lead was not identified as a COPC in soil; however, in order to evaluate potential impacts of cumulative exposure to lead in environmental media at the site, a concentration of 72 mg/kg has been assumed for lead in both soil and indoor dust for the young child resident. This represents the average soil concentration

for Transect 1 and is the highest average lead concentration identified in soil from the three transects (Transects 1, 2, and 3) nearest the two non-potable groundwater wells (DW-MCDO, DW-WRIG) where lead was identified as a COPC.

The IEUBK model calculates a distribution of blood lead concentrations in children, both graphically and in table format. The results are presented in Figure 1 and Table 2 for well DW-MCDO, and in Figure 2 and Table 3 for DW-WRIG.

Well DW-MCDO

As can be seen in Figure 1, 41.7% of young children initially exposed to lead under the condition summarized above are predicted to exhibit blood lead concentrations lower than the acceptable blood lead level of 10 μg/dL, and 58.3% of young children potentially exposed to lead under the condition summarized above are predicted to exhibit blood lead concentrations greater than the acceptable blood lead level of 10 μg/dL. The USEPA regulatory target is at least 95% of young children in a population potentially exposed to lead having blood lead levels below 10 μg/dL. Therefore, under the conditions described above, young children that consume groundwater exclusively from well DW-MCDO as drinking water may experience adverse health effects. However, as noted above, this well is not in fact used for drinking water. As shown in Table 1, the well itself is located in the backyard of the residence. Appendix Q presents an analysis of lead in this well for non-potable uses such as car washing and household use, and indicates no adverse health effects for children.

Well DW-WRIG

As can be seen in Figure 2, 95.3% of young children potentially exposed to lead under the condition summarized above are predicted to exhibit blood lead concentrations lower than the acceptable blood lead level of 10 μg/dL. The USEPA regulatory target is at least 95% of young children in a population potentially exposed to lead having blood lead levels below 10 μg/dL. Therefore, under the conditions described above, no adverse health effects are expected for young children potentially exposed to lead in groundwater. Additionally, as noted above, this well is not in fact used for drinking water.

References

USEPA. 1994. Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children. USEPA, Office of Emergency and Remedial Response, Washington, DC.

TABLE V-1
INFORMATION ON DOMESTIC WELLS SAMPLED
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

McDonald residence, 109 Judith Lane:
location: backyard
sampling method: peristaltic pump
sampled from: top of well casing
depth of well: 18.71 ft.
depth to water: 9.74 ft.
length of water column: 8.97 ft.
other information: 0.62 stickup

Settle residence, 102 Judith Lane
location: backyard
sampling method: well pump
sampled from: pump tap
depth of well: could not access, reportedly 26-30 ft.
depth to water: could not access
length of water column: could not access
other information: none

Wright residence, 100 Judith Lane
location: house basement
sampling method: peristaltic pump
sampled from: top of well casing
depth of well: 25.02 ft.
depth to water: 9.40 ft.
length of water column: 15.62 ft.
other information: 0.36 stickup

Schmidt residence, 104 Judith Lane
location: backyard
sampling method: well pump
sampled from: pump tap
depth of well: could not access, reportedly 49 ft.
depth to water: could not access
length of water column: could not access
other information: none

TABLE V-2
IEUBK MODEL OUTPUT - DRINKING WATER SCENARIO - MCDONALD
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.100 ug Pb/m3 DEFAULT
Indoor AIR Pb Conc: 30.0 percent of outdoor.
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 129.00 ug Pb/L
WATER Consumption: DEFAULT

SOIL & DUST:
Soil: constant conc.
Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	200.0	200.0
1-2	200.0	200.0
2-3	200.0	200.0
3-4	200.0	200.0
4-5	200.0	200.0
5-6	200.0	200.0
6-7	200.0	200.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	9.0	17.04	4.18
1-2:	12.6	32.27	6.04
2-3:	12.5	34.48	6.21
3-4:	12.2	35.94	6.40
4-5:	11.8	36.31	4.89
5-6:	11.4	38.11	4.46
6-7:	10.8	39.11	4.27

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.27	10.57	0.00	0.02
1-2:	2.15	24.04	0.00	0.03
2-3:	2.49	25.72	0.00	0.06
3-4:	2.46	27.01	0.00	0.07
4-5:	2.45	28.91	0.00	0.07
5-6:	2.62	30.93	0.00	0.09
6-7:	2.93	31.82	0.00	0.09

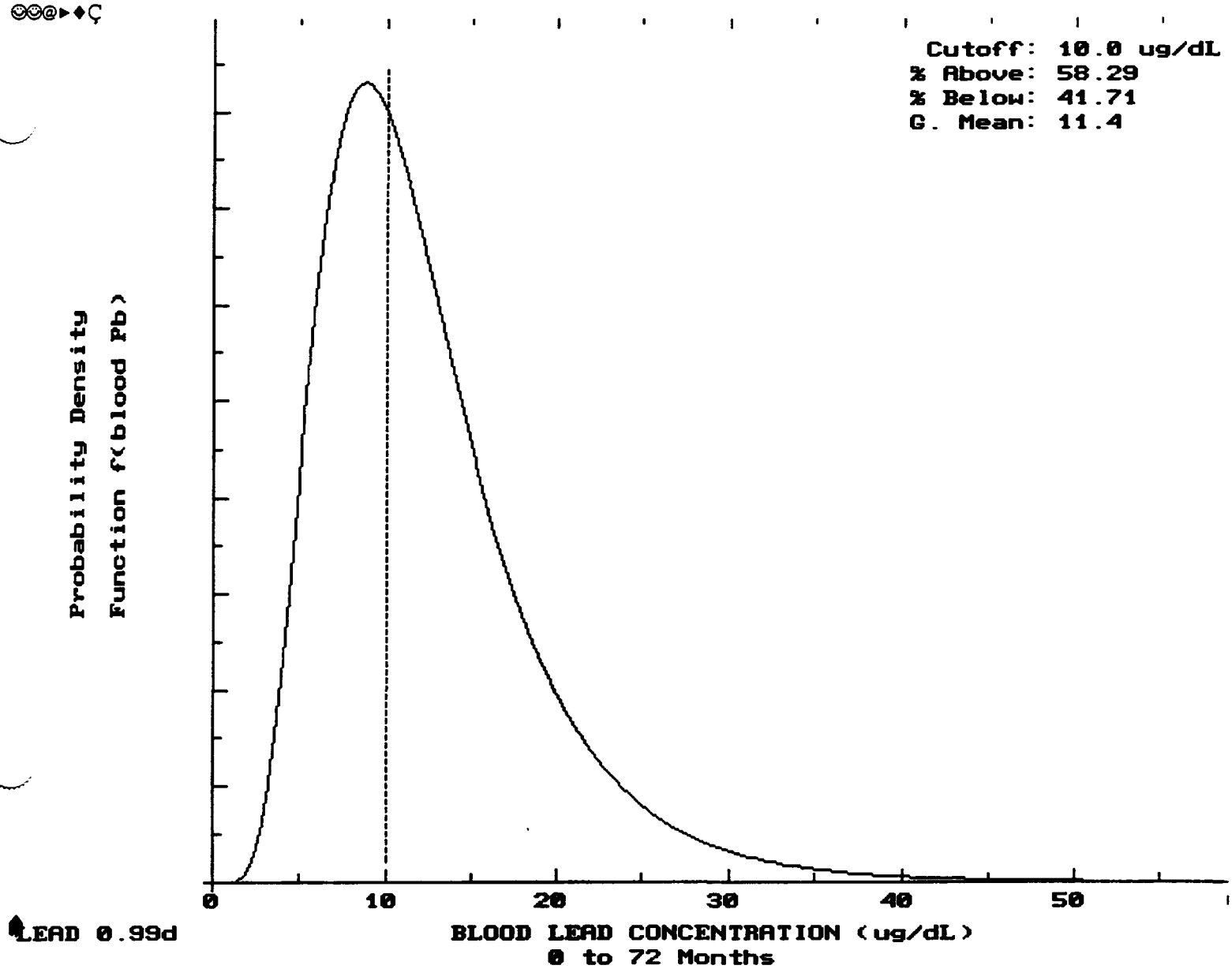

Cutoff: 10.0 ug/dL
% Above: 58.29
% Below: 41.71
G. Mean: 11.4
Probability Density
Function f(blood Pb)
0
10
20
30
40
50
LEAD 0.99d
BLOOD LEAD CONCENTRATION (ug/dL)
0 to 72 Months

TABLE V-3
IEUBK MODEL OUTPUT - DRINKING WATER SCENARIO - WRIGHT
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.100 ug Pb/m3 DEFAULT
Indoor AIR Pb Conc: 30.0 percent of outdoor.
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 15.00 ug Pb/L
WATER Consumption: DEFAULT

SOIL & DUST:
Soil: constant conc.
Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	200.0	200.0
1-2	200.0	200.0
2-3	200.0	200.0
3-4	200.0	200.0
4-5	200.0	200.0
5-6	200.0	200.0
6-7	200.0	200.0

Additional Dust Sources: None DEFAULT

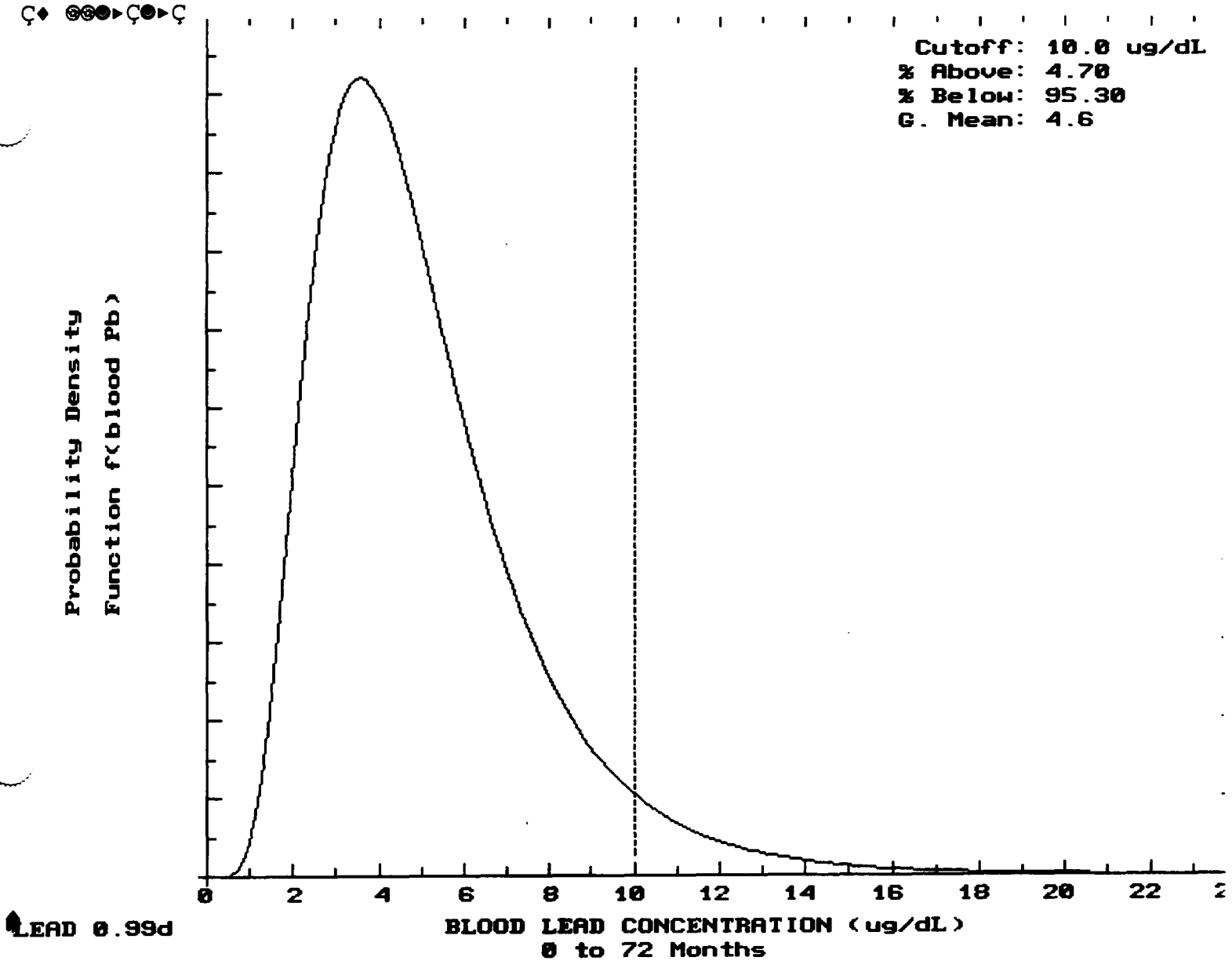
PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	4.6	8.52	4.63
1-2:	5.4	13.16	7.21
2-3:	5.1	13.81	7.30
3-4:	4.9	13.97	7.41
4-5:	4.3	12.34	5.61
5-6:	3.8	12.27	5.09
6-7:	3.5	12.42	4.83

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.51	1.36	0.00	0.02
1-2:	2.57	3.34	0.00	0.03
2-3:	2.93	3.52	0.00	0.06
3-4:	2.85	3.64	0.00	0.07
4-5:	2.81	3.86	0.00	0.07
5-6:	2.99	4.10	0.00	0.09
6-7:	3.31	4.19	0.00	0.09


Cutoff: 10.0 ug/dL
% Above: 4.70
% Below: 95.30
G. Mean: 4.6
Probability Density
Function f(blood Pb)
0
2
4
6
8
10
12
14
16
18
20
22
LEAD 0.99d
BLOOD LEAD CONCENTRATION (ug/dL)
0 to 72 Months

ATTACHMENT 15

REVISED TABLE 3-7

TABLE 3-7
SUMMARY OF CONSTITUENTS OF POTENTIAL CONCERN
SITES - AIR
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Constituent	Ambient Air Pathway			
	G	H	I	L
4-Methyl-2-pentanone	X	--	--	--
Acetone	X	--	--	--
Methylene Chloride	X	X	X	X
Trichloroethene	--	X	--	--
Cadmium	--	--	X	--
Total:	**3**	**2**	**2**	**1**

Notes:
-- This constituent was not identifed as a constituent of potential concern based on this pathway.

ATTACHMENT 16

RESPONSE TO WESTON - 15(b)

RESPONSE TO COMMENT WESTON-15(b)

Under the RME scenario, concentrations of COPCs in indoor and outdoor air are calculated based on the RME groundwater concentrations presented in Table 5-24. The exposure point concentrations in air were calculated on a groundwater sampling location-by-location basis. This method is conservative in that it assumes that a person at the Site (indoors or outdoors) is potentially exposed to the maximum concentrations present in each individual well.

Under the MLE scenario, site wells are grouped together, assuming that a person present at a Site is potentially exposed to the combined concentrations present in the Site groundwater sampling locations. The calculation of location-by-location averages involves several steps as discussed below. An example follows to clarify the method.

- Groundwater sampling locations are grouped by Site (G, H, I, L).
- One-half the detection limit is used as a proxy concentration where a constituent is reported as detected in at least one sample at a Site but not detected in other samples from that Site. If one-half the detection limit is greater than the maximum detected concentration in that Site, that sample is eliminated from the calculations.
- Duplicate samples are averaged and treated as one sample.
- Within each groundwater sampling location, the average concentration of each constituent detected at least once in the Site are determined.
- The average constituent concentrations calculated above are used to calculate the average constituent concentration in each Site.

Example - Benzene in Site G

Data:

Sample	Sample Concentration (ug/L)	
AA-GHL-S1-12-16FT	1.2	U
AA-GHL-S1-22-26FT	1.2	U
AA-GHL-S1-22-26FTFD	1.2	U
AA-GHL-S2-12-16FT	1.2	U
AA-GHL-S2-22-26FT	1.2	U
AA-GHL-S3-20-24FT	1.2	U
AA-SW-S1-14-16FT	1.2	U
AA-SW-S1-24-26FT	1.2	U
EE-05	110	
EEG-101	1.2	U
EEG-102	1.2	U
EEG-104	1.2	U
EEG-106	9.3	
EEG-107	3700	D
EEG-112	1.9	

One-Half Detection Limit and Averaging of Duplicates:

Sample	Sample Concentration (ug/L)	
AA-GHL-S1-12-16FT	0.6	U
AA-GHL-S1-22-26FT	0.6	U
AA-GHL-S2-12-16FT	0.6	U
AA-GHL-S2-22-26FT	0.6	U
AA-GHL-S3-20-24FT	0.6	U
AA-SW-S1-14-16FT	0.6	U
AA-SW-S1-24-26FT	0.6	U
EE-05	110	
EEG-101	0.6	U
EEG-102	0.6	U
EEG-104	0.6	U
EEG-106	9.3	
EEG-107	3700	D
EEG-112	1.9	

One-half the detection limit (0.6 ug/L) for all non-detects is less than the maximum detected concentration of 3700 ug/L. Therefore, all samples are used in the calculation of averages.

Average Concentration in Each Location:

Well	Average Concentration (ug/L)
AA-GHL-S1	0.6 U
AA-GHL-S2	0.6 U
AA-GHL-S3	0.6 U
AA-SW-S1	0.6 U
EE-05	110
EEG-101	0.6 U
EEG-102	0.6 U
EEG-104	0.6 U
EEG-106	9.3
EEG-107	3700 D
EEG-112	1.9

Site G Average Concentration of Benzene:

The average concentration of benzene in Site G groundwater is the average of the average concentration of benzene in the 11 wells listed above: 0.6+0.6+0.6+0.6+110+0.6+0.6+0.6+9.3+3700+1.9/11 = 347.76 ug/L.

A new Table 5-44, attached, will be inserted as the last table in Section 5. This table presents the MLE groundwater concentrations used in the various groundwater-to-air models. In addition, the following text will be inserted in Section 5.5.1.2 on Page 5-17 as a new paragraph after the second full paragraph on that page:

> INSERT-20: MLE groundwater concentrations used as the source term in the aforementioned three volatilization models are provided in Table 5-44. These MLE concentrations are averages of the groundwater concentrations within a given site, as noted in the table.

TABLE 5-44
EXPOSURE POINT CONCENTRATIONS (MLE) - GROUNDWATER WELL-BY-WELL AVERAGES
SAUGET AREA 1 - EE/CA AND RI/FS
HUMAN HEALTH RISK ASSESSMENT

Consituent	Number of Wells with Detects	Total Number of Wells	Number of Well Averages Used in Statistics (a)	Average Concentration (ug/L)
Site G				
4-Methyl-2-pentanone (MIB	1	11	11	139.8
Benzene	4	11	11	347.8
Chlorobenzene	6	11	11	466.1
Naphthalene	2	11	11	230.5
Tetrachloroethene	2	11	11	20.5
Toluene	3	11	11	862.8
Trichloroethene	4	11	11	20.9
Vinyl chloride	1	11	10	8.6
Site H				
1,1,2,2-Tetrachloroethane	1	4	3	5.7
Benzene	2	4	4	937.8
Chlorobenzene	3	4	4	1391.6
Chloroform	1	4	4	120.0
Ethylbenzene	1	4	4	498.1
Naphthalene	2	4	4	626.3
Trichloroethene	1	4	4	19.8
Site I				
Benzene	5	7	7	278.8
Chlorobenzene	5	7	7	1744.3
Trichloroethene	2	7	7	31.7
Vinyl chloride	2	7	7	157.9
Site L				
Benzene	1	6	6	7.8
Chloroform	1	6	6	14.8

Notes:
(a) - Number of wells used in statistics differs from total number of wells if one-half the detection limit for any well average is greater than the maximum detected concentration in any well for that Site.

ATTACHMENT 17

INSERT LOCATIONS

LIST OF ACRONYMS

AAF	Absorption Adjustment Factors
ACGIH	American Conference of Governmental Industrial Hygienists
AOC	Administrative Order by Consent
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	Ambient Water Quality Criteria
BEI	Biological Exposure Indices
bgs	below ground surface
BPL	Borrow Pit Lake
CADD	Chronic Average Daily Dose
CAS	Chemical Abstracts Service
COC	Constituent of Concern
COPC	Constituent of Potential Concern
CS	Creek Segment
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
DQL	Data Quality Level
EE/CA	Engineering Evaluation and Cost Analysis
EFH	Exposure Factors Handbook
ELCR	Excess Lifetime Cancer Risk
EPC	Exposure Point Concentration
ESL	Effects Screening Level
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IEPA	Illinois Environmental Protection Agency
IRIS	Integrated Risk Information System
LADD	Lifetime Average Daily Dose
LMS	Linearized Multi-Stage
LOAEL	Lowest Observed Adverse Effect Level
MLE	Most Likely Exposure
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NIOSH	National Institute of Occupational Safety and Health
NOAA	National Oceanographic and Atmospheric Administration
NOAEL	No Observed Adverse Effect Level
PAH	Polycyclic Aromatic Hydrocarbons
PC	Skin Permeability Constant
PCB	Polychlorinated Biphenyl

not underlined

ARAR Applicable or Relevant and Appropri. Requirement

1.0 INTRODUCTION

This report presents the baseline human health risk assessment (HHRA) and the stream-lined short-term risk assessment for Sauget Area 1, located in Sauget and Cahokia, Illinois. It is Volume II of the Remedial Investigation/Site Characterization Report (RI/SC) for Sauget Area 1 (in preparation). The environmental evaluations of Sauget Area 1 are being conducted as an Engineering Evaluation and Cost Analysis (EE/CA) for the Sauget Area 1 sites and soil, sediment, surface water and air, and for the Remedial Investigation and Feasibility Study (RI/FS) for Sauget Area 1 groundwater. The HHRA was conducted to satisfy the Scope of Work (SOW) for the EE/CA and RI/FS (specifically Task 4 Section 2.5 and Task 5 Section 2 of the SOW) provided as an attachment to the Administrative Order by Consent (AOC) entered into by the U.S. Environmental Protection Agency (USEPA) and Solutia Inc. (Solutia), as well as to be compliant with the National Contingency Plan (NCP) (USEPA, 1990).

The HHRA and the short-term risk assessment were conducted in accordance with the USEPA-approved Human Health Risk Assessment Workplan (HHRA Workplan) dated June 25, 1999 (including the August 6, 1999 revised pages), which was submitted as Volume 1B of the Support Sampling Plan (SSP) for Sauget Area 1 (Solutia, 1999). The HHRA Workplan is provided as Appendix A to this report. [Note that sections, figures and tables from the HHRA Workplan will be referenced in this report. Because of the similarity of numbering, the following approach has been taken to identify workplan elements: "Figure (Appendix A) 2-1" refers to an HHRA Workplan figure, and "Figure 2-1" refers to an HHRA Report figure.]

The HHRA and the short-term risk assessment were conducted using data from environmental samples collected from the study area (shown in Figure 1-1 and described in more detail in Section 2) in accordance with the USEPA-approved SSP. Validated laboratory analytical data are compiled in the Data Validation Report (Solutia, 2000a), and field data are compiled in the Field Sampling Report (Solutia, 2000b). These data are summarized and evaluated in the RI/SC (of which this report is Volume II).

INSERT (10) [USACE(2/01)-1]

Baseline Risk Assessment

The purpose of the baseline HHRA is to evaluate potential human health effects of chronic daily exposures to constituents detected in samples of environmental media collected from the study area.

The HHRA was conducted to be consistent with USEPA guidance for conducting a risk assessment including, but not limited to, the following:

- Risk Assessment Guidance for Superfund (RAGS): Volume 1 - Human Health Evaluation Manual (Parts A and D) (USEPA, 1989a and 1998a).

Therefore, environmental data from Site M and Dead Creek segments CS-B, CS-C, CS-D, CS-E, and a portion of CS-F have not been included in the risk assessment.

INSERT (7) -[USACE (12/00) - 1]

Conceptual Site Model

To guide identification of appropriate exposure pathways for evaluation in the risk assessment, a conceptual site model (CSM) for human health was developed. The purpose of the CSM is to identify source areas, potential migration pathways of constituents from source areas to environmental media where exposure can occur, and to identify potential human receptors. The CSM is meant to be a "living" model that can be updated and modified as additional data become available.

The initial CSM for the site is presented in Figure (Appendix A) 2-1, and was used to guide the investigation presented in the SSP and the COPC selection process in Section 3.0. An updated CSM is presented in Section 5.0, based on the data evaluation and COPC selection conducted in Section 3.0.

Sites - Data for shallow groundwater collected from locations within the sites, the downgradient alluvial aquifers, and shallow groundwater southwest of the sites, as identified in the SSP, were evaluated in the risk assessment. These data include the full suite of analytes and dioxins.

Collection of groundwater samples downgradient of the sites using push sampling methods per the SSP began at the water table, and samples were collected at approximately 10-foot intervals down to bedrock. Groundwater sample collection with a site/fill area began below the lower depth of the waste.

Screening of the groundwater data to identify COPCs was conducted on a location-by-location basis, therefore, summary statistics are not presented for groundwater in Appendix B.

3.1.4.2 Soil

Transects - Figure 3-3 identifies the location of each soil sample for each transect. Surface (0-0.5 feet bgs) and subsurface (0.5-6 feet bgs) soil samples were collected from undeveloped areas along seven transects as identified in the SSP in the residential/commercial/undeveloped area adjacent to Dead Creek and analyzed for the full suite of analytes and dioxins. These Undeveloped Area Soil sample identification numbers use the following format: undeveloped area soil designator – transect number – location – depth interval, e.g., UAS-T7-S4-0-0.5FT. Only surface soil sample identification numbers are provided on Figure 3-3 – all subsurface soil samples are co-located and distinguished by the sample depth interval "3-6FT".

Based on the transect analytical results, additional surface and subsurface soil samples were collected from three residences along each of Transects 1 through 6 and two residences along Transect 7 and analyzed for the full suite of analytes and dioxins. These samples are identified as Developed Area Soils, and follow the same sample identification scheme as above, but using the developed area soil designator of "DAS." Figure 3-3 also provides the developed area soil sample locations.

Sites - Figure 3-4 identifies the location of each surface soil sample for each site. Surface soil (0-0.5 feet bgs) samples were collected in each site. These samples were analyzed for the full suite of analytes and dioxins. The site soil sample identification numbers have the following format: site – location – depth interval, e.g., WASTE-N-B2-0-0.5FT.

INSERT (9) - [USACE (12/00) - 3]

Appendix B provides the summary statistics for Site and Transect soils and a listing of each sample included in each area/medium combination evaluated.

3.1.4.3 Sediment

Sediment sample locations included in the risk assessment are identified on Figure 3-5, and Appendix B presents the summary statistics. Study area sediment samples from locations not included in the

Three background groundwater samples were collected in upgradient locations, and three surface soil and three subsurface soil samples were collected at background locations, all identified in the SSP. These background locations are presented on Figure 3-6. Four surface water samples, four sediment samples and four fish fillet samples were collected from reference locations, as there are no upgradient locations in Dead Creek outside of the study area (see the Ecological Risk Assessment in Volume III of this report).

The procedure for determining whether a constituent concentration is consistent with background follows that developed by USEPA Region 4 (USEPA, 2000a) and presented in the HHRA Workplan (Appendix A). Maximum detected concentrations of constituents in environmental media at the site were compared to two times the arithmetic mean site-specific background concentration. USEPA Region 4 states that although RAGS (USEPA, 1989a) allows the use of statistics in data evaluation, statistics may not be sufficiently conservative at this stage of the risk evaluation; and in most cases, there are not a sufficient number of samples for conducting a statistical analysis. Therefore, if maximum concentrations of inorganic constituents in an area are found to be less than two times the average background concentrations, then those constituents are eliminated from quantitative evaluation in the risk assessment. Constituents whose maximum detected concentrations are above the defined background levels and not identified as an essential nutrient were retained for evaluation in the next step of the hazard identification process (Toxicity Screen).

The calculation of background concentrations is presented in Appendix D. It should be noted that arsenic in soil in a subset of the sites and transects was the only constituent eliminated as a COPC based solely on the background screening step.

insert (8) - [USAGE (12/00) - 2]

3.2.3 Toxicity Screen

A toxicity screen was performed in accordance with USEPA Region 5 guidance (USEPA, 1998b) and IEPA regulations (IEPA, 1998).

3.2.3.1 Sources of Screening Criteria

USEPA Region 5 guidance identifies the following three sources as appropriate screening levels for soil, in order of preference:

1) Most recent generic soil screening levels (SSLs) developed and presented in Appendix A of the Soil Screening Guidance (USEPA, 1996b). The SSLs are based on ingestion and inhalation (direct contact) and soil-to-groundwater exposure pathways for a residential scenario.
2) Site-specific SSLs derived using the methodology outlined in the above reference.

3) Most recent USEPA Region 9 Preliminary Remediation Goals (PRGs; USEPA, 1999).

The IEPA TACO program (IEPA, 1998) is very similar to that outlined in the SSL guidance (USEPA, 1996a) in that it provides Tier I criteria based on direct contact (ingestion and inhalation) and the soil-to-groundwater pathway. In fact, the TACO Tier I criteria have been developed based on the USEPA SSL guidance. However, the TACO Tier I criteria are more comprehensive because values are provided for a longer list of constituents, and Tier I criteria are available for both residential and industrial scenarios.

USEPA (1) [USEPA-1]

Therefore, IEPA TACO Tier I criteria were used for the identification of COPCs for soil and groundwater for quantitative evaluation in the risk assessment. Where IEPA TACO Tier I criteria (IEPA, 1998) were not available, structural similarity was used to assign a surrogate TACO Tier 1 criterion, and where this was not possible USEPA Region 9 PRGs (1999) were used. The screening values are presented in Appendix C.

Residential values were used to identify COPCs for residential soils and sediments, and industrial values were used to evaluate fill area soils. Region 9 PRGs were used as screening criteria for ten constituents detected in soil.

The TACO program also provides screening criteria for the groundwater ingestion component of the soil to groundwater pathway that were used here. These latter values conservatively address leaching of constituents from soils to underlying groundwater.

The IEPA TACO program provides Tier 1 groundwater remediation objectives for two classes of groundwater: Class I and Class II. Class I is potable resource groundwater, and Class II applies to all other groundwater. The derivation of the Class I and Class II criteria are discussed in Appendix C. Class II criteria were developed to allow for facile treatment of groundwater to meet Class I criteria, and to be protective of agricultural uses of groundwater. Thus, the Class II criteria are considered to be protective of incidental groundwater exposures.

The groundwater in the study area meets the Class I: Potable Resource Groundwater criteria set forth in 35 Ill. Adm. Code 620. However, as noted in the HHRA Workplan, a drinking water scenario would only be included in the risk assessment if it was determined that groundwater was being used as a sole source of drinking water for any of the residences in the study area that are downgradient of the fill areas. Private wells in the study area are either not used or are used for outdoor household activities. In addition, ordinances are in effect in the Village of Sauget and the Village of Cahokia that prohibit the use of groundwater as a potable water supply (these are presented in Appendix S). Therefore, a drinking water scenario is not included in the risk assessment. To identify COPCs for potential incidental exposures to groundwater (i.e., non-drinking water scenarios), the Class II criteria were

used. Region 9 PRGs for tap water were used as screening criteria for fourteen constituents detected in groundwater.

INSERT (15) [IEPA 4/5]

IEPA TACO Tier I values are not available for surface water, fish tissue, or air. Hence, surface water data were compared to the Class II groundwater criteria, as surface water exposures for evaluation in the risk assessment involve incidental contact with surface water, and not a drinking water exposure. Fish tissue data were compared to the USEPA Region 3 Risk-Based Concentrations (RBCs) for fish (USEPA, 2000b). As fish tissue data were available for evaluation, a comparison of surface water data to human health Ambient Water Quality Criteria (AWQCs) for fish ingestion (USEPA, 1998c) was not required. Air concentrations were compared to USEPA Region 9 PRGs (USEPA, 1999).

The toxicity criteria available at the time of the HHRA Workplan (Appendix A) preparation were used to develop data quality levels (DQLs), which were used to identify appropriate practical quantitation limits (PQLs) for laboratory methods for the analytical program addressed in the Quality Assurance Project Plans (QAPPs) for the site (see Volumes 2B and 3B of the SSP).

As noted in the HHRA Workplan, the PRGs and RBCs are periodically updated by USEPA. The most current criteria available at the time of the screening were used in the selection of COPCs. These are the Region 3 RBCs dated October 5, 2000 and the Region 9 PRGs dated October 1, 1999. The screening was conducted in October, 2000. The Region 9 PRGs were updated in the fall of 2000; the date on the Region 9 PRG update is November 1, 2000 (USEPA, 2000d). A review of the PRG values used in the screening indicates that only the value for lead in industrial soil has changed significantly (from 1000 mg/kg to 750 mg/kg). Therefore, the latter value was used in the industrial soil screening, though all of the screening tables by necessity refer to the 1999 PRGs.

The as-published sources of screening criteria are presented in the HHRA Workplan Appendices. The TACO Tier I values are presented in Appendix (Workplan) B, and the current AWQCs are presented in Appendix (Workplan) E. Because the USEPA Region 9 PRGs and the USEPA Region 3 RBCs have been updated since the submittal of the workplan, the current versions of these values used in this risk assessment have been included in the workplan appendices. Therefore, the current (2000d) USEPA Region 9 PRGs are presented in Appendix (Workplan) C, the current USEPA Region 3 RBCs (2000b) are presented in Appendix (Workplan) D.

Appendix C presents the specific screening values used for the residential soil – direct contact screen, the industrial soil – direct contact screen, the soil to groundwater pathway screen, the groundwater and surface water screen, the air screen, and the fish tissue screen used in this risk assessment.

PAHs are common combustion products and are found in grilled foods, charcoal, and in motor oils and asphalt paving (ATSDR, 1995). A paper entitled "Background Levels of Polycyclic Aromatic Hydrocarbons (PAH) and Selected Metals in New England Urban Soils" (Bradley et al., 1994) investigated the occurrence of PAHs in soils in three New England towns: Boston, MA; Providence, RI; and Springfield, MA. Samples were collected in non-industrial areas. PAH concentrations were consistently higher than residential screening criteria. Higher PAH concentrations were found near roadways and near telephone poles. A copy of the paper is presented in Appendix D – Background Calculations. Comparison of the PAH concentrations in this paper with those concentrations detected in Transect 3, 4, 5, 6, and 7 surface soils indicates that the transect concentrations are similar to those presented in the paper, i.e., are consistent with urban background.

Arsenic was identified as a COPC in surface soils in Transect 7. Of the nine surface soil samples collected in this transect, eight had concentrations ranging from 6.2 to 8.1 mg/kg, below the site-specific background concentration of 19 mg/kg. However, one sample in Transect 7 (UAS-T7-S1-0-0.5FT) had an arsenic concentration of 34 mg/kg. Because this maximum detected value is greater than the background concentration, arsenic was identified as a COPC in Transect 7. This concentration is within the range of arsenic concentrations detected in eastern U.S. soils of 0.1 to 73 mg/kg (ATSDR, 1992). INSERT-22 [IEPA-7]

IEPA has published a report entitled "A Summary of Selected Background Conditions for Inorganics in Soil" (IEPA, 1994). This report is presented here in Appendix D. In this publication, background concentrations are reported for soils within counties in metropolitan areas and soils in counties outside of metropolitan areas. Within metropolitan areas, 114 soil samples were evaluated; arsenic concentrations ranged from 1.1 to 24 mg/kg, with a mean concentration of 7.4 mg/kg and a median concentration of 7.2 mg/kg. Outside of metropolitan areas, 120 soil samples were evaluated; arsenic concentrations ranged from 0.35 to 22.4 mg/kg, with a mean concentration of 5.9 mg/kg and a median concentration of 5.2 mg/kg. The Illinois TACO program (IEPA, 1998) uses the median concentrations as its point estimates for the statewide area background approach for concentrations of inorganics in soils; this is a conservative approach as equal numbers of samples in the background population had higher concentrations than the reported median value as those with lower concentrations. Sauget Area 1 is in St. Clair County, which is identified as a metropolitan area county in the TACO program. All detected concentrations of arsenic in soil were within the range of arsenic concentrations detected in metropolitan areas (1.1 to 24 mg/kg) with the exception of the single sample noted above. As provided for in the TACO program, an alternative statistical approach for background was used in the HHRA, as identified in the HHRA Workplan. The site-specific background concentration for arsenic of 19 mg/kg is also within the range of arsenic concentrations detected in background locations presented in the IEPA report.

Therefore, although the majority of the COPCs identified in the transect soils are likely consistent with background concentrations, they have all been quantitatively evaluated in the risk assessment.

L, and lead was not identified as a COPC in any other groundwater sampling location included in the evaluation.

3.3.3 Sediment

Maximum constituent concentrations in sediment in the combined CS-F/Borrow Pit Lake area were compared to residential soil screening values for direct contact, per the HHRA Workplan. The screening table is presented in Appendix E.

Two COPCs were identified in sediment, as shown in Table 3-6; arsenic and PCBs.

3.3.4 Surface Water

Maximum constituent concentrations in surface water in the combined CS-F/Borrow Pit Lake area were compared to the screening values for surface water, which are the Class II groundwater criteria. The screening table is presented in Appendix I. Based on this screen, no COPCs were identified in surface water. Therefore, surface water is not evaluated further in the risk assessment.

3.3.5 Fish Fillet

The selection of COPCs for fish fillet samples was conducted on a sample-by-sample basis. Fish tissue concentrations were compared to the USEPA Region 3 RBCs (USEPA, 2000b). The screening tables are presented in Appendix I. The background calculation is also presented in Appendix I.

One COPC was identified in fish tissue – arsenic, as shown on Table 3-6. Arsenic was detected in only one of the three fish tissue samples analyzed for arsenic.

3.3.6 Air

[WESTON -4]

3-7

Ambient air sampling was conducted at Sites G, H, I and L to determine the tendency of site constituents to enter the atmosphere and local wind patterns. At Site G, air samples were collected at two upwind and two downwind locations. At Sites H, I, and L, air samples were collected at one upwind and two downwind locations. Figure ~~3-9~~ identifies the ambient air sampling locations.

Air samples were analyzed for VOCs, SVOCs, PCBs, dioxins, and metals. Appendix J presents the upwind or background air concentrations and the comparison of each downwind sample concentration to upwind concentrations and to the PRGs for ambient air (USEPA, 1999).

Table 3-7 provides the summary for the COPCs identified in air. It should be noted that 4-methyl-2-pentanone, acetone and methylene chloride are all common laboratory contaminants, however, review

of the field blank data did not clearly indicate a problem with sample collection or analysis. Methylene chloride was identified as a COPC in all four sites. However, the numerical results are sporadic (see Table 3-7 and Appendix J). For example, in each downwind sample pair, methylene chloride was detected at a high concentration in one sample, and not detected or detected at a much lower concentration in the second downwind sample. As samples were collected from all areas on the same day, such spikes would not be expected. Moreover, methylene chloride was not identified as a COPC in site soils or groundwater. Therefore, although it is not indicated by the sample blank evaluations, laboratory contamination seems to be the most likely source of methylene chloride in these samples.

INSERT (18) [USAEC(12/00)75]

These data are evaluated further in Section 7.0.

each sample, the reported sample concentration (or half the detection limit, as appropriate, for non-detected congeners) for each dioxin and furan congener having a TEF listed by WHO was multiplied by its TEF, resulting in a TCDD toxic equivalence concentration (TCDD-TEQ). The TCDD-TEQ values for each of the congeners were then added together for each sample and treated as one sample concentration in the risk assessment. The cancer slope factor for 2,3,7,8-TCDD was used to calculate potential carcinogenic risks resulting from potential exposure to 2,3,7,8-TCDD-TEQs.

INSERT-6 [WESTON-18]

The initial CSM for the site is presented in Figure (Appendix A) 2-1. Table (Appendix A) 5-1 presented the matrix of receptors and pathways by area and medium that would be considered for evaluation in the risk assessment. The CSM and the receptor area matrix have been updated based on a review of the analytical results and the COPC selection process. The updated CSM is presented in Figure 5-1. The updated receptor/area matrix is presented in Table 5-1. Both are discussed below.

5.1.1 Sites

In Sauget Area 1, the sites are identified as Sites G, H, I, L, M, and N. These are identified as source areas in the CSM (Figure 5-1). Constituents in the sites may leach to underlying groundwater. In accordance with the SSP, samples of wastes in the fill areas were analyzed by the Toxicity Characteristic Leaching Procedure (TCLP) to address potential leachate issues.

Site M is included in the UAO sediment removal action (Section 2.0), therefore, it is not evaluated further in the HHRA. COPCs were identified in samples of shallow groundwater in Site H, Site G, Site L, and in Site I and downgradient (west) of Site I. Groundwater is, therefore, identified as a secondary source in the CSM (Figure 5-1), and these COPCs are quantitatively evaluated in the HHRA. It should be noted that no COPCs were identified in groundwater south of Site L, with the exception of lead in a nonpotable use well in the residential area.

INSERT (5) -[USACE(2/[illegible]) -5]

VOCs identified as COPCs in shallow groundwater may volatilize and infiltrate indoor air in overlying buildings and outdoor air, and these potential exposure pathways (Figure 5-1) are evaluated in the HHRA. Construction work may occur to depths at which shallow groundwater may be encountered by direct contact, and this pathway is evaluated in the HHRA. It is assumed that construction could occur to depths up to 30 feet bgs as some sewer lines in the area are at this depth. It is assumed that volatilization of VOCs to indoor or outdoor air can occur from groundwater up to this depth, although this pathway is more commonly evaluated for groundwater less than 15 feet bgs (MADEP, 1995).

No COPCs were identified in surface soil in Site G, therefore, this medium is not further evaluated in the HHRA. COPCs were identified in surface soil in Sites H, I, L, and N. COPCs in surface soil may be suspended in dusts in outdoor air (no VOCs were identified as COPCs in site soils). Exposure to COPCs in outdoor air as well as direct contact with soils are evaluated as potential exposure pathways in the HHRA (Figure 5-1).

5.1.2 Dead Creek and Borrow Pit Lake

Historical information presented in the SSP demonstrates that the major source of COPCs in surface water and sediments in Dead Creek was past industrial and municipal discharges directly to the creek. There are no current discharges to the creek other than stormwater.

discussion in Section 8, where the use of institutional controls to enforce these safeguards is discussed.

Due to the presence of VOCs in groundwater in Sites G, H, I and L, an on-site indoor industrial worker will be evaluated for potential exposure to COPCs via inhalation of volatile constituents present in indoor air due to vapor intrusion from groundwater. It is unlikely that the indoor worker receptor would be exposed to soils to the same extent as an outdoor worker, therefore, this pathway was concluded to be insignificant and was not quantitatively evaluated in the risk assessment for this receptor.

5.2.2 Dead Creek and Borrow Pit Lake

INSERT ② [USEPA-2]

Access to Dead Creek is generally uncontrolled except for CS-B, which is secured with a fence. Since sediments in CS-B, C, D and E and the upstream portion of F will be excavated and contained on-site as part of a Time Critical Removal Action, exposure to sediments is not considered a potential exposure scenario in these creek segments. Although access to Borrow Pit Lake is uncontrolled, it is located on private property, and access is very difficult due to its setting. Again, although access is difficult, recreational fishing may occur in Borrow Pit Lake. Borrow Pit Lake and the majority of CS-F that are not included in the sediment removal action are evaluated as one area in the HHRA.

COPCs were identified in sediment but not in surface water. Therefore, a recreational receptor (i.e., teenager) could be exposed to COPCs in sediment of CS-F and the Borrow Pit Lake while wading or swimming. This scenario was evaluated in the HHRA.

One COPC was identified in fish tissue collected from Borrow Pit Lake. Therefore, a recreational fisher receptor potentially exposed to COPCs in sediment while wading and via ingestion of fish was evaluated in the HHRA.

5.2.3 Transect Areas

The transect areas consist of residential, commercial and undeveloped land. Therefore, both residential and non-residential exposure scenarios were evaluated for these areas. COPCs for a residential scenario were identified in surface soil in Transects 3 through 7 and Site N. COPCs for an industrial scenario were identified in surface soil in Transects 3, 4, 6, and 7, and in subsurface soil in Transects 4 and 6. The only COPC identified in groundwater in the transect area was lead in a non-potable use well.

An indoor industrial worker was not evaluated in the transect areas as no VOCs were identified as COPCs in groundwater. An outdoor industrial worker was evaluated for potential exposure to COPCs in surface soil via incidental ingestion and dermal contact, and via inhalation of COPCs that may be suspended as dusts from soils.

$$\frac{480\ mg/day}{3.5\ mg/cm^2} = \frac{ingestion\ rate\ (mg/day)}{soil\ adherence\ (mg/cm^2)}$$

The soil adherence value for the "farmer" is 0.47 mg/cm^2. The calculated soil ingestion value is 64 mg/day; therefore, a soil ingestion rate of 64 mg/day is used for the MLE construction worker receptor in this risk evaluation.

Additional support for this value comes from a new paper by Kissel and coworkers (Kissel et al., 1998) that presents the results of a study of the transfer of soil from hand to mouth by intentional licking. Soil was loaded onto the skin by pressing the hand onto soil, and the amount transferred to the mouth was measured. The thumb sucking, finger mouthing, and palm licking activities resulted in geometric mean soil mass transfers of 7.4 to 16 mg per event. The author concludes that "transfer of 10 mg or more of soil from a hand to the oral cavity in one event is possible, but requires moderate soil loading and more than incidental hand-to-mouth contact." However, "the fraction of soil transferred from hand to mouth that is subsequently swallowed is unknown but may be less than 100 percent." In addition, "the adult volunteers in this study reported that the presence of roughly 10 mg of soil in the mouth is readily detected (and unpleasant). Repeated unintentional ingestion of that mass of soil by adults therefore seems unlikely. In light of this observation, the 480 mg per day estimate [of Hawley, 1985] would require hundreds or perhaps thousands of hand-to-mouth contacts that resulted in soil transfer per day."

For the RME scenario, a soil ingestion rate of 100 mg/day is assumed for the construction worker. This is the adult soil ingestion rate provided by USEPA (1991b). For the MLE scenario, the soil ingestion rate of 64 mg/kg derived above was used.

5.4.3 Frequency of Exposure to COPC in Soil

INSERT (3) [USEPA-3]

A meteorological factor is generally used to account for the fraction of the year during which exposure to constituents in soils may occur (Sheehan et al., 1991; USEPA, 1989a). It is reasonable to assume that direct contact with soil or intrusive activities will not occur for residential receptors during inclement weather, i.e., when it is raining or snowing, when the ground is wet or frozen, or when snow or ice (32 degrees F) are covering the ground. Thus the frequency of contact with potentially impacted soil is adjusted for these site-specific meteorological conditions (USEPA, 1989a).

There are only a few metrics that can be used to describe the fraction of the year when meteorological conditions are likely to limit exposure. These include temperature and the amount of precipitation per day and per year, which includes rain, snow and ice. While measures are collected hourly, the National Weather Service (NWS, 1986-1995) reports the number of days when precipitation is greater than 0.01 inches (one one-hundredth), greater than 0.1 inches (one tenth), and greater than 1 inch in

$$e^{(\bar{x} + 0.5s^2 + sH / \sqrt{n-1})}$$

Where:

e	=	base of the natural log, equal to 2.718
$\bar{x}$	=	mean of the transformed data
s	=	standard deviation of the transformed data
H	=	H-statistic
n	=	the number of samples in the population

INSERT (19) [WESTON-5]

H-statistic and t-statistic values were obtained from Gilbert (1987).

The Shapiro-Wilk Test for Normality (W-test) is used to determine which 95% UCL value is appropriate for use as an EPC for each COPC. The results of the W-test indicate whether the data set is more likely to be normally or lognormally distributed. The UCL based on the student t-statistic is selected where the data set is more likely to be normally distributed, while the UCL based on the H-statistic is selected where the data set is more likely to be lognormally distributed. The W-test values were calculated and compared for the log-transformed and untransformed data sets. If the log-transformed data have the higher W-test value, the data are assumed to be more lognormally distributed, and the H-statistic 95% UCL value is the appropriate UCL. Similarly, if the untransformed data have the higher W-test value, the data are assumed to be more normally distributed, and the t-statistic 95% UCL is the appropriate UCL.

EPCs for each of the COPC identified in Section 3.0 have been selected using the above described procedure. The tables in Appendix B (Summary Statistics) present for each constituent detected the W-test results, the log-transformed and untransformed 95% UCLs, the selected 95% UCL, and the selected EPC. The EPCs for each medium and scenario are presented in Tables 5-14 through 5-28 for the RME scenario. The EPCs for each medium and scenario are presented in Tables 5-29 through 5-40 for the MLE scenario.

5.5.1.2 Modeled EPCs

Some pathways required modeling to derive the EPCs. These pathways include volatile constituents in groundwater migrating upwards and infiltrating into indoor air, outdoor air and excavation air, and generation of fugitive dusts from undisturbed soils as well as during construction activities.

The model used to predict indoor air concentrations of VOCs for evaluation of the indoor worker receptor was the model of Johnson and Ettinger recommended by the USEPA (1996a and 1997c) to

predict concentrations of COPCs migrating from groundwater to indoor air of an overlying building. Appendix K presents the model calculations and output.

Calculation of outdoor air concentrations of VOCs in groundwater due to exposure to groundwater in an excavation trench is presented in Appendix L. These concentrations were used to evaluate the construction worker receptor.

Concentrations of volatile COPCs in outdoor air due to migration from groundwater was estimated using the methodology recommended by the American Society for Testing and Materials (ASTM, 1995). Appendix M presents the model calculations and output. These concentrations were used to evaluate the outdoor worker and the trespasser receptors.

INSERT (21) [WESTON-15(6)]

The calculation of concentrations of inorganic and semivolatile organic COPCs bound to soil in fugitive dust involves multiplying the soil exposure point concentrations by the concentration of dust in air as follows:

1) Ambient Air:

   COPC concentration in ambient air (mg/m^3) = Exposure point concentration in soil (mg/kg soil) x Dust concentration (kg soil/m^3)

The dust concentration in air used in the evaluation of ambient outdoor air pathways in this risk evaluation is the inverse of the particulate emission factor (PEF) derived in accordance with USEPA guidance (USEPA, 1996a). Tables 5-18, 5-19 and 5-20 present the PEF calculations used for the various fill areas and transects.

2) Excavation Air (i.e., during construction activities):

   COPC concentration in excavation air (mg/m^3) = Exposure point concentration in soil (mg/kg soil) x Dust concentration (mg soil/m^3) x Unit correction factor (1 kg/10^6 mg)

   The dust concentration in air used in the evaluation of excavation air pathways in this risk evaluation is 60 ug/m^3. This value is the recommended concentration of respirable particulate with a mean diameter of 10 microns or less (PM10) for excavation activities (MADEP, 1995).

COPC concentrations in homegrown produce are dependent upon the potential for direct uptake of COPCs from soil through plant roots and will be estimated via the following equation:

Table 6-6 indicates that the potential HIs for the construction worker (RME) are below the target HI of 1 in each area with the exception of Sites G, H and I. The HI for the construction worker for the MLE scenario presented in Table 6-20 is below 1 for all areas with the exception of Site H.

The RME HI exceeds 1 in Site G primarily due to potential inhalation exposure to benzene and naphthalene in excavation air. The RME HI exceeds 1 in Site H due to potential inhalation exposure to benzene, chloroform, and naphthalene in excavation air due to volatilization from standing groundwater. The MLG HI for Site H exceeds 1 primarily due to chloroform in excavation air, and secondarily due to benzene in excavation air. The HI exceeds 1 for the RME scenario in Site I primarily due to potential ingestion and dermal contact exposure to PCBs in soil.

Section 8.0 and Appendix R discuss the target endpoint analyses for the scenarios with total HI exceedances. INSERT (20) [USACE-COVER + through 4]

6.3.4 Trespassing Teen

Potential carcinogenic risks for the RME scenario are presented in Table 6-7, and the potential HIs for the RME scenario are presented in Table 6-8. Risks and HIs for the MLE scenario are presented in Tables 6-21 and 6-22, respectively. The trespassing teen is assumed to be exposed to COPCs in surface soil via incidental ingestion and dermal contact and inhalation of particulates, and to COPCs in groundwater via inhalation of constituents volatilized into outdoor air.

As indicated in Table 6-7, the potential risk for the trespassing teen (RME) is below or within the USEPA risk range of 10^{-4} to 10^{-6}. Table 6-21 indicates that the potential risks for the MLE scenario are also below or within the USEPA risk range of 10^{-4} to 10^{-6}.

Table 6-8 indicates that the potential HI for the trespassing teen (RME) is below the target HI of 1 in each area. The HIs for the trespassing teen in the MLE scenario presented in Table 6-22 are below 1 for all areas.

6.3.5 Recreational Teen

Potential carcinogenic risks for the RME scenario are presented in Table 6-9, and the potential HIs for the RME scenario are presented in Table 6-10. Risks and HIs for the MLE scenario are presented in Tables 6-23 and 6-24, respectively. The recreational teen is assumed to be exposed to COPCs in sediment (wading and swimming) in Dead Creek/Borrow Pit Lake via incidental ingestion and dermal contact.

In comparison with the list of constituents analyzed in each environmental sample (approximately 180 analytes), relatively few constituents were detected in transect and site soils, and of these, relatively few COPCs (a total of seven) were identified for quantitative evaluation in the risk assessment for the transect soils. The COPCs identified were PAHs, arsenic and dieldrin. PAHs and arsenic were also identified as COPCs in site soils (a total of 6 constituents were identified as COPCs in site soils). As discussed in Section 3.3.1.4, the levels of PAHs and arsenic are likely consistent with natural and anthropogenic background, i.e., the detected concentrations would not be expected to be very different in other areas of Sauget and Cahokia, or in other areas in the state of Illinois. Dieldrin is a pesticide that has been in common usage; it was identified as a COPC in a single transect (Transect 5) where it was detected in 2 of 9 samples, the concentration of only one of these samples exceeded the screening criteria. The presence of dieldrin may be due to past agricultural practices in the area. Therefore, these COPCs, although included in the risk assessment, may not necessarily be related to specific site-related releases.

INSERT (13) [IEPA-4]
INSERT (14) [IEPA-5]

6.5.2 Toxicity Assessment

The purpose of the toxicity assessment is to identify the types of adverse health effects a constituent may potentially cause and to define the relationship between the dose of a constituent and the likelihood or magnitude of an adverse effect (response). Risk assessment methodologies typically divide potential health effects of concern into two general categories: effects with a threshold (noncarcinogenic) and effects assumed to be without a threshold (potentially carcinogenic). Toxicity assessments for both of these types of effects share many of the same sources of uncertainty. To compensate for these uncertainties, USEPA has developed the reference doses (RfDs) and cancer slope factors (CSF) that are biased to overestimate rather than under-estimate human health risks. Several of the more important sources of uncertainty and the resulting biases are discussed below.

6.5.2.1 Animal-to-Human Extrapolation in Noncarcinogenic Dose-Response Evaluation

For many constituents, animal studies provide the only reliable information on which to base an estimate of adverse human health effects. Extrapolation from animals to humans introduces a great deal of uncertainty into the risk characterization. In most instances, it is not known how differently a human may react to the constituent compared to the animal species used to test the constituent. If a constituent's fate and the mechanisms by which it causes adverse effects are known in both animals and humans, uncertainty is reduced. When the fate and mechanism for the constituent are unknown, uncertainty increases.

The procedures used to extrapolate from animals to humans involve conservative assumptions and incorporate uncertainty factors such that overestimation of effects in humans is more likely than underestimation. When data are available from several species, the lowest dose that elicits effects in

Sample Location. In addition, the data used to calculate the EPCs are assumed to be representative of general site conditions. Sample locations in the sites and transects were identified to be as representative of site conditions as possible.

Environmental Degradation. Finally, it is assumed that the EPCs calculated in the risk assessment based on current site conditions remain constant for the assumed exposure duration – for an industrial or residential scenario this is a period of 25 to 30 years. However, it is well known in the scientific community that constituents in the environment are subject to natural attenuation and biodegradation processes. Organic constituents are naturally degraded in the environment by a variety of processes (i.e., photodegradation, microbial activity, hydrolysis, etc.). USEPA has recognized the validity and utility of natural attenuation and biodegradation as a remedial option and has recently published guidance for its site-specific implementation (USEPA, 1997d). Environmental half-lives vary for specific constituents based on environmental conditions (i.e., presence of bacteria, pH, exposures to sunlight and oxygen), and there are respected literature sources of such information. However, environmental degradation is not typically accounted for in the calculation of risks for the site. This has likely resulted in an over-estimation of site risks.

INSERT 17 [WESTON-7]

Exposure Assumptions

When estimating potential human doses (i.e., intakes) from potential exposure to various media containing COPCs, several assumptions are made. Uncertainty may exist, for example, in assumptions concerning rates of ingestion, frequency and duration of exposure, and bioavailability of the constituents in the medium. Typically, when limited information is available to establish these assumptions, a conservative (i.e., health-protective) estimate of potential exposure is employed. Default exposure assumptions recommended by the USEPA are intended to be conservative and representative of an individual who consistently and frequently contacts environmental media at a site, a scenario that rarely occurs. Most individuals will contact media at non-site locations, while the risk assessment assumes that all exposure to environmental media will occur at the site. Moreover, it is often assumed that contact with environmental media occurs in the areas having the highest constituent concentrations for the entire exposure frequency/duration used in the risk assessment, due to both statistical handling of the data and the original sampling plan.

The assumptions regarding exposure frequency and duration are very conservative. For example, while the agency default for working tenure is 25 years, the average occupational tenure for an industrial/commercial worker is 4.2 years. The use of conservative assumptions is likely to lead to an overestimate of potential risk.

INSERT 4 [USEPA-3]

Another conservative assumption used in the risk assessment has been the use of an adult produce consumption rate of 454 g per day, which is equivalent to 1 pound of homegrown produce per day. This value was obtained from the EFH (USEPA, 1997a), and represents an upper bound ingestion

7.2.6 Air

Ambient air sampling was conducted at Sites G, H, I and L to determine the tendency of site constituents to enter the atmosphere and local wind patterns. At Site G, air samples were collected at two upwind and two downwind locations. At Sites H, I, and L, air samples were collected at one upwind and two downwind locations. Figure 3-7 identifies the ambient air sampling locations.

[WESTON-8]

Air samples were analyzed for VOCs, SVOCs, PCBs, dioxins, and metals. Appendix J (Table J-6) presents the comparison of average air concentrations in air to 100 times the PRGs for ambient air (USEPA, 1999).

Methylene chloride is the only constituent identified as an STCOPC in air. It should be noted that methylene chloride is a common laboratory contaminant, however, review of the field blank data did not clearly indicate a problem with sample collection or analysis. Methylene chloride was identified as a COPC in all four sites. However, the numerical results are sporadic (see Appendix J). For example, in each downwind sample pair, methylene chloride was detected at a high concentration in one sample, and not detected or detected at a much lower concentration in the second downwind sample. As samples were collected from all areas on the same day, such spikes would not be expected. Moreover, methylene chloride was not identified as a COPC in sites soils or groundwater. Therefore, although it is not indicated by the sample blank evaluations, laboratory contamination appears to be the most likely source of methylene chloride in these samples.

As noted in the HHRA Workplan, and because these data represent a single 24-hour snapshot of air quality, they are not used for further risk calculations, and methylene chloride is not considered to be present.

7.2.7 Summary of STCOPC

Based on the analysis of short-term risk presented above, it is concluded that no short-term (acute) risks are posed at the site.

excavation air, generation of fugitive dusts from undisturbed soils as well as during construction activities, and prediction of garden produce concentrations. The models used are described in Section 5.0 and the appendices.

The exposure point concentrations for each COPC in each medium are presented in Section 5 tables for both the RME and MLE scenarios.

8.3.3 Receptor Evaluation

Table 5-1 presents the detailed receptor/pathway/area matrix that summarizes the receptors evaluated in each area, by medium and exposure route. These scenarios were developed based on the data, the CSM, and the COPCs identified in each medium. RME scenarios and MLE scenarios based on appropriate USEPA guidance were both evaluated in the quantitative risk assessment. In all, 64 receptor scenarios were evaluated in the Sauget Area 1 risk assessment.

To estimate the potential risk to human health that may be posed by the presence of COPCs in environmental media in the study area, it is first necessary to estimate the potential exposure dose of each COPC for each receptor. The exposure dose is estimated for each constituent via each exposure pathway by which the receptor is assumed to be exposed. Exposure dose equations combine the estimates of constituent concentration in the environmental medium of interest with assumptions regarding the type and magnitude of each receptor's potential exposure to provide a numerical estimate of the exposure dose. The exposure dose is defined as the amount of COPC taken into the receptor and is expressed in units of milligrams of COPC per kilogram of body weight per day (mg/kg-day). The exposure doses are combined with the toxicity values to estimate potential risks and hazards for each receptor. The exposure dose and risk calculation spreadsheets are presented in Appendix P.

8.4 Risk Characterization

remainder of text replaced by Attachment 7 [Weston-9]

The potential risk to human health associated with potential exposure to COPCs in environmental media at the site is evaluated in this step of the risk assessment process. Risk characterization is the process in which the dose-response information (Section 4.0) is integrated with quantitative estimates of human exposure derived in the Exposure Assessment (Section 5.0). The result is a quantitative estimate of the likelihood that humans will experience any adverse health effects given the exposure assumptions made. Two general types of health risk are characterized for each potential exposure pathway considered: potential carcinogenic risk and potential noncarcinogenic risk. Carcinogenic risk is evaluated by averaging exposure over a normal human lifetime, which, based on USEPA guidance (1989a), is assumed to be 70 years. Noncarcinogenic risk is evaluated by averaging exposure over the total exposure period.

the review of these chemicals' treatment potentials found at least 90% removal efficiency for all added organics, therefore, the Class II standards for these chemicals were set at 10 times the Class I standard.

Regarding the inorganics, the intent was to assure that the concentration in groundwater would not be so high that the water could not be safely used for agricultural purposes (crop irrigation and livestock watering). A search for upper limits on water concentrations which are acceptable for long-term agricultural use was conducted for the chemicals for which Class I standards were being proposed. For most chemicals, the appropriate concentration was found in USEPA's Water Quality Criteria 1972 (the "Blue Book"). Exceptions included cyanide (for which the Agency developed the equivalent of the Blue Book concentration after reviewing relevant papers in the scientific literature), fluoride and iron (for which pre-existing standards were incorporated into the proposal), and chloride, sulfate, and total dissolved solids (for which the 95th percentile of state-wide monitoring data was the proposed concentration).

INSERT (16) [GCPA-6]

Calculation of TACO Tier 1 Standards for Beryllium

The USEPA updated its Integrated Risk Information System (IRIS) (USEPA, 2000) file for beryllium on 4/3/2000. The dose-response values changed significantly for beryllium. The most significant change is that beryllium is no longer considered carcinogenic by the oral route of exposure. Therefore, TACO Tier 1 objectives for Residential and Industrial Soil - Direct Contact were recalculated for beryllium using these current dose-response values, and following the TACO Section 742, Appendix C, Table A: SSL Equations and Table B: SSL Parameters guidance. Table C-7 here presents the equations, parameters, and calculations used to provide the updated TACO values for beryllium.

References

IEPA. 1998. Tiered Approach to Corrective Action Objectives. Title 35, Subtitle G, Chapter I, Subchapter J, Part 742. As amended June 8, 1998. Illinois Environmental Protection Agency.

USEPA. 2000. USEPA. 2000. Integrated Risk Information System (IRIS).

[URL: http://www.epa.gov/ngispgm3/iris/]

APPENDIX D
BACKGROUND CALCULATIONS

This appendix presents the concentrations to be used as background for constituents detected in background samples collected for:

- Table D-1 Subsurface Soil
- Table D-2 Surface Soil
- Table D-3 Sediment
- Table D-4 Surface Water
- Table D-5 Groundwater

Background is calculated as described in the USEPA-approved workplan for the Human Health Risk Assessment for Sauget Area 1 (presented in Appendix A), following USEPA Region 4 (2000) guidance. The background concentration is defined as two times the arithmetic mean site-specific background concentration.

Background calculations for fish tissue are presented in Appendix I, with the fish tissue screening table. Background data for air are presented in Appendix J.

INSERT (B) [USACE (12/00) -2]

Reference

USEPA. 2000. Region 4 Human Health Risk Assessment Bulletins - - Supplement to RAGS. USEPA Region 4. Atlanta, GA. Update 05/30/00.

[URL: http://www.epa.gov/region4/waste/oftecser/healthbul.htm]

- Surface soil – Fill Area G
- Surface soil – Fill Area H
- Surface soil – Fill Area I
- Surface soil – Fill Area L
- Surface soil – Fill Area N

For metals and ionizable organics, the soil to groundwater pathway screening values are pH dependent. The screening conducted in the above tables used the lowest screening value available, regardless of pH. In Tables G-2, G-3 and G-4 that follow the tables listed above, constituents that failed the initial soil to groundwater screen for transect surface soil, transect subsurface soil, and fill area surface soil are then compared to area-specific pH-specific soil to groundwater pathway screening values, where available. Many of the initial COPCs were screened out based on this site-specific screening step.

The screening results are summarized in Section 3.3.1 of the text.

→ insert (21) USACE(2/01)-7

exposure or medium is the same as the fraction absorbed in the laboratory study, then the AAF is 1.0. This does not mean that there is 100% absorption, only that the magnitude of absorption is the same in both cases. There are situations in which it is expected that the fraction absorbed from a site-related exposure would be higher than that in the laboratory study. There are also situations where the reverse could occur. Thus, use of AAFs provides more accurate and more realistic estimates of potential human health risk. In the absence of detailed toxicological information on a COPC, the following default AAF values are generally employed. A default AAF value of 0.01 is used for dermal exposure to organics, a value of 0.001 is used for dermal exposure to inorganics, and a value of 1.0 is employed for all other routes of exposure.

INSERT (11) [WESTON-18]

Support for the Use of AAFs in Agency Guidance

The use of absorption factors is recommended by USEPA for use in risk assessment when the "medium of exposure in the site exposure assessment differs from the medium of exposure assumed by the toxicity value" (USEPA, 1989). In more recent guidance (USEPA, 1992), USEPA states:

> The applied dose, or the amount that reaches exchange boundaries of the skin, lung or gastrointestinal tract, may often be less than the potential dose if the material is only partly bioavailable. Where data on bioavailability are known, adjustments to the potential dose to convert it to applied dose and internal dose may be made.
>
> This may be done by adding a bioavailability factor (range: 0 to 1) to the dose equation. The bioavailability factor would then take into account the ability of the chemical to be extracted from the matrix, absorption through the exchange boundary, and any other losses between ingestion and contact with lung or gastrointestinal tract.

Oral Bioavailability of Chemicals in Soil

Oral bioavailability is a measure of the degree to which a chemical may be systemically absorbed following ingestion. Some chemicals are absorbed almost completely (100 percent bioavailability) when ingested in pure form. Other chemicals may pass through the body largely unabsorbed. In part, the physical characteristics of the chemical affect the amount absorbed. In general, as the lipophilicity of a chemical increases, its absorption across the gastrointestinal tract increases.

In addition, the oral bioavailability or absorption of soil-bound chemicals is also dependent upon the rate at which chemicals dissociate from the soil or slag matrix in the gut. Soil-bound chemicals, particularly inorganics, are usually absorbed to a lesser degree than chemicals in pure form (Paustenbach, 1987; Goon et al., 1990, 1991; Sheehan et al., 1991; Sheppard et al., 1995, Magee et al., 1996). The reduced absorption is a result of hydrophobic attraction between the chemical and soil matrix. The greater the degree of affinity between a chemical and soil, the less likely that a soil-bound chemical will be absorbed upon ingestion. Absorption of the pure chemical in the gut is inherently

ATTACHMENT 18

RESPONSE TO USACE (2/01)-7

RESPONSE TO COMMENT USACE (2/01)-7

The following text and table will be added at the end of the introductory text of Appendix G:

INSERT-21:

As shown in Table G-1, TACO Tier 1 soil to groundwater screening values were not available for the following 23 constituents:

- **2,4-DB**
- **2-Butanone (MEK)**
- **2-Hexanone**
- **2-Nitroaniline**
- **Aluminum**
- **Calcium**
- **Chromium**
- **Cobalt**
- **Dibenzofuran**
- **Dicamba**
- **Iron**
- **Lead**
- **Magnesium**
- **Manganese**
- **MCPA**
- **MCPP**
- **Molybdenum**
- **Potassium**
- **Silver**
- **Sodium**
- **Total 2,3,7,8-TCDD TEQ**
- **Total PCBs**
- **Vanadium**

Of these, the following 5 are essential nutrients:

- Calcium
- Iron
- Magnesium
- Potassium
- Sodium

USEPA provides soil screening levels (SSLs) (USEPA, 1996a,b, as referenced in Section 8 of the HHRA report) for the soil to groundwater pathway for the following 5 constituents (followed by the SSL value for a DAF of 20):

- Chromium III (any value protective of underlying groundwater)
- Chromium VI (38 mg/kg)

Although soil concentrations exceed the hexavalent chromium screening value in Transect 1 surface soil, Transect 2 surface soil, Transect 7 subsurface soil , Site I surface soil and Site L surface soil, there is no reason to believe that hexavalent chromium is present at the site. Therefore, chromium is not identified as a COPC for the soil to groundwater pathway.

- Lead (no soil to groundwater SSL - direct contact evaluation appropriate for this constituent)
- Silver (32 mg/kg)

  There are no exceedances of the SSL for silver.
- Total PCBs (no soil to groundwater SSL - direct contact evaluation appropriate for this constituent)
- Vanadium (6,000 mg/kg)

  There are no exceedances of the SSL for vanadium.

The purpose of the soil to groundwater screen is to identify where soils may serve as a source of constituents to underlying groundwater. The Sauget Area 1 Sites have been in place for many years, and have not seen recent disposal activity. Therefore, it they are serving as a source of constituents to underlying groundwater, those constituents should be detectable in groundwater at levels of concern. Therefore, the list of groundwater COPCs was compared to the list of remaining constituents lacking soil to groundwater screening values to determine if significant leaching has

occurred. The following constituents were not identified as COPCs in groundwater. Therefore, they are eliminated from further consideration in the soil-to-groundwater pathway:

- 2,4-DB
- 2-Butanone (MEK)
- 2-Hexanone
- Aluminum
- Cobalt
- Dibenzofuran
- Dicamba
- Manganese
- MCPA
- MCPP

Therefore, the following 3 constituents are detected in soil and identified as a COPC in groundwater:

- 2-Nitroaniline
- Molybdenum
- Total 2,3,7,8-TCDD TEQ

2-Nitroaniline was detected in one soil sample in Site I, and was not identified as a COPC for soil. It was identified as a groundwater COPC in one well in Site H, but was not detected in Site H soil. Therefore, 2-nitroaniline is not identified as a soil to groundwater COPC.

Molybdenum was identified as a groundwater COPC in one well in Site G. Although it was detected in soil samples from Site G, all concentrations were below background. Therefore, molybdenum is not identified as a soil to groundwater COPC.

Total 2,3,7,8-TCDD TEQ was identified as a direct contact COPC in Site H and Site I soils. Total 2,3,7,8-TCDD TEQ was also identified as groundwater COPC in sample locations in Site G, Site H and Site I. Given the limited mobility of dioxins in the soil environment, there is the strong potential that the observance of dioxin in groundwater at these Sites is due to its presence in fill material that is saturated with groundwater rather than due to transport from the soil to groundwater. Therefore, Total 2,3,7,8-TCDD TEQ is not identified as a soil to groundwater COPC.

Table G-1
Evaluation of Constituents Lacking Soil to Groundwater Criteria
Sauget Area 1 - EE/CA and RI/FS
Human Health Risk Assessment

Constituents Without Soil to Groundwater Pathway Survey Values	Eliminated from further consideration based on:			
	Essential Nutrient Status	Comparison to USEPA SSLs	Not a COPC in Groundwater	See Text for Explanation
2,4-DB			X	
2-Butanone (MEK)			X	
2-Hexanone			X	
2-Nitroaniline				X
Aluminum			X	
Calcium	X			
Chromium		X		
Cobalt			X	
Dibenzofuran			X	
Dicamba			X	
Iron	X			
Lead		X		
Magnesium	X			
Manganese			X	
MCPA			X	
MCPP			X	
Molybdenum				X
Potassium	X			
Silver		X		
Sodium	X			
Total 2,3,7,8-TCDD TEQ				X
Total PCBS		X		
Vanadium		X		

Notes:
SSL - Soil Screening Levels
COPC - Constituent of Potential Concern